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CONTENTS

I

Diagnostic value of Lasègue test in discopathy in patients with acute low back pain

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Abstract: Introduction: Low back pain is one of the most important health problems. Disk herniation is one of the common reasons of low back pain. Accurate examination is the best and the simplest diagnostic methods. Physical finding and Straight Leg Raising (SLR) test, neurologic tests and other tests are used to know the exact site of herniation. Para clinical studies such as MRI should be used, because physical examination has not high specificity.

Methods: 100 patients, who were referred with back pain or radicular pain to the emergency department of Imam-Reza hospital of Tabriz city, were enrolled in study. SLR, Reverse SLR and Cross SLR tests were done for all patients. Then patients were referred to the neurosurgeon for treatment. Lumbar MRI was taken for all patients. Then all patients were followed up and there data were collected. **Results:** Sensitivity and specificity of SLR test, Cross SLR test and Reverse SLR test was 100%, 0% and 94.68%, 100% and 88.89%, 100%, respectively. There was no significant relationship between MRI and positive discopathy in examination and SLR (P=0.11). **Conclusion:** SLR has low sensitivity but high specificity. If it uses with physical examination it's sensitivity increases but it's specificity decreases. The most sensitive test for detection of low back pain is SLR and most specific test is Cross SLR.

Keywords: Straight Leg Raising, Low Back Pain, Discopathy

1. Introduction:

Back pain is one of the most common causes of referring to clinics and medical services. It affects two third of adults during their life [1]. Acute back pain of most patients recovers automatically and there is not found any cause for back pain in 95% of the patients. It usually results from muscular or ligament injuries [2, 3]. To find need to any intervention for disc hernia, quad equine syndrome, or myeloid stenosis constituting 5% of back pains and focus on them, further evaluations will be required when back pain is associated with neurological findings [1].

Exact clinical examination is the best and the easiest way of detection. Physical findings in SLR (Straight Leg Raising) test, neurological tests, and others are not only helpful in detecting the problem but also they can be used in specifying exact pathological location. Since clinical examination is of high specificity, Para-clinical modalities such as MRI should also be used [4,5]. Although MRI is of high sensitivity in detecting intervertebral disc hernia, it is not recommended to use it without considering clinical symptoms and it is better that MRI is used to confirm clinical detection and help in determining

exact pathological location to surgery. Unfortunately, it is often used as the first step in detecting back pain and deciding for surgery in spite of its high expenses and lack of its public availability [6].

Whether SLR is positive or negative, MRI is finally used to detect discopathy. There is not any study conducted on importance of SLR test in patients referring to emergency departments while complaining of acute back pain attack indicating to the relationship found between positive SLR and discopathy. Therefore, we aimed to evaluate the validity of positive Lasègue test in identifying the patients with discopathy and acute back pain attack, referring to emergency departments.

2. Materials and Method:

This descriptive cross sectional study was conducted on 100 patients suffering from radiculopathy and acute low back pain referring to the emergency department of Imam Reza hospital from 21 March 2011 to 22 November 2011.

The patients were selected randomly. Lasègue test was conducted for all patients. The patients were treated at emergency department and then were referred to neurosurgery service. MRI of the patients

was evaluated during follow-up period. Additionally, exclusion criteria for patients were:

- History of back surgery (luminectomy and disc surgery)
- Lumbar penetrating or blunt trauma
- TB
- Paravertebral infection
- Cancer

All patients were studied considering positive and negative SLR and the obtained results were registered. The patients were referred to neurosurgery clinic. Since most patients with back pain underwent MRI even with negative SLR, most of them had one of the findings related to radicolopathy, chronic back pain, muscular force reduction, sphincter impairment, decreased sensory. Financial costs of the patients were supported by researchers and results were registered either through phone call or reference to emergency department.

Considering lack of any special intervention, the plan was executed in accordance with instructions of Tabriz University of medical Sciences- ethical committee of the medical faculty. All trusteeship principles were observed and the patients name and address was not disclosed anywhere.

The data were analyzed using SPSS15.0 statistical software and qui-square or Fisher's exact test. Descriptive statistical methods (frequency, percentage, mean ±standard deviation) were used to statistically evaluate the data. In this study, $P<0.05$ was regarded statistically significance. Finally, accuracy and specificity of SLR test were calculated to predict discopathy.

3. Results:

The present study was conducted on 100 patients. 74 (74%) patients experienced back pain again while 26 (26%) cases had not any history of back pain in the past.

Clinical examinations of SLR test was positive in 76 (76%) and was negative in 24 (24%) patients. Reverse SLR test was positive and negative in 36 (36%) and 64 (64%) patients, respectively. Also, cross SLR test was positive in 27 (27%) and negative in 73 (73%) patients.

According to the reports, discopathy was seen in 89 (89%) patients but there was not any sign of discopathy in 11 (11%) cases.

All patients mentioned back pain following activity. Back pain with diffusion to leg was reported in 99 (99%) patients.

Urinary and fecal incontinence was reported only in 3 (3%) patients while 97 (97%) did not suffer from incontinence.

Increasing factor was mentioned in 94 (94%) patients.

Results of SLR test demonstrated that 99 (99%) patients suffered from discopathy while one patient did not experience it.

Results of the study indicated lack of any meaningful relationship between reverse SLR and positive discopathy result in MRI (P=0.97). Also, there was not any meaningful relationship between cross SLR and positive discopathy result in MRI (P=0.15). Additionally, the present study demonstrated that there was not any meaningful relationship between Lasik test and positive discopathy result in MRI (P=0.3).

Fisher' exact test did not show any significant difference between back pain with diffusion to leg and positive discopathy result in MRI (P=0.11).

The study showed that there was a meaningful difference between positive discopathy result in MRI and positive SLR test (P=0.004).

There was a meaningful relationship between history of back pain and MRI findings(P=0.02). Also, there was not any meaningful relationship between increasing factors and MRI findings (P=0.64).

There was not any statistically meaningful relationship between positive discopathy finding in MRI and disposition (P=0.62), walking (P=0.29), lifting heavy objects (P=0.269), bending (P=0.64), and standing (P=0.119). Fisher's exact test did not indicate any meaningful difference between lying and positive discopathy finding in MRI (P=0.2) (diagram 1).
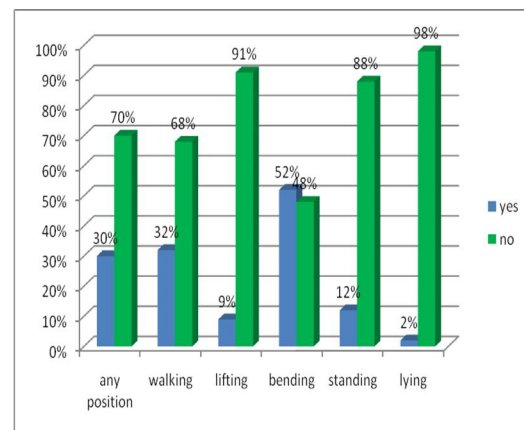
Diagram1: Cause of low back pain

In this study, accuracy and specificity rate as well as positive and negative diagnostic value of SLR test was 77.52%, 36.36%, 90.6%, and 16.66%, respectively.

Additionally, accuracy and specificity rate of cross SLR test was respectively 29.21%, 90.9% and positive and negative indicative value of the test was calculated 96.29% and 13.96%, respectively.

Accuracy and specificity rate of reverse SLR test was respectively 88.89%, 10.94% and positive and negative indicative value of the test was calculated 35.96% and 63.64%, respectively.

Accuracy and specificity rate of associating the description of the patients' conditions with positive Lasik test in diagnosing discopathy was calculated 89.90% and 100%, respectively. Positive and negative indicative value of the method was 100% and 9.09% (diagram 2).
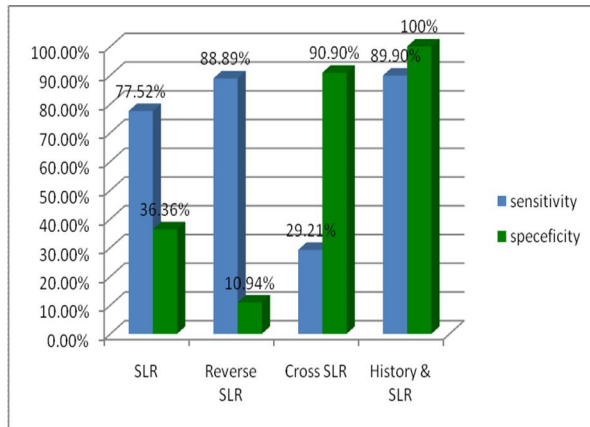
Diagram 2: specificity and sensitivity of SLR, Reverse SLR, Cross SLR, History and positive SLR

4. Discussion:

Back pain is a great health problem such that back and spine pain is regarded as one of disability factors and reduces life quality of people [7]. Statistics indicate that 80% of people refer to physician because of back pain at least once during their life. It is believed that people having to stand or walk for many hours, do heavy and repetitive physical activities associated with several bending, pushing, pulling, and lifting, experience vibration during driving and long-term tiredness as well as those who are dissatisfied from their occupation more suffer from back pain. Therefore, such occupations are being affected by back pain in several ways [8].

SLR is used as the first test to detect disc hernia and it is of 70-80% accuracy. More accurate test such as Slump may be used in diagnosing disc hernia where SLR is negative [9].

In a study, Capla et al referred to 36% as accuracy of the test [10]. Accuracy rate of Lasègue test was measured as 72% in a similar study conducted by Mohseni et al [11] while it was 72% in the study conducted by Masoud et al [12].

Specificity rate of SLR test was 89% in the study conducted by Majlesi et al [9]. Walter et al referred to 26% as specificity rate of the test [13]. Our study also showed that specificity rate of the test equals 36.36%.

Accuracy rate of cross SLR test was 29.21% in the above-mentioned study. It was 29% in the study conducted by Walter et al [13]. Specificity rate of cross SLR test was 88% in the same study [13]. It was 90.9% in the present study.

Capla et al calculated positive and negative indicative value of SLR test as 69% and 52% [10] while it was 90.6% and 16.16% in our study, respectively. Also, accuracy and specificity rate of reverse test was respectively 89.89% and 10.94% in the above-mentioned study.

In the study conducted by Masoud et al, 47% of the patients suffered from Achilles reflex disorder, 31% of them experienced sensory disorders, and 2% of the patients complained from muscular atrophy. There were sphangtory disorders in 5% of the patients [12]. Considering neural disorders, urinary and fecal incontinence was reported by 3 (3%) patients in our study.

Accuracy and specificity rate of associating the description of the patients' conditions with positive Lasègue test in diagnosing discopathy was calculated 89.90% and 100%, respectively.

The present study suggested that incidence of back pain in housewives is more frequent then other groups and low back pain was seen in 28% of housewives. Additionally, Masoud et al demonstrated that incidence rate of acute back pain and discopathy in housewives is higher than other groups [12].

Conclusion:

Results of the present study demonstrate that SLR is of high accuracy by itself but of low specificity. When the test is associated with clinical examination, slight decrease of accuracy and significant increase of specificity are observed. SLR and cross SLR are the most accurate and specific tests to diagnose back pain, respectively

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Scaphoid Nonunion Treatment with Reverse Flow Vascularized Bone Graft from Distal Metaphysis of Radius

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Background: The scaphoid is the most frequently fractured carpal bone. Those fractures are commonly difficult to diagnose and usually go undetected. If the patient does not get medical attention considering that it was a trivial wrist trauma, or if the patient is not appropriately immobilized for enough time, Healing will not occur, partially due to the scaphoid peculiar vascularity. The scaphoid nonunion treatment method is controversial. The aim must be bone healing with scaphoid shape restoration and ligament structure preservation. This study was aimed to evaluate the results of treatment of scaphoid nonunion with reverse flow vascularized bone graft from distal metaphysis of radius. **Materials & Methods:** In a quasi-experimental setting, 20 patients with scaphoid nonunion in Shohada Trauma Center of Tabriz were evaluated during 13 months. All these were operated and a reverse flow vascularized bone graft from distal metaphysis of radius was employed. Long and short thumb spike casting was applied tow times for 1.5 and 2 months respectively. Radiological union, range of motion, presence of pain and the degree of patients' satisfaction were assessed. **Results:** Twenty patients, 19 males and 1 female with mean age of $25.15\pm 6.62(17-40)$ years were recruited. There were 17 waist and 3 proximal pole fractures. Preoperative pain and pain with decreased grip strength was seen in 11 and 9 cases, respectively. Postoperatively, the range of motion did not change significantly. The frequency of patients suffering from pain was significantly decreased at the end of study (100% to 25%; $p<0.001$). There were 7(35%) complications: pin fracture (2 cases), occupation change (2 cases), nonunion (1 case), delayed union (1 case), and the irritation of pin place (1 case). The man time of union-achievement was 10.71 ± 1.62 (8-14) weeks. Eighty percent of the patients were highly to very highly satisfy with the procedure. Mayo wrist score was significantly increased after operation. **Conclusion:** This study showed that the treatment of scaphoid nonunion with reverse flow vascularized bone graft from distal metaphysis of radius is safe and effective. The risk of nonunion should be evaluated studies with larger sample sizes.
[Jafar Ganjpour sales, Amin Moradi, Jafar Soleimanpour-mokhtarmanand, Yashar Hashemi-aghdam, Behrouz Nazari, Sanaz Rahimi. **Scaphoid Nonunion Treatment with Reverse Flow Vascularized Bone Graft from Distal Metaphysis of Radius.** *Life Sci J* 2012;9(4):4319-4323]. (ISSN: 1097-8135). http://www.lifesciencesite.com. 646

Keywords: Scaphoid, Nonunion, Bone Graft.

Scaphoid Nonunion Treatment with Reverse Flow Vascularized Bone Graft from Distal Metaphysis of Radius

1. Introduction:

Scaphoid fracture is the most common fracture among carpal bone fractures (about 71% of all carpal bone fractures). About 345 thousand scaphoid fractures occur every year in USA. This kind of fracture mainly occurs in young and middle-age people (15-60 years of old). About 5-12% of scaphoid fractures are associated with other kinds of fractures and 1% of fractures are bilateral. Scaphoid bone fracture diagnosis is very important because, 90% of the fractures are cured by an early procedure (1). 40% of these fractures remain undetected after primary examination. Consequent nonunion results in: pain, progressive and destructive changes in wrist

joints, deformation of the wrist, erosional changes (osteoarthritis), mobility limitations and a consequent defect in life, especially young and active people (1). The important point is that, it is articulated with distal end of radius and four other carpal bones and moves with every wrist motion. Any change in this joint due to fracture, dislocation, semi-dislocation or any other change in joint stability because of torn ligaments causes severe secondary changes in whole of the wrist joint. If scaphoid fracture remains undetected for 4weeks, we will expect nonunion scaphoid. Many solutions have been proposed to solve this problem (2).

Primary mechanism of scaphoid bone damage is falling on outstretched hand. In adults, it occurs in waist (70%), distal part (10-20%), proximal part (5-10%) and tubercle (5%). the frequency is somehow different in children; tubercle (52%), distal (33%), waist (15%) and proximal part fracture is rare and is often healed without any problem but, because of rising participation of children in group sports this pattern is turning into adults' pattern(3). Associated fractures with scaphoid fracture are: Radius styloid fracture, triquetrum fracture, capitate fracture and trans-carpal peri-lunate fracture. An associated distal fracture is rare (4). Scaphoid fracture problems include:

- Mal-union
- Delayed union
- Nonunion.

There are some classification methods for scaphoid fractures. One of them is classifying based on anatomical details of fracture. According to this classification, scaphoid fractures are divided into four groups:

- Tubercle
- Distal end
- Proximal end
- Waist fraction.

As the second classification based on fracture surface:

- Vertical oblique
- Horizontal oblique
- Transversal fracture.

In another classification, we consider fracture duration and consequent healing duration. In this method there are:

- Acute union (complete union after 4 months of immobilization)
- Delayed union
- Nonunion.

In another method we use stable and unstable expression to describe the condition of fracture (1, 2, and 8). Also, Hepert and Fisher have proposed another method of classification.

Nonunion Treatment:

There is still debate about the most appropriate treatment method for nonunion scaphoid fracture. The main purpose of treatment must be complete bone union associated with primary shape return and ligament structure protection.

Different treatment methods are proposed:

- Electrical and electromagnetic stimulation
- Internal fixation
- Bone graft
- Vascularized bone graft
- Multiple methods with each other (9-13).

Although many successes have been achieved in this field, but fracture cases are numerous and lots of time is needed for immobilization.

This condition results in trouble in patients' life, activity limitations and at last socioeconomic statues destruction. Nowadays the most common methods in using graft which contains recurrent radial artery even vascularization from distal radius, ulna, scaphoid tubercle, dorsal metacarpal artery an ulnar artery might be used (14).

According to the results of some researches, one of the treatment procedures is reverse flow vascularized bone graft from distal metaphysis of radius, which is 86-90% successful in proportion to un-vascularized bone graft . This is the first time which this procedure is being executed in Iran, thus we've decided to investigate the results.

2. Materials & Methods:

2.1. Study Design and Population: In a quasi-experimental setting, 20 patients (19 males and 1 female with mean age of $25.15\pm 6.62(17-40)$ years) with scaphoid nonunion referred to Shohada Trauma Center of Tabriz were evaluated during a 13-months period (Jun-2009 until July-2010). All these were operated and a reverse flow vascularized bone graft distal metaphysis of radius was employed. After patients' admission, patients were questioned with a questionnaire. After an accurate examination of arm and fore arm, acute and chronic problems of sensation, mobility and circulation were searched for and results was compared with other arm and fore arm. Postero-anterior and specific scaphoid view radiography were executed. After MRI, condition of distal and proximal vessels was investigated; at last the operation was performed. A curved incision was made on radial margin of the wrist and scaphoid bone, radius donor end was revealed.

Between first and second compartment, the first and second ICSRA arteries and the vein associated with the bone fraction, were removed about 1.5 cm away from radiocarpal joint and were attached to the prepared nonunion site. Then, internal fixation was performed with kirschner wire. After operation, wrist was dressed with long thumb spika cast for 1.5 months. Then, it was dressed with short thumb spika cast for 2 months more. Medical wrist band was used also. After 4 months kirschner wire was removed and radiologic signs of bone union were investigated. We used simple MRI or CT-Scan to overcome the doubt on curing process. At the end of treatment, patients' satisfaction, pain withdrawal, grip power, and range of motions were investigated and were scored as very good, good, intermediate and bad. Mayo wrist scores before and after operation was measured and compared.

Study Variables:

Age, sex, duration between injury and operation, primary complaints, follow up duration, dominant hand, injured hand, injury mechanism, pain, deterioration and improvement mechanism, treatments before operation, manipulation, sensation, motion and circulation examination, previous disease history, smoking, nonunion location, AVN, occupation before injury, severity of activity before fracture, pain after operation, simultaneous styloidectomy, operation side effects ,duration between operation and union, final result, Mayo wrist score and related classification were studied.

2.2. Statistical Analysis & Ethical Considerations:

Statistical analysis was performed by SPSS software package version 16.0 for windows (SPSS Inc., Chicago, USA). Quantitative data were presented as mean ± standard deviation (SD), while qualitative data were demonstrated as frequency and percent (%). In order to statistical analysis, collected quantitative data were studied with Student T-test (independent Samples), paired samples T-test and Man-whitney U test and for Qualitative data statistical methods, the mean difference test for independent groups, and Chi Square[2] test or Fisher's exact test. P value less than 0.05 was statistically considered significant in all steps. All participants have signed a written consent, and the study protocol was approved by the Ethics Committee of Tabriz University of Medical Sciences (TUMS), which was in compliance with Helsinki Declaration.

3. Results:

We studied 20 patients using reverse flow vascularized bone graft from distal metaphysis of radius. The mean age was 25.15±6.62 (17- 40) and the mean duration between injury and operation was 28.03±41.22 (2-180 months). The mean follow up duration was 8.60±1.64 months. Other primary information are showed in tables (Table 1).

Table 1, Primary Information about patients

	Right	left
Dominant hand	19(95%)	1(5%)
Injured hand	12(60%)	8(40%)

All patients complained of pain. Pain had increased with activity in all cases, but resting in 12 patients relieved the pain. 18 of the patients had fracture dislocation. Sensation and circulation in forearm and hand was normal. None of them had chronic diseases before. 11 patients were smoker. MRI revealed AVN in 11 patients. The patients had different jobs such as: mechanic, farmer (5 patients), car painter, turner, welder, carpenter (2patients), shop keeper (2 patients), slaughter-house worker, confectionery worker, simple worker, student, clerk and teacher. 5 patients complained of pain after

operation which was severe in 3 of them. Styloidectomy was executed on 12 patients (Chart 1).
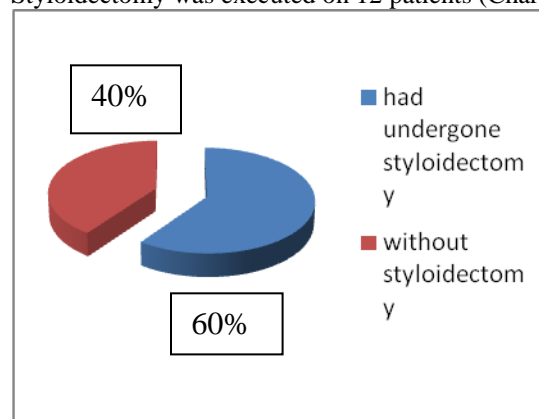
Chart 1. Styloidectomy Cases

In some cases there were side-effects like: pin breakage (1cases), change in occupation (2 cases), nonunion, delayed union and stimulation of pin location. 19 patients (95%) after operation achieved complete union (final result). Mean time between fracture and union was 10.71±1.62 weeks (8-14weeks). 80% of patients were pleased with the results (Table 2). Range of motion didn't change after operation. Mayo wrist score was significantly increased after operation (Table3).

Table 2. Patients' satisfaction after operation

Bad	Medium	Good	Very good
3(15%)	1(5%)	8(40%)	8(40%)

Table 3, Comparison between before and after operation, between before operation and intact hand and between after operation and intact hand

P[3]	P[2]	P[1]	Intact hand	After operation	Before operation	Parameters	
<0.001	<0.001	0.330	72.8±5.0	63.3±7.5	62.8±6.8	Flexion (degree)	
0.010	0.006	0.267	63.0±12.3	54.3±7.7	53.5±7.6	Extension(degree)	
<0.001	<0.001	0.330	39.3±6.7	31.8±5.7	31.0±5.8	Ulnar deviation(degree)	
0.001	<0.001	0.083	16.4±4.2	11.8±2.5	11.3±2.2	Radial deviation(degree)	
-	-	0.091	-	4(20%)	(45%)9	Grip power	
-	-	<0.001	-	88.0±7.7	44.8±14.2	Mayo wrist score	
-	-	<0.001	-	-	17(85%)	Poor	Mayo classifi
				3(15%)	3(15%)	Satisfactory	
				6(30%)	-	Good	
				11(55%)	-	Excellent	

4. Discussion:

In this study we investigated the results of 20 cases of scaphoid nonunion treatment with reverse flow vascularized bone graft from distal metaphysis of radius, in which 95% union after operation was seen. Mean time of bone fraction union was 10.71 weeks in current study, but in a case union was delayed.

Malizos et al (2007) used this kind of operation on 30 patients with nonunion Scaphoid bone fraction,

that union was completed in 12 weeks (15). In a study by Dailiana et al. (2006) on 9 patients, the union was obtained in 6-12 months (17). In s study by Caporrino et al (2003) on 29 patients, union was obtained in 46 days in 93% of patients (16). Diliana et al (2004) in another study on 47 cases of nonunion scaphoid fraction observed complete union for all cases in 12 months, Although MRI (with radio opaque substance) in one case revealed a nonunion after 3 months which was healed in 12 months (14). Chaug et al (2006) in a study on 50 cases of nonunion scaphoid fraction in 49 patients, detected 34cases (68%) of complete union after operation, mean time for union is 15.6 weeks (18). In a study by Uerpairojkit et al (2000) on 10 patients, complete union was obtained 6.5 weeks after operation in all cases (19). Sotereanos et al (2006) studied on 13 patients and investigated the results in 19 months, union was observed in 76.9% of patients (20). In s study by Water et al (2002) on 3 patients, complete union was obtained in 3-4 months (21). Malizos et al (2000) Studied 22 case of nonunion scaphoid fraction with this method and in this study all cases achieved complete union after 6-12 weeks (22). Chen et al (2006) studied on 11 patients and observed complete union after 13 weeks (23). Sauerbier et al (2001) studied on 15 patients and observed complete union after 11.1 weeks (24). Bertelli et al (2004) used this method on 24 patients in 5 years. In 87.5% of them the treatment was successful (25). In study of Steinmann and et al (2002), 14 patients obtained fracture union after 11.1 weeks (26). According to the mentioned results, union was obtained in most of the patients after reverse vascularized bone graft from distal metaphysis of radius.

General results are:

- Union rate after operation was 68-100%.
- Mean duration between operation and union was 4.3-19 weeks.

So published results are rated ((very good)) but we should consider that many factors affect study results, for example: patients' quantity and surgeons' skill.

Chaung et al (2006) studied risk factors affecting union after operation on 50 patients, in this study they mentioned:

- High age
- Female sex
- A vascular necrosis of proximal end
- Humpback deformity
- Fixation without bolt
- Smoking

As risk factors (18). In our study we couldn't determine the risk factors because of insufficient nonunion scaphoid cases (1 case). To determine risk

factors further studies about risk factors with higher nonunion population is needed. Patients' differences in different studies about risk factors cause wide range of results. In our study range of motion was measured before and after operation. This factor was improved after operation although it was not significant.

Malizos et al (2007), Caporrino et al (2003) and Steinmann et al (2002) didn't observe any significant improvement after operation (15, 16 and 26). Boyer et al (2007) observed deterioration after operation (27).

According to the insufficient samples, further studies are needed. In our study, we couldn't examine grip power because of some limitations. So, comparison is based on patient's description of his or her grip power. In several studies, grip power was increased after operation significantly (15, 17, 19, 21, 22, 24, 25 and 28). On the other hand, patients' complaints of pain were decreased significantly. In other studies, achieved results were similar to the results mentioned above. Also, according to scoring scale, patients' satisfaction was rated good – very good in 80% of cases. This score in study of malzios et al (2007) was 77% (15), in Dailiana et al (2006) study was good-very good (17). In Chans' (2006) study it was good-very good in 91%of patients (23). In Sauberbier (2001) study, all of the patients' satisfaction was rated good-very good (24). The score was 64.3% in Steinmann et al (2002) study (26).

5. Conclusion:

After operation, union was obtained in 95% of cases. Mean duration between operation and union was 10.71 ± 1.62 weeks. Pain in 80% of cases was decrease or completely relieved after operation. Range of motion didn't change after operation. Return to the primary occupation was observed in 80% of patients. Mayo wrist score was significantly increased after operation. Percentage of the group with high-very high Mayo wrist score was increased significantly after operation.

Suggestions:

According to the results, scaphoid nonunion treatment with reverse flow vascularized bone graft from distal metaphysis of radius is suggested. Further studies with more population are needed to determine the risk factors of scaphoid nonunion fraction.

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9/6/2012

Evaluation of etiologies and results of treatment of septic arthritis of large joints in patients under 5 years old as a phenomenon needs emergency intervention

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Abstract: Objective: The basic goal of study is to determine the etiologies and treatment results of septic arthritis of shoulder, hip and knee joint in patients under 5 years old. Other purposes were estimation of the predisposing factors in development of septic arthritis, determination of frequency of clinical signs and symptoms in patients, determination of male-female ratio, estimation of importance of laboratory studies and most importantly evaluation of complications.Method and material: We studied 56 patients (under 5 years) who having septic arthritis in shoulder, hip and knee in Shohada Hospital between 2000-2005 years. We gathered the necessary information in a previously provided check list form. Patients were evaluated pre-operatively and post-operatively. Results: 56 patients, under 5 years ;(female: 17, male: 39) were treated for septic arthritis of the joints shoulder, hip and knee. 17 patients had knee septic arthritis, 33 patients had hip septic arthritis and 6 patients had shoulder septic arthritis. Staphylococcus aureus was the most common organism on all age groups .A good result has been found with arthrotomy with antibiotic therapy in these patients .In general predominance among males is evident. Conclusion: Although joint infections are quite common; the diagnosis of septic arthritis is not always straight forward. The most important goal in treating of septic arthritis is to confirm diagnosis and if possible identify the specific pathogen involved. Prompt arthrotomy and prompt evaluation of purulent joint fluid appears to be crucial both for preservation of articular cartilage and for resolution of the infection.
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Key words: Septic arthritis, Shoulder, Hip, Knee, Arthrotomy
Short title: Evaluation of etiologies and results of treatment of septic arthritis

Introduction:

Bone and joint sepsis is a relatively common disorder especially in pediatric population. Infectious arthritis, or suppurative or septic arthritis, is a serious bacterial infection of the joint space that in children results from hematogenous dissemination of bacteria (1, 2).

This makes it likely that all orthopedic surgeons will be faced with the problem in diagnosis and treatment of these disorders. Thus, in any child with fever, undefinable clopping, abnormal gait, abnormal position of the limbs and muscular pain especially with swelling and erythema, doubt for septic arthritis should be considered (3).

It is caused by bacterial, viral, and fungal infection, but the disease behaves the same but it is mostly caused by Bacteria. Even with the currently available antibiotics and treatment regimens, serious complications may results delay as diagnosis and failure to begin treatment promptly are the most common reasons for late complications of infection like Dislocation, Epiphyseal destruction, Growth disturbance, Ankylosis, Secondary osteoarthritis, Osteomyelitis , abscess and sinus. Thus early accurate diagnosis and managing the patients are very important.

Infection is caused by dissemination of pathogens via the blood, from distant site (most common), from an acute osteomyelitis focus, from soft tissue infection, via penetrating trauma and via iatrogenic means. It is caused by some microorganisms. The causal organism is usually Staphylococcus aureus. In children under the age of 3 years Haemophilus influenza is fairly common. Others are Gram-negative bacilli (a group of bacteria,

including Escherichia coli, or E. coli) and Streptococci

Pathology is an acute synovitis with a purulent joint effusion and Synovial membrane becomes edematous, swollen and hyperemic, and produces increase amount of cloudy exudates contains leukocytes and bacteria. As infection spread through the joint, articular cartilage is destroyed by bacterial and cellular enzymes. The joint may be become pathologically dislocated.

Typical features are acute pain and swelling in single large joints, commonly the hip in children and the knee in adults; however any joint can be affected. The most commonly involved joint is the knee (50% of cases), followed by the hip (20%), shoulder (8%), ankle (7%), and wrists (7%). Inter-phalangeal, sternoc-lavicular, and sacroiliac joints each make up 1-4% of cases.

The typical features of suppurative arthritis include: Erythema, warmth, swelling, tenderness over the affected joint and Palpable effusion, Decreased range of movement. Small joints, such as those of the hand, usually are involved after penetrating trauma and closed fist injuries.

Features in children include: Acute pain in single large joint, swelling in the joint (if superficial), warmness and tenderness, Fever. Also all movements are restricted due to muscle spasm (Pseudo-paresis).

Findings in physical exams are: Decreased or absent range of motion, Signs of inflammation: joint swelling, warmth, tenderness and erythema, Joint orientation as to minimize pain (position of comfort):

- ✓ Hip: abducted, flexed and externally rotated.
- ✓ Knee, ankle and elbow: partially flexed.
- ✓ Shoulder: abducted and internally rotated

In order to diagnosis some Investigations are used, containing:

- ✓ *Lab studies:* The diagnosis can usually be confirmed by joint aspiration and immediate microbiological investigation of the fluid. Blood culture may be positive in about 50% of proven cases. Nonspecific features of acute inflammation-leukocytosis (50,000/μL, neutrophils more than 75%), ESR, CRP-are suggestive but not diagnostic.
- ✓ *Imaging studies:*

1-Plain x-ray:

The appearance of significant x-ray findings depends upon the duration and virulence of infection. Plain radiography findings are generally nonspecific and may reveal only soft tissue swelling, widening of the joint space (due to the effusion), and peri-articular osteoporosis during the first 2 weeks. Later, when the articular cartilage is attacked, the joint space is narrowed.

2-Ultrasonography

This study is very sensitive in detecting joint effusions generated by septic arthritis. Ultrasound helps to differentiate septic arthritis from other conditions (e.g., soft tissue abscesses, tenosynovitis) in which treatment may differ.

3-Radio-isotope bone scan:
Show increase uptake of the isotope in the region of the joint.

4- CT scan:
This study may help to diagnose sterno-clavicular or sacroiliac joint infections.

5-MRI:
MRI is most useful in assessing the presence of peri-articular osteomyelitis as a causative mechanism.

The first priority is to aspirate the joint and examine the fluid; treatment is then started without further delay. Analgesics and splinting of the involved joint in the position of maximal comfort alleviate pain. Fluid replacement and nutritional support may be required. Intravenous antibiotics should be given empirically and started as soon as joint fluid and blood sample have been taken for culture. Even with the currently available antibiotics and treatment regimens, serious complications may results delay as diagnosis and failure to begin treatment promptly are the most common reasons for late complications of infection? Thus early accurate diagnosis and managing the patients are very important (1).

Due to the importance of on time diagnosis and treatment of this disease, we tried to find an effective treatment method to overcome its terrible phenomenon. The basic goal of this study is to determine the etiologies and treatment results of septic arthritis of shoulder, hip and knee joints in patients under 5 years old. Other purposes were estimation of the predisposing factors in development of septic arthritis, determination of frequency of clinical signs and symptoms in patients, determination of male-female ratio, estimation of importance of laboratory studies and most importantly evaluation of complications of septic arthritis.

Materials and Methods:

In prospective Analyzed Descriptive Study, we studied 56 patients (under 5 years) who were diagnosed septic arthritis of shoulder, hip and knee joints in Shohada Trauma and orthopedic Center on Tabriz University of medical sciences between 2005-2010 years (The end of June, 2010) .

We gathered the necessary information from a previously provided check list forms. Patients were evaluated pre-operatively and post-operatively on last control time. Follow up was done in physician's office. Study Variables were age, Sex, Clinical

Manifestations, radiological and Laboratory findings, Findings in first examination, treatment and complications. Statistical analysis was performed by SPSS software package version 12.0 for windows. Quantitative data were presented as mean ± standard deviation (SD), while qualitative data were demonstrated as frequency and percent (%). In order to statistical analysis, collected quantitative data were studied with Student T-test (independent Samples), paired samples T-test and Man - whitney U test and for Qualitative data statistical methods, the mean difference test for independent groups, and Chi Square^2 test or Fisher's exact test. P value less than 0.05 was statistically considered significant in all steps.

All participants have signed a written consent, and the study protocol was approved by the Ethics Committee of Tabriz University of Medical Sciences (TUMS), which was in compliance with Helsinki Declaration.

Results:

39 patients (69.7%) were male and 17 (30.3%) were female. Mean age in all patients was 1.19. Knee joint was infected in 17 patients (30.3%), Hip was infected in 33 patients (85.9%) and Shoulder joint was infected in 6 patients (10.7%) (Table1), while these frequencies were different with sex distribution. In males, Knee joint was infected in 11 patients (28.2%), Hip was infected in 25 patients (64.1%) and Shoulder joint was infected in 3 patients (7.6%). In females, Knee joint was infected in 6 patients (35.2%), Hip was infected in 8 patients (47%) and Shoulder joint was infected in 3 patients (17.6%) but, There was no significant difference between males and females (P value=0.636).

Mean age in patients with Knee, Hip, and shoulder septic arthritis were 2.31, 1.98 and 0.92 years of old. There was no significant difference between the age ranges (P value=0.69).

In all patients Joint fluid aspiration was done at first. Results were positive in 19 patients (33.9%). Staphylococcus aureus was the most prevalent microorganism, in 18 patients (32.1%). Homophiles Influenza followed Staphylococcus aureus in prevalence, with 2 patients (3.6%). Etiology was unknown in 36 patients (64.3%) while culture was negative in these patients (Table2). 19 patients (33.9%) had Trauma history in their background. In 5 patients (8.9%) an infection in other parts was seen.

On the basis of clinical manifestations, Pain in joint and Clopping were prevalent causes of the reference. Other causes were fever, swelling, tenderness and decreased range of motion of the joint especially in abduction.

Other manifestations were: Fever in 29 cases (66.8%), Swelling in 12 cases (21.4%), Pain and

Tenderness in 55 cases (98.2%), only in one patient there was no tenderness, Decreased range of motion (ROM) specially in abduction in 54 cases (96.4%). only in two patients there was no decreased ROM.
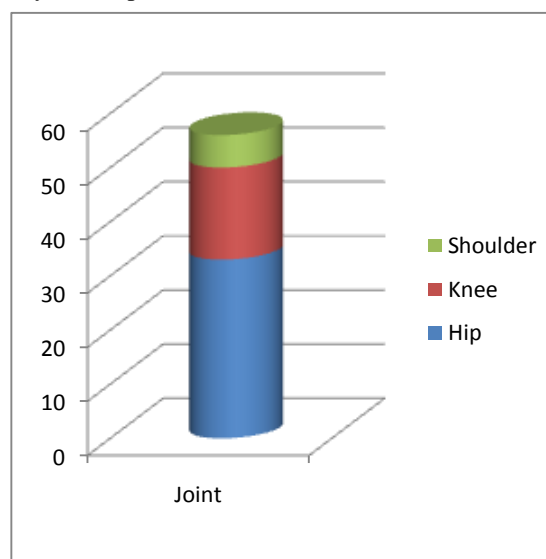
Table 1. Infected Joint
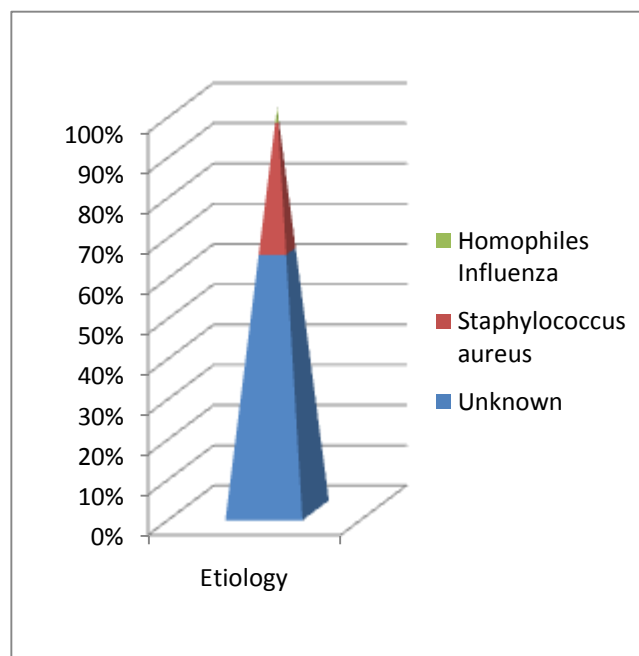
Table 2. Etiology

Radiologic findings showed: Swelling in Soft tissue in 24 patients (42.8%, as the most common finding), inflammation in bone and bone marrow in 4 cases (7.1%). In 28 patients there was no evidence of radiologic changes.

Laboratory test showed: Increased ESR in 45 cases (80.3%), Leukocytosis (More than 10000) in 29

cases (51.7%). PMN frequency was between 70-85% in all patients. CRP was positive in 48 cases (85.7%). Blood Culture (B/C) was positive in 13 cases (23.2%), while 7cases of patients with hip septic arthritis had positive B/C (21.2%) (Table 3). There was no significant difference between Positive or negative B/C and infected joint. (P value=0.935).
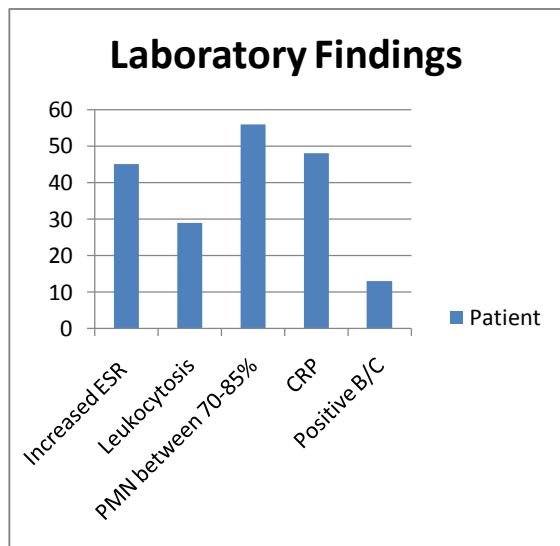
Table 3

8 Patients had the history of recent Antibiotic therapy (32.1%). Arthrotomy was done in 22 cases (39.2%) in first 24 hours before starting the signs and in 34 cases (60.8%) after 24 hours. Fluid Culture was positive in 7 cases (41.2%) in knee cases and in 13 cases (39.4%) of hip cases but, There was no significant difference between Positive and negative culture. (P value=0.66).

In all patients Arthrotomy and antibiotic therapy were done. Combination of cefazolin + Gentamycin was used in 44 cases (78.5%) and Ceftriaxone + cloxaciline in 12 cases (21.5%) (Table4).

After treatment, pain was seen in 17 patients (30.3%), decreased ROM was seen only in 13 patients (23.2%) and changes in bone were seen in 8 patients (14.3%). Also dislocation in joint was seen only in 2 patients (3.5%) and ankylosis was seen in 2 patients (3.5%). (Table5)

Discussion:

Osteomyelitis and septic arthritis are common diseases in children. Earlier diagnosis and sufficient and on time treatment are so important in its prognosis. Most common manifestations in children are; Fever, swelling, pain, tenderness and limitation in ROM. On the basis of our results 98.2% of patients had pain in infected joint and 38.1% of

them were referred with body temperature (BT) more than 38.1°C. Totally, Pain in infected joint is the most common manifestation (1).
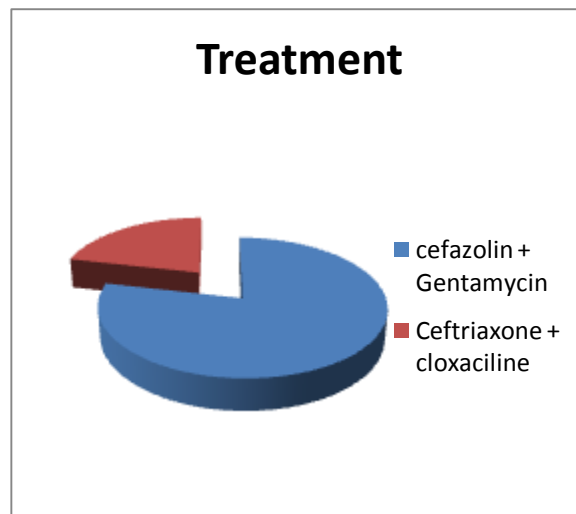
Table 4
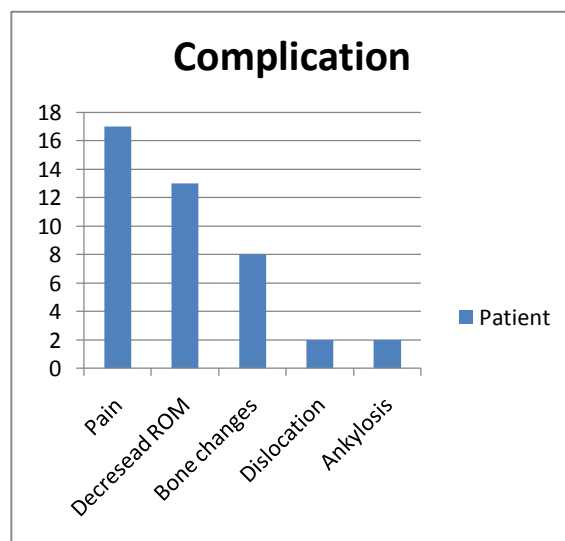
Table 5

In a study on 116 patients diagnosed as septic arthritis by Scott et al it is showed that 30% of the patients had a history of bacteremia and only 36% of the patients had BT more than 37.5°C (4).In another study by Ho.G on 25 patients, 24% of them had BT more than 37.5°C (5).

Having a history of Trauma is common in children with Osteomyelitis and septic arthritis, that causes delay in diagnosis sometimes (4). In our study 22 patients had this background.

In all of the patients blood culture and gram straining should be done. Involved pathogen in septic arthritis is age dependent. The causal organism is

usually Staphylococcus aureus in all ages, but in children under the age of 3 years it is the second organism. In these ages we should consider Gram Negative organisms in first stage (1, 7, and 8).

In childhood Haemophilus influenza is more common. It is so important because 20% of the patients infected by Haemophilus influenza are diagnosed as Meningitis (9). In recent years infection by Haemophilus influenza is decreased but infection by another gram negative bacteria named Kingella Kingate is increased (10).

Confirming other studies, Staphylococcus aureus was the most prevalent microorganism in our study. Staphylococcus aureus was seen in 18 patients (32.1%) while Homophiles Influenza was seen in 2 patients (3.6%) that all of them were less than 2 years of old confirming other studies. Etiology was unknown in 36 patients (64.3%). In patients with Haemophilus influenza there was no diagnosed Meningitis.

Appropriate treatment is combination of drainage and antibiotic therapy on the basis of gram staining, age and risk factors, even inter-articular injection is suggested in some studies, but it is suggested mostly not to use it due to chemical synovitis (9).

In our study used antibiotics were cefazolin + Gentamycin in 44 cases (78.5%) and Ceftriaxone + cloxaciline in 12 cases (21.5%). Most of the joints can be aspirated by daily needle aspiration, but surgical drainage (open or arthroscopic) is suggested mostly, especially in Hip and in children.

In a study by Paulo et al on the children under 1 year of age, suitable results were reported by daily needle aspiration and antibiotic therapy (11). In our study Arthrotomy and antibiotic therapy were done in all patients.

In treatment of septic arthritis, to prevent pathological fractures and dislocations, the joint should be immobile for sufficient time. In some studies it is reported that, prolonged immobilization results in stiffness, pain, muscular atrophy, osteoporosis and degenerative changes (11). Paterson suggests 6 weeks immobilization for these patients (8). In our study, we used Spica casting in semi-abduction position of the joint after surgery in patients with hip septic arthritis and opened a window on cast to prevent the wound from infection. In patients with knee septic arthritis long splint was used for all patients and activity of the joint started after 48 hours.

Conclusion:

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Infection in large joint is common in first 10 years of age especially in first 5 years. It is more common in males. Although joint infections are quite common; the diagnosis of septic arthritis is not always straight forward. A high index of suspicion must be maintained in order to make an accurate and prompt diagnosis of bone sepsis because, even, it is caused by bacteria; B/C is mostly negative. So it should always be considered as differential diagnosis. Complication is mostly seen in patients with late diagnosis and without efficient antibiotic therapy and on time surgery.

The most important goal in treating of septic arthritis is to confirm diagnosis and if possible identify the specific pathogen involved. Prompt evaluation of purulent joint fluid and prompt arthrotomy appear to be crucial both for preservation of articular cartilage and for resolution of the infection. On time diagnosis and earlier efficient treatment cause successful results without complication. Problems are mostly seen in patients with delayed diagnosis and delayed surgery and antibiotic therapy.

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Comparative study of the sera concentration of prolactin and cortisol hormones in healthy cows and the cows with subclinical ketosis

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Abstract: Understanding the pathogenesis and serum parameters of ketosis leads to proper diagnosis and choose of accurate preventional procedures. In this study 200 blood samples were collected through jugular vein from cows were at the pick of the production, randomly (2 months after parturition). Then serum separated and serumic values of the betahydroxibutyric acid (BHBA) were measured by Randox kit. The cows with BHBA >1.4 mmol/l, were considered subclinical ketosis group and cows that had BHBA <1.4 mmol/l were taken at normal group. There after the levels of prolactin and cortisol in the serum were measured using biochemical kits by ELISA in both groups. 14% of cows had subclinical ketosis. Results suggested that the cortisol and prolactin values in the serum of the in the subclincal ketosis group were higher than normal group and the difference of the means of these parameters were significant between the groups (p<0.05). There were significant correlation between BHBA and glucose with prolactin levels in the serum (r= 0.84, p<0.01 and r= 0.73, p<0.01 respectively). The correlation between levels of BHBA and glucose in serum with blood concentration of the cortisol were significant (r= 0.81, p<0.01 and r= 0.51, p<0.05 respectively). On the bases of the results obtained it is concluded that the increasing of sera concentrations of cortisol and prolactin hormones can confirm and prognose the subclinical ketosis in the dairy cows.

1. Introduction

Subclinical ketosis (SCK) is the accumulation of large quantities of ketone bodies in blood and tissues. Ketone bodies include beta- hydroxy butyric acid, acetoacetic acid and acetone. The maintenance of adequate concentrations of glucose in blood is critical to the regulation of energy metabolism. In ruminants carbohydrates are fermented in the rumen to fatty acids principally acetate, propionate and butyrate. Propionate and amino acids are the major precursors for gluconeogenesis with glycerol and lactate of lesser importance (21, 25). The initial event in the pathogenesis of ketosis is negative energy balance and the accompanying mobilization of non esterified fatty acids from adipose tissue. Negative energy balance is prevalent in dairy cows during the first 2 to 8 weeks of lactation since feed intake doesn't keep pace with the rapid increase in energy demands for milk production. Ketosis may be clinical or subclinical and affected milk production and reduced reproduction (7, 8 and 16). The economic impact of ketosis is derived from treatment costs, reduced milk production and reduced fertility. The disease is seldom fatal, so death loss isn't an important economic factor. Clinical ketosis is frequently associated with concurrent disease both infectious and metabolic. In many cases, ketosis occur secondary to another disease. In other instances, ketosis may be the initial disease (21, 25).

Clinical ketosis cause gastrointestinal and nervous sings. SCK often is without clinical sings and cause drop in milk production, reduced fertility and partial anorexia that result in less body condition. Diagnosis of SCK is important for prevention of economic losses (25, 28). With understanding the pathogenesis of this metabolic disorder we can find an approach for diagnosis and prevention of this disease, so we can prevent economic losses of that (17, 28). In this study the levels of prolactin and cortisol hormones in serum of the normal and cows with subclinical ketosis compared.

2. Material and Methods

200 cows postafter 2 months of parturition were randomly selected from 7 dairy farms throughout the east Azarbaijn provine in Iran. Blood samples were taken from jugular veins and serum was harvested by centrifuging blood samples by 3000 rpm for 10 min. BHB levels were measured using RANBUT kits (Randox. England) and glucose levels were measured by commercial kits (Ziest Chimi, Iran) using spectrophotometer (Biowave F 2100). Cows that had BHBA >1.4 mmol/l considered in subclinical ketosis group and cows with BHBA <1.4 mmol/l assigned into normal group (6). The prolactin and cortisol levels of serum were measured by with biochemical kits in both groups.

Significant difference between the groups evaluated by student's t- Test was used to evaluate the

differences between groups. Simple linear correlation was used to find the relationships between the variables, using SPSS15 soft ware.

3. Results

In this study, the prevalence of SCK, considering 1.4 mmol/l of BHB, as the cut-off point for detection of SCK, was 14% at two months after parturition. The results are shown in Table 1. Mean values of BHBA and blood glucose levels are shown in Table 2.

Table 1) The prevalence of subclinical ketosis at two months after parturition

Prevalence of subclinical ketosis	SCK	normal
	28(14%)	172(86%)

Table 2) BHB and blood glucose values (± SD) in the cows under this study

	No.	Mean	SD
BHB (mmol/l)	200	0.61	0.52
Glucose(mg/dl)	200	42.78	17.34

Values of the blood biochemical parameters including BHBA, glucose, prolactin and cortisol in the normal and SCK groups are shown in Tables 3-6. Mean differences between the groups were statistically significant.

Table 3) BHB mean levels (± SD) in the normal and SCK cows

	No.	Mean(mmol/l)	SD	significant
SCK group	28	1.68	0.12	*
Normal group	172	0.45	0.31	

*: The difference between means was significant (P<0.05).

Table 4) Glucose mean levels (± SD) in the normal and SCK cows

	No.	Mean(mg/dl)	SD	significant
SCK group	28	23.14	4.31	*
Normal group	172	46.00	16.54	

*: The difference between means was significant (P<0.05).

Table 5) Prolactin mean levels (± SD) in the normal and SCK cows

	No.	Mean(ng/ml)	SD	significant
SCK group	28	16.57	1.55	*
Normal group	172	11.73	0.27	

*: The difference between means was significant (P<0.05).

Table 6) Cortisol mean levels (± SD) in the normal and SCK cows

	No.	Mean(ng/ml)	SD	significant
SCK group	28	102.78	10.76	*
Normal group	172	58.61	2.50	

*: The difference between means was significant (P<0.05).

The correlation of these parameters was observed in the table 7. The correlation between BHBA and glucose is negative and significant (r= -0.64 and p<0.01). A positive and significant correlation was observed between BHBA and prolactin and cortisol (p<0.1 in the both, r= 0.84 and r= 0.81, respectively). The correlations between glucose and these hormones were significant and positive, too (r=0.73, p<0.01 and r=0.51, p<0.05 respectively).

Table7: The correlation between biochemical parameters in the cows

The coorelation between parameters	Regression index(r)	Significant
BHBA and Glucose	- 0.64	**
BHBA and Cortisol	0.81	**
BHBA and Prolactin	0.84	**
Glucose and Cortisol	0.51	*
Glucose and Prolactin	0.73	**

*: The difference between means was significant (P<0.05).
**: The difference between means was significant (P<0.01).

4. Discussion:

SCK (also called acetonaemia) occurs in higher yielding cows in early lactation. Acetone is produced by the liver and released into the blood where it acts as an intoxicant to the cow. The disease is caused by an inadequate intake of "starchy" foods in a cow, which is already mobilizing body fat. SCK is a disease of dairy cattle and is prevalent in most countries where intensive farming is practiced. The occurrence of the disease is very much dependent upon management and nutrition(7,8 and 23). In this study cows that had BHBA >1.4 mmol/l were taken at subclinical ketosis group and cows that had BHBA <1.4 mmol/l were taken at normal group (6).

One of the energy metabolism parameters monitored in this study was blood glucose concentration. Statistically significant difference between the two groups of dairy cows (normal and SCK) was found (P < 0.05). The mean level of glucose in cows with SCK was lower than the healthy cows in two months after parturition. Decrease in blood glucose concentrations reported in response to fat supplementation in the first stage of lactation in dairy cows. Our results are in accordance with the results of other studies (4,5,11 and 30). Glucose is a substance that plays a fundamental role in all animals. In the last weeks of fetal development, the fetus uses around 46% of maternal glucose taken up by the uterus. Additionally, a cow producing 30 kg of milk per day uses at least 2 kg of blood glucose to

synthesize lactose for milk. The end of pregnancy and the beginning of lactation, therefore, represent a time when there is a massive increase in need for glucose. This poses an enormous challenge for the liver that has to synthesize all of this glucose from propionate and amino acids as well as a challenge for other tissues and organs that have to adapt to a reduction of glucose availability. Glucose is an equally important energy source for the ovary and the reduced glucose availability in the beginning of lactation period can negatively impact the reestablishment of ovarian activity after calving (15,23 and 24).

Another parameter of energy metabolism monitored was the blood concentration of BHB. Compared with glucose, BHB is a more sensitive indicator of energy metabolism disruptions, and its concentrations are increased by lipid mobilization. In our study, BHB concentrations in the SCK group were higher than in healthy groups ($P < 0.05$). Our results were similar with other studies (12, 17, 18 and 20,).

There was a negative significant correlation between BHB and glucose levels in the serum in these cows ($r = - 0.64$ and $P < 0.01$). In the other studies this result were observed, too (9, 15, 19, 22, 26, 27, 29 and 30).

The serum's values of the cortisol and prolactin in the subclincal ketosis group were high than normal group and the difference of the means of these parameters were significant between two groups ($p<0.05$, both). The mean levels of the cortisol in serum in the cows with SCK were $102/57±11.13$ and in the normal cows was $59.69±17.41$ ng/ml. The correlation between levels of BHBA and glucose in serum with blood concentration of the cortisol were significant ($r= 0.81$, $p<0.01$ and $r= 0.51$, $p<0.05$ respectively) (table 7). The parturition and lactation are stress for cow and induce the secretion of the glucocorticoids. Cortisol is one of the glucocorticoids(3,6). Other surveys are showed that with ketosis or other disorders the concentration of the cortisol in blood increase in the dairy cows (1,10,11 and 12).

The mean serum levels of the prolactin in the cows with SCK were $16.57±4.40$ and in the normal cows was $11.73±1.76$ ng/ml. The correlation between levels of BHBA and glucose in serum with blood concentration of the prolactin were significant ($r= 0.84$, $p<0.01$ and $r= 0.73$, $p<0.01$ respectively) (table 7). After parturition active the mammary gland and increase the secretion of the prolactin hormone. In the cows with high production the secretion of this hormone and the incidence of SCK is high (2,13,14 and 31). The results of this study suggest that the

serum levels of the prolactin is high in cows with subclinical ketosis in comparison with healthy cows.

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Non-Polynomial Spline Approach to the Solution of Twelfth-Order Boundary-Value Problems

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Abstract: Non-polynomial spline in off step points is used to solve special twelfth order linear boundary value problems. Associated boundary formulas are developed. Truncation errors are given. Two examples are considered for the numerical illustration. However, it is observed that our approach produce better numerical solutions in the sense that max $|e_i|$ is minimum.

1 Introduction

We consider twelfth -order boundary-value problem of type

$$y^{(12)}(x) + f(x)y(x) = g(x) \quad , \quad x \in [a,b]$$
(1)

With boundary conditions

$$y(a)=\alpha_0, y^{(1)}(a)=\alpha_1, y^{(2)}(a)=\alpha_2, y^{(3)}(a)=\alpha_3, y^{(4)}(a)=\alpha_4, y^{(5)}(a)=\alpha_5,$$
$$y(b)=\beta_0, y^{(1)}(b)=\beta_1, y^{(2)}(b)=\beta_2, y^{(3)}(b)=\beta_3, y^{(4)}(b)=\beta_4, y^{(5)}(b)=\beta_5$$
(2)

where α_i , β_i for $i = 0,1,2,3,4,5$ are finite real constants and the functions $f(x)$ and $g(x)$ are continuous on $[a,b]$.

The solutions of twelfth-order boundary value problems are not very much found in the numerical analysis literature. These problems generally arise in the mathematical modelling of viscoelastic flows [1, 2].

The conditions for existence and uniqueness of solution of such boundary value problems are explained by theorems presented in Agarwal [3]. Siddiqi and Twizell [4-7] presented the solutions of sixth-, eighth-, tenth- and twelfth-order boundary value problems using the sixth, eighth, tenth and twelfth degree spline, respectively. Siddiqi and Ghazla [8] Solutions of 12th order boundary value problems using non-polynomial spline technique.

Following the spline functions proposed in this paper have the form:

$$T_{13} = span\{1, x, x^2, x^3, x^4, x^5, x^6, x^7, x^8, x^9, x^{10}, x^{11}, \cos(kx), \sin(kx)$$

where k is the frequency of the trigonometric part of the spline functions which can be real or pure imaginary and which will be used to raise the accuracy of the method. Thus in each subinterval $x_i \le x \le x_{i+1}$ we have

$$span\{1, x, x^2, x^3, x^4, x^5, x^6, x^7, x^8, x^9, x^{10}, x^{11}, \cos(|k|x), \sin(|k|x)\}$$

In this paper, in Section 2, the new Non-polynomial spline methods are developed for solving equation (1) along with boundary condition (2). Development of the boundary formulas are considered in Section 3 and in Section 4 numerical experiment, discussion are given:

2 Numerical methods

To develop the spline approximation to the twelfth -order boundary-value problem (1)-(2), the interval [a,b] is divided in to n equal subintervals using the grid $x_{i-\frac{1}{2}} = a + (i - \frac{1}{2})h$, $i = 1,2,3,..,n$ where $h = \frac{b-a}{n}$. We Consider the following Non-polynomial spline $S_i(x)$ on each Subinterval $[x_{i-\frac{1}{2}}, x_{i+\frac{1}{2}}]$, $i = 0,1,2,..,n-1$, $x_0 = a$, $x_n = b$,

$$S_i(x) = a_i \cos k(x - x_i) + b_i \sin k(x - x_i) + c_i(x - x_i)^{11} + d_i(x - x_i)^{10} + e_i(x - x_i)^9 +$$
$$f_i(x - x_i)^8 + g^*_i(x - x_i)^7 + o_i(x - x_i)^6 + p_i(x - x_i)^5 + q^*_i(x - x_i)^4 + u_i(x - x_i)^3 +$$
$$z_i(x - x_i)^2 + r_i(x - x_i) + t^*_i$$
(3)

where
$a_i, b_i, c_i, d_i, e_i, f_i, g^*_i, o_i, p_i, q^*_i, u_i, z_i, r_i,$ and
t^*_i are real finite constants and k is free parameter.

The spline is defined in terms of its 1td, 2th, 3th, 4th, 5th and 12th derivatives and we denote these values at knots as:

$$S_i(x_{i-\frac{1}{2}}) = y_{i-\frac{1}{2}}, S_i'(x_{i-\frac{1}{2}}) = m_{i-\frac{1}{2}}, S_i''(x_{i-\frac{1}{2}}) = M_{i-\frac{1}{2}}, S_i'''(x_{i-\frac{1}{2}}) = z_{i-\frac{1}{2}}, S_i^{(4)}(x_{i-\frac{1}{2}}) = V_{i-\frac{1}{2}},$$

$$S_i^{(5)}(x_{i-\frac{1}{2}}) = w_{i-\frac{1}{2}}, S_i^{(12)}(x_{i-\frac{1}{2}}) = L_{i-\frac{1}{2}},$$

$$S_i(x_{i+\frac{1}{2}}) = y_{i+\frac{1}{2}}, S_i'(x_{i+\frac{1}{2}}) = m_{i+\frac{1}{2}}, S_i''(x_{i+\frac{1}{2}}) = M_{i+\frac{1}{2}}, S_i'''(x_{i+\frac{1}{2}}) = z_{i+\frac{1}{2}}, S_i^{(4)}(x_{i+\frac{1}{2}}) = V_{i+\frac{1}{2}}$$

$$S_i^{(5)}(x_{i-\frac{1}{2}}) = w_{i-\frac{1}{2}}, S_i^{(12)}(x_{i+\frac{1}{2}}) = L_{i+\frac{1}{2}}$$

For $i = 0,1,2,...,n-1$.   (4)

Assuming $y(x)$ to be the exact solution of the boundary value problem (1) and y_i be an approximation to $y(x_i)$ using the continuity conditions ($S_{i-1}^{(\mu)}(x_i) = S_i^{(\mu)}(x_i)$ where $\mu = 6,7,8,9,10$ and 11), after lengthy calculations we obtain the following spline relations:

$$y_{i-\frac{13}{2}} - 12y_{i-\frac{11}{2}} + 66y_{i-\frac{9}{2}} - 220y_{i-\frac{7}{2}} + 495y_{i-\frac{5}{2}} - 792y_{i-\frac{3}{2}} + 924y_{i-\frac{1}{2}} - 792y_{i+\frac{1}{2}} + 495y_{i+\frac{3}{2}} +$$

$$220y_{i+\frac{5}{2}} + 66y_{i+\frac{7}{2}} - 12y_{i+\frac{9}{2}} + y_{i+\frac{11}{2}} = h^{10}[\alpha L_{i-\frac{13}{2}} + \beta L_{i-\frac{11}{2}} + \gamma L_{i-\frac{9}{2}} + \delta L_{i-\frac{7}{2}} + \eta L_{i-\frac{5}{2}} + \rho L_{i-\frac{3}{2}} +$$

$$\tau L_{i-\frac{1}{2}} + \rho L_{i+\frac{1}{2}} + \eta L_{i+\frac{3}{2}} + \delta L_{i+\frac{5}{2}} + \gamma L_{i+\frac{7}{2}} + \beta L_{i+\frac{9}{2}} + \alpha L_{i+\frac{11}{2}}]$$, $i = 7,8,...,n-7.$

(5)

Where

$$\alpha = \frac{\csc\theta}{39916800\theta^{12}}(-39916800\,\theta + 6652800\,\theta^3 - 332640\,\theta^5 + 7920\,\theta^7 - 110\theta^9 + \theta^{11} + 39916800\,\mathrm{Sin}\,\theta),$$

$$\beta = \frac{-\csc\theta}{19958400\theta^{12}}(\theta(-39916800 + 6652800\,\theta^2 - 332640\,\theta^4 + 7920\,\theta^6 - 110\,\theta^8 + \theta^{10})\mathrm{Cos}(\theta) + 2(-99792000\,\theta + 6652800\theta^3 + 1663200\,\theta^5 - 229680\,\theta^7 + 13750\,\theta^9 - 509\,\theta^{11} + 119750400\,\mathrm{Sin}(\theta))),$$

$$\gamma = \frac{-\csc\theta}{19958400\theta^{12}}(918086400\,\theta + 6652800\,\theta^3 - 12307680\,\theta^5 - 2843280\,\theta^7 + 748330\,\theta^9 - 76319\,\theta^{11} + 4\,\theta(99792000 - 6652800\,\theta^2 - 1663200\,\theta^4 + 229680\,\theta^6 - 13750\,\theta^8 + 509\,\theta^{10})\mathrm{Cos}(\theta) - 1317254400\,\mathrm{Sin}(\theta)),$$

$$\delta = -\frac{\csc\theta}{19958400\theta^{12}}(3\theta(-598752000 - 6652800\,\theta^2 + 8316000\,\theta^4 + 1892880\,\theta^6 - 498850\,\theta^8 + 50879\,\theta^{10})\mathrm{Cos}(\theta) + 2(-1297296000\,\theta - 73180800\,\theta^3 + 1663200\,\theta^5 + 3001680\,\theta^7 + 1650550\,\theta^9 - 551381\,\theta^{11}] + 2195424000\,\mathrm{Sin}(\theta)),$$

$$\eta = \frac{-\csc\theta}{13305600\theta^{12}}(3392928000\,\theta + 286070400\,\theta^3 - 28274400\,\theta^5 + 2874960\,\theta^7 +$$

$$290950\theta^9 - 3296917\,\theta^{11} + 64\,\theta\,(49896000 + 3326400\,\theta^2 - 134640\,\theta^6 -$$

$$68200\,\theta^8 + 22953\,\theta^{10}\})\,\mathrm{Cos}(\theta) - 6586272000\,\mathrm{Sin}(\theta)),$$

$$\rho = \frac{-1}{3326400\theta^{12}}(2634508800 + (\theta\,(-1397088000(1+\theta^2) - 18295200\,\theta^4 -$$

$$2383920\,\theta^6 + 103950\,\theta^8 + 1623019\,\theta^{10})\,\mathrm{Cot}(\theta)) + -2\,\theta\,(-618710400 +$$

$$59875200\,\theta^2 + 7650720\,\theta^4 + 1180080\,\theta^6 + 350130\,\theta^8 + 746989\,\theta^{10})\,\mathrm{Csc}(\theta)),$$

$$\tau = \frac{-1}{3326400\theta^{12}}(-3073593600 + 4\,\theta\,(419126400 + 46569600\,\theta^2 + 7650720\,\theta^4 +$$

$$1718640\,\theta^6 + 622930\,\theta^8 + 655177\,\theta^{10})\,\mathrm{Cot}(\theta) + \backslash\,theta\,(1397088000 +$$

$$139708800\,\theta^2 + 18295200\,\theta^4 + 2383920\,\theta^6 - 103950\,\theta^8 - 1623019\,\theta^{10})\,\mathrm{Csc}(\theta)).$$

If $\theta \to 0$ then

$$(\alpha,\beta,\gamma,\delta,\eta) \to (\frac{1}{6227020800}, \frac{1363}{1037836800}, \frac{82207}{345945600}, \frac{9106698}{124540416}, \frac{28218769}{415134720}),$$

$$(\rho,\tau) \to (\frac{125468459}{518918400}, \frac{27085381}{74131200}).$$

And the consistency relation of non-polynomial is reduced to consistency relation of the thirteenth polynomial spline functions derived in [9]. The local truncation error corresponding to the method equation (5) can be obtained as:

$$t_i = (1 - 2(\alpha+\beta+\gamma+\delta+\eta+\rho) - \tau)h^{12}y_i^{(12)} + (\frac{-1}{2} + \alpha+\beta+\gamma+\delta+\eta+\rho+\frac{\tau}{2})h^{13}y_i^{(13)}$$

$$+ (\frac{5}{8} - \frac{1}{4}(145\alpha + 101\beta + 65\gamma + 37\delta + 17\eta + 5\rho + \frac{\tau}{2}))h^{14}y_i^{(14)}$$

$$+ (\frac{-13}{48} + \frac{1}{24}(433\alpha + 301\beta + 193\gamma + 109\delta + 49\eta + 13\rho + \frac{\tau}{2}))h^{15}y_i^{(15)}$$

$$+ (\frac{119}{640} - \frac{1}{192}(21601\alpha + 10601\beta + 4481\gamma + 1513\delta + 353\eta + 41\rho + \frac{\tau}{2}))h^{16}y_i^{(16)}$$

$$+ (\frac{91}{1280} + \frac{1}{1920}(105121\alpha + 51001\beta + 21121\gamma + 6841\delta + 1441\eta + 121\rho + \frac{\tau}{2}))h^{17}y_i^{(17)}$$

$$+ (\frac{6821}{193536} - \frac{1}{23040}(3299185\alpha + 1151501\beta + 324545\gamma + 6637\delta + 8177\eta + 365\rho + \frac{\tau}{2}))h^{18}y_i^{(18)}$$

$$+ ....$$
$$i = 7,8,...,n-7 \qquad (6)$$

3 Development of the boundary formulas

Liner system equation (5) consist of (n − 1) unknown, so that to obtain unique solution we need twelfth more equations to be associate with equation (5) so that we can develop the boundary formulas of different orders, but for sake of briefness here we develop the twelfth order boundary formulas so that we define the following identity:

$$w_0' y_0 + \sum_{i=0}^{8} a_i' y_{i+\frac{1}{2}} + c' h y_0' + d' h^2 y_0'' + e' h^3 y_0''' + u' h^4 y_0^{(4)} + p' h^5 y_0^{(5)} = h^{12} \sum_{i=0}^{10} b_i' y_{i+\frac{1}{2}}^{(12)} \quad (7)$$

$$w_0'' y_0 + \sum_{i=0}^{9} a_i'' y_{i+\frac{1}{2}} + c'' h y_0' + d'' h^2 y_0'' + e'' h^3 y_0''' + u'' h^4 y_0^{(4)} + p'' h^5 y_0^{(5)} = h^{12} \sum_{i=0}^{11} b_i'' y_{i+\frac{1}{2}}^{(12)} \quad (8)$$

$$w_0''' y_0 + \sum_{i=0}^{10} a_i''' y_{i+\frac{1}{2}} + c''' h y_0' + d''' h^2 y_0'' + e''' h^3 y_0''' + u''' h^4 y_0^{(4)} + p''' h^5 y_0^{(5)} = h^{12} \sum_{i=0}^{12} b_i''' y_{i+\frac{1}{2}}^{(12)}$$
$$(9)$$

$$w_0^{\circ} y_0 + \sum_{i=0}^{11} a_i^{\circ} y_{i+\frac{1}{2}} + c^{\circ} h y_0' + d^{\circ} h^2 y_0'' + e^{\circ} h^3 y_0''' + u^{\circ} h^4 y_0^{(4)} + p^{\circ} h^5 y_0^{(5)} = h^{12} \sum_{i=0}^{13} b_i^{\circ} y_{i+\frac{1}{2}}^{(12)}$$
$$(10)$$

$$w_0^{\circ\circ} y_0 + \sum_{i=0}^{12} a_i^{\circ\circ} y_{i+\frac{1}{2}} + c^{\circ\circ} h y_0' + d^{\circ\circ} h^2 y_0'' + e^{\circ\circ} h^3 y_0''' + u^{\circ\circ} h^4 y_0^{(4)} + p^{\circ\circ} h^5 y_0^{(5)} = h^{12} \sum_{i=0}^{14} b_i^{\circ\circ} y_{i+\frac{1}{2}}^{(12)} \quad (11)$$

$$\dot{w}_0 y_0 + \sum_{i=0}^{13} \dot{a}_i y_{i+\frac{1}{2}} + \dot{c} h y_0' + \dot{d} h^2 y_0'' + \dot{e} h^3 y_0''' + \dot{u} h^4 y_0^{(4)} + \dot{p} h^5 y_0^{(5)} = h^{12} \sum_{i=0}^{15} \dot{b}_i y_{i+\frac{1}{2}}^{(12)} \quad (12)$$

$$\ddot{w}_n y_n + \sum_{i=0}^{13} \ddot{a}_i y_{i+n-\frac{25}{2}} + \ddot{c} h y_n' + \ddot{d} h^2 y_n'' + \ddot{e} h^3 y_n''' + \ddot{u} h^4 y_n^{(4)} + \ddot{u} h^5 y_n^{(5)} = h^{12} \sum_{i=0}^{15} \ddot{b}_i y_{i+n-\frac{29}{2}}^{(10)} \quad (13)$$

$$\dddot{w}_n y_n + \sum_{i=0}^{12} \dddot{a}_i y_{i+n-\frac{23}{2}} + \dddot{c} h y_n' + \dddot{d} h^2 y_n'' + \dddot{e} h^3 y_n''' + \dddot{u} h^4 y_n^{(4)} + \dddot{p} h^5 y_n^{(5)} = h^{12} \sum_{j=0}^{14} \dddot{b}_i y_{i+n-\frac{27}{2}}^{(12)} \quad (14)$$

$$w_0^* y_n + \sum_{i=0}^{11} a_i^* y_{i+n-\frac{21}{2}} + c^* h y_n' + d^* h^2 y_n'' + e^* h^3 y_n''' + u^* h^4 y_n^{(4)} + p^* h^5 y_n^{(5)} = h^{12} \sum_{j=0}^{13} b_i^* y_{i+n-\frac{25}{2}}^{(12)} \quad (15)$$

$$\overline{w}_0 y_n + \sum_{i=0}^{10} \overline{a}_i y_{i+n-\frac{19}{2}} + \overline{c} h y_n' + \overline{d} h^2 y_n'' + \overline{e} h^3 y_n''' + \overline{u} h^4 y_n^{(4)} + \overline{p} h^5 y_n^{(5)} = h^{12} \sum_{i=0}^{12} \overline{b}_i y_{i+n-\frac{23}{2}}^{(12)} \quad (16)$$

$$\breve{w}_0 y_n + \sum_{i=0}^{9} \breve{a}_i y_{i+n-\frac{17}{2}} + \breve{c} h y_n' + \breve{d} h^2 y_n'' + \breve{e} h^3 y_n''' + \breve{u} h^4 y_n^{(4)} + \breve{p} h^5 y_n^{(5)} = h^{12} \sum_{i=0}^{11} \breve{b}_i y_{i+n-\frac{21}{2}}^{(12)} \quad (17)$$

$$\widetilde{w}_0 y_n + \sum_{i=0}^{8} \widetilde{a}_i y_{i+n-\frac{15}{2}} + \widetilde{c} h y_n' + \widetilde{d} h^2 y_n'' + \widetilde{e} h^3 y_n''' + \widetilde{u} h^4 y_n^{(4)} + \widetilde{u} h^5 y_n^{(5)} = h^{12} \sum_{i=0}^{10} \widetilde{b}_i y_{i+n-\frac{19}{2}}^{(12)} \quad (18)$$

Where all of the coefficients are arbitrary parameters to be determined.

4 Numerical results
In this section the presented method are applied to the following test problems if choosing

$$\alpha = \frac{-691}{130767436800}, \beta = \frac{311}{9906624000}, \gamma = \frac{11108959}{217945728000}, \delta = \frac{250027007}{65383718400},$$

$$\eta = \frac{1604131663}{29059430400}, \rho = \frac{443084947}{18162144000}, \tau = \frac{6132449119}{15567552000}$$

We obtained the method of order $O(h^{26})$ respectively.

Example 1. We Consider the following boundary-value problem

$$y^{(12)}(x) + x y(x) = -(120 + 23x + x^3)e^x, \ 0 \le x \le 1,$$
$$y(0) = 0, y(1) = 0,$$
$$y'(0) = 1, y'(1) = -e,$$
$$y''(0) = 0, y''(1) = -4e,$$

$y^{'''}(0) = -3 \,, y^{'''}(1) = -9e \,,$

$y^{(4)}(0) = -8, y^{(4)}(1) = -16e \,.$

$y^{(5)}(0) = -15, y^{(5)}(1) = -25e \,.$ (15)

The analytic solution of the above system

is $y(x) = x(1-x)e^x$. It is evident

from Table 1 that the maximum errors in absolute values are less than those presented by [8].

Example 2. We Consider the following boundary-value problem

$y^{(12)}(x) - y(x) = -12(2x\cos x + 11\sin x) \,, \; -1 \le x \le 1 \,,$

$y(-1) = y(1) = 0, \quad y^{'}(-1) = y^{'}(1) = 2\sin(1) \,,$

$y^{''}(-1) = -y^{''}(1) = -4\cos(1) - 2\sin(1) \,,$

$y^{'''}(-1) = y^{'''}(1) = 6\cos(1) - 6\sin(1) \,,$

$y^{(4)}(-1) = -y^{(4)}(1) = 8\cos(1) + 12\sin(1) \,,$

$y^{(5)}(-1) = y^{(5)}(-1) = -20\cos(1) + 10\sin(1) \,.$
(16)

The analytic solution of the above system

is $y(x) = (x^2 - 1)Sinx$. It is evident from Table 2 that the maximum errors in absolute values are less than those presented by [8].

Table1: Observed maximum absolute errors for example 1.

h	Our methods	[8]
$1/9$	1.44(−13)	7.38(−9)
$1/18$	7.18(−14)	-
$1/27$	8.71(−15)	-
$1/36$	4.09(−16)	-

Table2: Observed maximum absolute errors for example 2.

h	Our methods	[8]
$1/16$	5.67(−12)	1.14(−7)
$1/32$	8.01(−12)	-
$1/48$	9.11(−13)	-
$1/64$	5.84(−14)	-

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Conclusion

We approximate solution of the twelfth - order linear boundary-value problems by using non-polynomial spline. The new methods enable us to approximate the solution at every point of the range of integration. Tables 1-2 show that our methods produced better in the sense that max $|e_i|$ is minimum in comparison with the methods developed in [8].

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Relationship between Bleomycin hydrolase and Apolipoprptein E genes in Alzheimer patients in Northwest of Iran

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Abstract: Background and Aims: Alzheimer's disease (AD) is the most common and devastating neurodegenerative disease of the elderly. Several studies indicated a relationship between different genes and AD. Bleomycin hydrolase (BLMH) and the Apolipoprotein E (ApoE) gene allele epsilon4 (E4) known as genetic risk factors for late-onset AD in sporadic cases. We have analyzed the association between the Apo E and BLMH polymorphisms in AD and control group in Northwest of Iran. **Methods:** EDTA blood from 62 AD and 65 controls were collected and DNA was extracted. The genes were amplified with SSCP-PCR for BLMH and RFLP-PCR for ApoE and allelic frequencies were performed. Then the results compared between AD cases and control group by chi- squared test. **Results:** Apo E4 and BLMH alleles frequencies are %8.33 Control, %18.33 AD and %20 Control, %36 AD respectively. **Conclusion**: According with our result, no association was observed between carrying the G allele of BLMH gene and AD in epsilon4 negative groups but carrying the epsilon4 allele is a dose-dependent risk factor for the AD and decrease the age of symptom onset (p < 0.05). Finally when considering the ApoE and BLMH polymorphisms alone, ApoE4 status is the best predictor of AD.
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Keywords: Alzheimer's disease (AD), Apolipoprotein E, Bleomycin hydrolase, Northwest of Iran population

1. Introduction

Alzheimer's disease (AD) the most common form of dementia is a disease of the brain that is characterized by the deposition of β-amyloid plaques and neurofibrillary tangles in selected regions of the brain (Braak et al 1998 and Price et al 1999). It destroys different brain cells, causing problems with memory, thinking and behavior. Major risk factors for the development of AD include age, gender, nutrition and genetic factors such as Bleomycin hydrolase (BLMH) and Apolipoprotein E gene allele E4(epsilon4) (Morris et al 2003).

It is well known that BLMH a cysteine protease belonging to the Papain super family.This protein plays an important role in production and secretion of beta-amyloid proteins. BLMH encoding gene contains 12 exons with different sizes ranged from 69 to 198 base pairs that are separated by introns about 1 kb. This gene locus is located on the long arm of chromosome 17 (17q11.1-11.2) (Namba et al 1999).

1430 A>G nucleotide polymorphism, which finally leads to the displacement of I443V amino acid, is affected at the end of the c-terminal of this enzyme. Bromme et al. in 1996 using the technique of PCR-SSCP, identified a polymorphism at 1430 BLMH gene locus that alter A>G which would change isoleucine to valine (I443V) in the sequence of amino acids at 443 residue. It is said that BLMH is a candidate for beta secretase that may be involved in analyzing beta amyloid from amyloid beta precursor protein (APP), the same substance that is associated with AD (Bromme et al 1996).

Also Apolipoprotein E as a cholesterol transport protein in cell biology (Hooijmans et al 2008 and Wahrle et al 2004), it plays a prominent role in the redistribution of cholesterol to the neurites for membrane biosynthesis during the axon and to the Schwann cells for myelin formation. ApoE is a multifunctional lipoprotein consisting of 299 amino acids, synthesized in various organs, including liver, spleen, kidney and brain (Mahley et al 1988).

Existence of Apolipoprotein E4 allele into other forms of alleles (E2 and E3) increased the possibility of getting Alzheimer's disease and also decreased the age of getting the disease.The risk of getting Alzheimer's disease for individuals that don't carry E4 allele is about 10%, while individuals carrying one allele from E4 is approximately 30% (Seshadri et al 2005).On the other hand people with ApoE2 allele, have the late-onset of disease (Corder et al 1994); however, the protective role of ApoE2 allele is not very clear yet. It has been shown that one of the two isoforms of BLMH (BLMH-val443) is associated with an increased risk of sporadic AD in non-ApoE4 patients (Montoya et al 1998).

In this study we try to show the relationship between ApoE gene polymorphism and BLMH; which two candidate genes for AD. So we compared 62 affected people of AD, with 65 control cases in Northwest of country.

2. MATERIALS AND METHODS
2.1. Participants
The patient group consisted of 62 patients (29 women and 33 men) from Northwest area of Iran who were referred from Neurologists with DSM IV criteria of AD. Also the control group consisted of 65 (30 women and 35 men) with no personal history of psychiatric or neurological abnormalities from this area.

2.2. Blood samples
Peripheral blood obtained with vacuum system and DNA extracted from White Blood Cells with using QIAamp DNA Blood Mini Kit (Qiagen; Catalog number: 56304).

The used method for amplification and study of BLMH gene is SSCP-PCR and RFLP-PCR for Apo E gene.

2.3. The primers used
The characteristics of primers used for PCR to examine BLMH-I344V and ApoE genes polymorphism are shown in Table1.

Table 1 - Primers used for PCR to examine BLMH and APOE genes polymorphism

Primer's name	Sequence
BLMH- F	5`CCTGGATCTGTCCTTTGCAGCTACG3`
BLMH- R	3`GGAAGCATGTCCCTGAAGAGGTGC5`
APOE- F	5`GGCACGGCTGTCCAAGGAGCTGCAG3`
APOE-R	5`CCCCGGCCTGGTACACTGCCAGGC3`

2.4. PCR condition
The steps of PCR reaction for amplification of BLMH and APOE genes are shown in Table 2 (Montoya et al 1998).

Table 2- Steps of PCR, temperatures and durations for amplification of BLMH and APOE genes

APOE GENE			
Step	$^\circ C$ Temperature	Time	Cycle No.
Initial Denaturation	95	10 Min.	1
Denaturation	95	30 Sec.	
Annealing	56	30 Sec.	32
Extension	72	1 Min.	
Final Extension	72	5 Min.	1
BLMH GENE			
Step	$(^\circ C)$ Temperature	Time	Cycle No.
Initial Denaturation	95	10 Min.	1
Denaturation	95	30 Sec.	
Annealing	67	30 Sec.	35
Extension	72	1 Min.	
Final Extension	72	10 Min.	1

2.5. Statistical analysis
We studied this hypothesis that, "what is the relationship between ApoE4 and BLMH genes and existence of this two gene mutations in Alzheimer's disease?" Chi-Squared test is used in order to analysis data related to this hypothesis.

3. Results
The sequence of BLMH gene 1430 A> G Polymorphism has different structures in AD compared with normal individuals. With using the Chi-Squared test and according to Table 3 significant differences is observed between groups and sequence of BLMH gene 1430 A> G polymorphism has different structures in AD compared with normal individuals.

Table 3- Relationship between presence of BLMH and ApoE ε4 in AD and control cases.

		ApoE 4-carriers		ApoE 4 non-carriers		All Participants
		AD	Control	AD	Control	
BLMH Genotype	AA (%)	(10%)	(6.67%)	(40%)	(53%)	(55%)
	GG (%)	(10%)	0	(13.33%)	0	(11.67%)
	AG (%)	(6.67%)	(3.33%)	(20%)	33.33%	(33.34%)
Allele Frequencies	A	16.67%)	(8.33%)	(50%)	71.67%)	(71.66%)
	G	(13.33%)	(1.67%)	(23.33%)	18.33%)	(28.33%)

There was significant relationship between this two gene mutations in people with Alzheimer's disease and this indicated that a combination of ApoE4 and BLMH in this group is not identical according to its variants, as existence of E4 allele along with a low incidence of G allele(P<0.01).

4. Discussion:
Findings of our study showed that both Alzheimer's disease group and control group have a different structure in BLMH gene 1430 A>G and ApoE gene polymorphism. In explaining of these findings it can be stated that BLMH is a candidate for beta secretase that may be involved in analyzing beta amyloid fragment from amyloid precursor protein (APP), the same substance that is associated with Alzheimer's disease. G/G genotype of A1430G polymorphism in this gene have a great effect on the progression of Alzheimer's disease. Increased risk due to homozygosis for the genotype G/G is limited to people who do not carry the ApoE4 allele.

Another interesting point is that the various studies, including results of Montoya et al. in 1998 and Ferrando et al. in1996 reported the inhibitory effect of genotype G/G from 1430 A>G polymorphism in individuals who are carriers of ApoE4 (Ferrando et al 1996). These findings are

conformed to the present findings. It seems that the absences of the ApoE4 allele and BLMH in a person deprive him/her from living and now during the evolution just the people can survive that have at least one of two alleles. Another important point in the presence of G allele in Alzheimer's patients with ApoE4 genotype is that, maybe somehow during the genetic evolution this issue is missed that the presence of two genes, which predisposing Alzheimer's disease, causes rapid death of individuals carrying these two genes.

Other findings indicated that there is a relationship between ApoE4, BLMH genes and the mutations of them. In this regard, several studies such as of Montoya et al. in 1998 showed that the frequency of G/G homozygous in Alzheimer patients than control subjects is significantly higher in the group without ApoE4 (15.9% of Alzheimer cases versus 4.7 % of control cases) (Montoya et al 1998). These findings are aligned with the findings of present research, so that the most frequent genotype among Alzheimer subjects is related to the G/G genotype but without ApoE4 allele. Also findings related to the states of cognitive functions is different in Alzheimer's disease according to the BLMH gene1430 A>G polymorphism showed that the cognitive status of Alzheimer's disease according to levels of BLMH gene1430 A>G polymorphism was not significantly different and on the other hand there is no significant correlation between the BLMH genotype and cognitive states.

In the explanation of these findings it can be pronounced that BLMH gene isn't directly involved in causing Alzheimer's disease and the protein production of this gene causes the Alzheimer's disease by involving in the many cascade pathways of amyloid precursor protein (APP) production and without beta-amyloid degradation (βA).

Conflict of interests

Authors declare no conflict of interests.

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The survey of gastrointestinal parasites in turkeys of Tabriz Iran

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Abstract: In Iran, Tabriz city and suburb are the places both to a commercial poultry industry and to many small rural homesteads. Parasitic diseases are an important cause of hidden economic loss. Based of parasites economical importances, present study was done and results of this study revealed that prevalence of turkeys parsasites in Tabriz city and suburb are high. In our study, six helminth species comprising four nematodes and two cestode species were recognized. Raillietina tetragona (13%) and Raillietina echinobothrida (8%) were found species of cestodes and Ascaridia galli (18%), Heterakis galinarum (16%), Subulura brumpti (14%) were our found nematodes. Based of our results Tabriz city and suburb turkeys are very infected to different gastrointestinal parasites that cause many economical losses and hence must be considered with control programs.

Key words: parasites, gastrointestinal, turkeys.

1. Introduction

Native turkeys can be infected with very parasites and parasites infections in turkeys are very important. Turkeys are hosted to many different parasites (helminthes, protozoa & arthropoda) (8).Infection with large number of parasites can have a devastating effect on growth, egg production, and over-all health. Clinical signs of parasitic disease are unthriftyness, poor growth and feed conversion, decreased egg production, and even death in severe infections (8, 9). Furthermore, parasites can make the flock less resistant to diseases and exacerbate existing disease conditions.In Iran studies of turkey parasites is very limited and there is few information about Tabriz city native turkey parasites and hence the aim of present study is to show occurrence and prevalence of gastrointestinal parasites in Tabriz city native turkeys.

2. Materials and methods

Turkeys were collected from different areas of Tabriz suburb villages and where examined for parasites infections. 100 gastrointestinal tracts (esophagus, prorentriculus, ventriculus, small intestine, large intestine & caeca) were collected during one year. Fecal samples from the large intestine were collected for fecal flotation to detect parasites ova and all organs were then opened to check for lesions and evidence of helminthes. The gastrointestinal sales were placed in 10% neutral buffered formalin for further processing and helminthes identification. One hundred and six turkey intestinal tracts that had been preserved in formalin and then were examined for helminthes parasites. Water was washed over the intestines to remove any excess preservative. The intestines were opened with scissors along their entire length and a standard glass microscope slide was used to scrape the lining of the intestine to remove embedded parasites. Using a heavy stream of water the scraped intestinal contents were first filters through a large screen (350nm) with mesh small enough to retain coarse debris. The second screen (150nm) was placed under the first to catch all parasites. Next the contents were washed in a bowl filled with water. The helminthes were allowed to settle to bottom of the bowl. The unsettled particles and liquid were decanted. The procedure was repeated until the supernatant was relatively clear. The remaining contents were examined for helminthes under a dissecting microscope. The parasites were separated into 3 major groups (Cestodes, Nematodes & Tremotodes) and then they were identified with valuable standard keys.

3. Results

Our results revealed that 34% of turkeys from 100 examined birds were infected with different parasites. Based of results six helminthes species comprising four nematodes and two cestode species were recognized.

Raillietina tetragona and Raillietina echinobothrida were found species of cestodes and Ascaridia galli, Heterakis galinarum, Subulura brumpti were our found nematodes. In table 1 prevalence rate of different species of separated helminthes are shown.

Table 1 - prevalence rate of different species of separated helminthes from turkeys

Parasite	Range	Mean (±SE)	Prevalence (%)
Raillietina tetragona	1-3	2 (0.5)	13
Raillietina echinobothrida	1-6	3 (1.1)	8
Ascaridia galli	1-14	5(1.5)	18
Heterakis galinarum	1-19	12(6.9)	16
Subulura brumpti	1-12	2(1.1)	14

4. Discussion

In Iran Tabriz city and suburb is home both to a commercial poultry industry and to many small rural homesteads that raise turkeys for subsistence, hobby, show, or simply for pleasure (9). The owners of many of these smaller farm flocks have often adopted a free-range type of management. The free-range management is certainly an acceptable type of husbandry practice, but there are some special health considerations to keep in mind, especially in the area of parasite control (9). Free-ranging birds have an increased opportunity to encounter the infective eggs, larvae, and intermediate hosts of parasites that can cause serious debilitating infections (8, 9). It is well known that parasitic disease are the cause for much money of losses to turkey producers each year (8, 9). Death losses are an obvious loss, but even greater economic losses are associated with decreased growth, egg production, and feed efficiency among the living (8). Parasites are an important cause of this hidden economic loss.

Based of parasite economical importance, present study was done and results of this study revealed that prevalence of turkeys parasites in Tabriz city and suburb is high.

In our study, six helminthes species comprising four nematodes and two cestode species were recognized.Raillietina tetragona and Raillietina echinobothrida were found species of cestodes and Ascaridia galli, Heterakis galinarum, Subulura brumpti were our found nematodes.

The large roundworm, Ascaridia gallis lives in the intestines of the turkeys. Symptoms of infection with this parasite include poor flesh, unthriftiness, weakness, reduced egg production, weight loss, and pale head and legs (8, 9).In our study Ascaridia galli was found in 18% of tested turkeys and results revealed that Ascaridia galli is one of the most important parasites in Tabriz turkeys. Good management and husbandry is very important to control this parasite, it is very important to separate young turkeys from older and yards and pens should be rotated and cleaned, and deep-litter pens must be kept dry(8,9).There is many studies that show Ascaridia spp has very occurrence in turkeys .Based

of Sassevile et. al (1988) survey, Ascaridia dissimilis is the most prevalent parasite(52%) in turkeys (7) and in Iran Elami (1980) reporte indicate that Ascaridia galli prevalence in turkey is 10% and Ascaidia galli is one of the most important parasite in turkeys(4). According Norton et al. (1992) survey Ascaridia spp can cause high mortality in domestic turkeys (5,6). The nematode Heterakis gallinarum has a wide geographical

and is often reported during avian helminthes surveys. Although of common occurrence, few are the Iranian studies related to the parasite prevalence .In present study Heterakis gallinarum appeared with a prevalence of 16% in the studied turkeys .In a previous study in Iran, Eslami (1980) has reported that Heterakis gallinarum prevalence in turkeys is 58% and this the highest prevalence of turkeys parasites in Iran(4). Castle et.al (1984) have reported that prevalence of Heterakis gallinarum based of different area in USA is ranged from 15% to 33% (2).According Betriz et al.(2006) report prevalence of Heterakis gallinarum was 70% (1). Our finding result about high prevalence of Heterakis gallinarum in turkeys is similar to other reports.

Subulura brumpti is another roundworm that occurs in the ceca of turkeys and related and has low pathogen city. In present study prevalence of Subulura brumpti in studied turkeys was 14%. Based of Eslami (1980) study in Iran the prevalence of Subulura brumpti in turkeys was 2% that is less than our findings (3, 4).

Several species of tapeworms infect turkeys. The two most common worms that were found in Tabriz city and suburb were Raillietina tetragona and Raillietina echinobothrida and their prevalence rate were 13% and 8% respectively. Both species of adult tapeworm live in the intestines of the turkeys. The segments of the minute tapeworm pass out in the feces, and eggs contained in the segments hatch after being swallowed by any of several species of slug, which serve as the intermediate host(8). Within the slug, the tapeworm develops to an intermediate stage called a cysticercoid in about 3 weeks. When the slugs containing the tapeworm are eaten by a turkey, the intermediate tapeworm stage is released and develops to an adult in about 2 weeks. In the previous study in Iran Eslami and Anvar (1973) reported Raillietina tetragona and Raillietina echinobothrida prevalence in turkeys is 2% (3). Based of our results Tabriz city and suburb turkeys are very infected to different gastrointestinal parasites that cause many economical losses and hence must be considered and control programs should be planned and done.

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Emission of X and **γ** rays by relativistic runaway electrons produced during atmospheric lightning

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Abstract: Quasi electrostatic fields generated during the lightning produces runaway electrons with energies in MeV range. These relativistic electrons can emit X and **γ** rays over the lightning region. Light emission appears in the form of red sprites and blue jets in their path towards the lower ionosphere. Some of these energetic runaway electrons are trapped by the Earth radiation belt and some fall down in the magnetically conjugate point in the opposite hemisphere. Whistler waves excited by lightning can accelerate electrons in the Earth's magnetosphere. In this research work the distribution function of relativistic electrons energy is calculated. The angular distribution of the electron beam moving along the magnetic field, $F(\alpha)$, the variation of the distribution function with the Earth magnetic latitude $f(\lambda)$ and the variation of electron beam radius with altitude resulted from diffusion and scattering are discussed. The variation of dynamic friction force with runaway electrons energies is plotted and the decrease in the scattering cross section with electrons energy is demonstrated.

Key **word**: Lightning, Runaway electrons, Gamma ray, X ray, Whistlers waves

1- INTRODUCTION

Millions of lightning's and thunderstorms occur yearly in the Earth atmosphere. Whistler wave interacts with particles trapped in the radiation belt of the Earth and this leads to the pitch angle scattering of electrons. During the lightning, hot plasma columns with diameters of tens centimeters and length of several kilometers are produced by large discharge currents. In this process a high current of about tens to thousands ampere is produced in a temperature of about $2500°C$. A high voltage discharge takes place between the cloud and Earth, cloud-cloud and cloud – ionosphere. The emitted electromagnetic spectrum during the lightning contains VLF(up to tens of KHz), short radio wave , visible and UV light , X and **γ** rays [1,2,3]. The main effect of the strong quasi-electrostatic fields after each discharge in the lower ionosphere is to change electrons distribution function. Red sprites are appeared in mesosphere about $1ms$ after each discharge. The mechanism for electron acceleration and hence X and **γ** ray production is still being studied by many groups. In the breakdown model, runaway electrons originating from cosmic rays are accelerated by the electric field produced during the lightning. Terrestrial **γ** ray bursts are then produced by bremsstrahlung process. In the

altitudes below $20Km$, new runaway electrons inside the clouds produce terrestrial **γ** ray flashes [4,5,6].

Electrical discharges produce plasmas where whistler waves are excited by energetic electrons. Initial cosmic rays with energies up to $10^{20}eV$ and electric field of $10KVcm^{-1}$ are known as the source for seed electrons [7, 8]. The condition $E \gg E_c$ alone is not sufficient for runaway breakdown, the presence of seed electrons with energies $0.1 - 1\,MeV$ is also needed since collision with air requires electrons with energies $E > E_c$. Excited whistler waves are observed frequently during lightnings. These waves propagate in the form of guided and non guided waves towards the magnetic conjugate point on the opposite hemisphere and take part in the acceleration process of electrons in the Earth radiation belts. Avalanches of runaway electrons in altitudes between $3 - 10Km$ can be produced in an electric field of $E > E_c \cong 2\,{}^{KV}\!/_{m}$ [9].

The production of energetic neutrons from photonuclear phenomena of terrestrial **γ** rays flashes are investigated, and $20MeV$ photons have been recognized as responsible for the production of neutrons and their existence in satellite altitudes of about $300Km$. Compton scattering and pair

production are also investigated in these processes. Energetic runaway electrons produced during the lightning lead to γ ray flashes with terrestrial origin. Runaway electrons with energies higher than $1MeV$ cause the bremsstrahlung [10,11].

The energy of γ radiation may reach $20MeV$ in the atmosphere. For runaway electrons, a threshold electric field under given pressure condition exists. The presence of seed electrons with energies higher than tens of kilovolts in high electric field region is required. Such energetic electrons exist in the atmosphere. The runaway electron phenomena is originated from long range and small angular scattering of charged particles in coulomb interactions.

For a given value of electric field, there is threshold energy where the dynamic friction force cannot overcome the acceleration force due to the electric field, so this leads to a continuous acceleration of electrons. In unmagnetized plasma, electron acceleration begins within an ionized plasma. Cold electrons with velocity v smaller than the thermal velocity are exposed to the dynamic friction force, proportional to the velocity: $F = mv_0 v$

Since for $v \ll v_T$, the electron collision frequency is constant, $v = v_0$ which is determined by thermal velocity of electrons. For fast electrons with velocities bigger than v_T , the dynamic friction force reduces with velocity [12].

$$F = mv(v) = \frac{4\pi n e^4}{mv^2} ln\Lambda$$

where n is the electron density and $ln\Lambda$ is called coulomb logarithm. When $v \cong v_T$, the friction force is maximum. The critical field or Dreicer field is given by

$$E_D = E_{Ci} = \frac{4\pi n e^3}{T} ln\Lambda$$

If the electric field is bigger than E_D , electrons become runaway electrons.

2- Terrestrial γ ray flashes

High energy photon bursts during the lightning is called terrestrial γ ray flashes (TGF_s). TGF_s are observed by satellite as photons with energies higher than $20\ MeV$ in a time du $E=10$ one to few msec. Vela satellites were eq with instruments capable to detect the of nuclear explosions (neutron ,

γ and X rays , visible light and radio wave) up to distances farther than Moon. Other satellites (Compton gamma ray observation and burst and terrestrial source experiment) were also launched later in 1991 for cosmic γ ray emissions. Very low frequency (VLF) wave ranging from $3KHz$ to $30KHz$ produced by the lightning are studied by many research groups. These waves are guided along the Earth magnetic dipole field and reach to the magnetically conjugate point in the opposite hemisphere. The guided VLF waves in magnetosphere deposit its energy to the medium by multiple reflections. Terrestrial γ ray flashes depend on VLF radio waves activity and both are related to inter cloud and cloud-Earth lightning's at $10\ Km$ altitude. The behavior of energetic photons of TGRF and their propagation are accompanied by three main physical processes namely: photoelectric, Compton scattering and pair production. These photons are recognized as bremsstrahlung radiation. Avalanche phenomena take place in the gas where free electrons accelerated by high electric fields collide with atoms and ionize them. The number of electrons is fastly increased and the newly produced particles contribute to the phenomena.

Terrestrial atmosphere is transparent for γ rays with energies higher than $1\ MeV$. Strong γ- bursts originate from higher troposphere have been registered by CGRO satellite (about 10 to 20 TGF_s , space telescope has also detected TGF_s). Neutron production phenomenon is also related to photonuclear (γ, n) reaction produced by runaway electrons. So, neutrons from photonuclear reaction are related to the lightning discharge.

The distribution function for the kinetic energy of runaway electrons is given by:

$$f(\varepsilon) = C e^{\varepsilon / k_B T} \gamma \sqrt{\gamma^2 - 1}$$

Where $\gamma = 1 + \frac{\varepsilon}{m_0 c^2}$ is the relativistic factor and $k_B T \cong 2\ MeV$ is considered here. In Figs (1-a) and (1- b), the distribution function of runaway electrons are shown for energies from 2 and $10\ MeV$. One can see from these graphs that electron energy distribution function has a minimum around $3.5\ MeV$ which cannot be observed in fig (1-a) for $2MeV$ electrons.
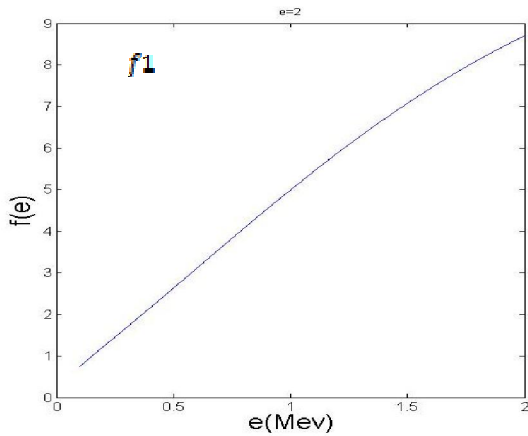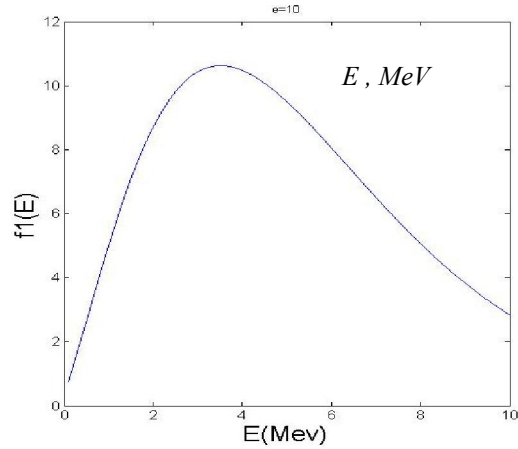
Fig(1-a)   *Fig(1-b)*

Fig.1. Representation of electron energy distribution function $f(E)$

The angular distribution of transmitted beam in the direction of the magnetic field line up to the fallout point is $F(\alpha)$ function designated by the conservation of particle's number:

$$F(\alpha) = \frac{N_{tot}}{4\pi B} \frac{B_{eq}Cos\alpha}{\sqrt{1 - \frac{B_{eq}}{B}Sin\alpha}}$$

$$\frac{Sin\alpha}{Sin\alpha_{eq}} = \sqrt{\frac{B}{B_{eq}}}$$

Where α is the pitch angle, α_{eq} is the pitch angle in the magnetic equatorial. B_{eq} is terrestrial magnetic field intensity in the magnetic equatorial and N_{tot} is the total number of fallout electrons. In figure (2), $F(\alpha)$ is plotted for $\alpha_{eq} \cong 2 - 3°$ and $B_{eq} \approx 0.311 \, Gous$.
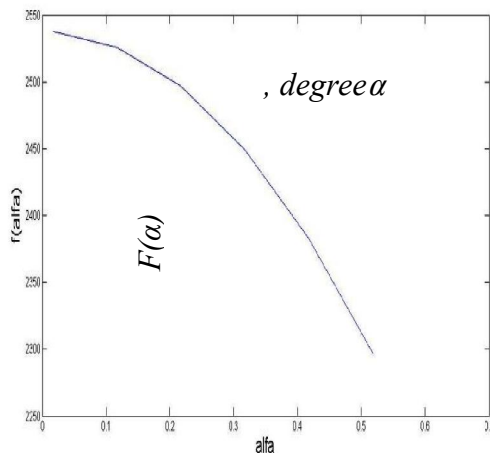
Fig.2. Representation of $F(\alpha)$ versus α

Since the Earth magnetic dipole field is expressed as function of the latitude by:

$$\frac{B}{B_{eq}} = \frac{\sqrt{1 + 3Sin^2\lambda}}{Cos^6\lambda}$$

The variation of $f(\lambda)$ with latitude is also calculated and plotted in figure (4).
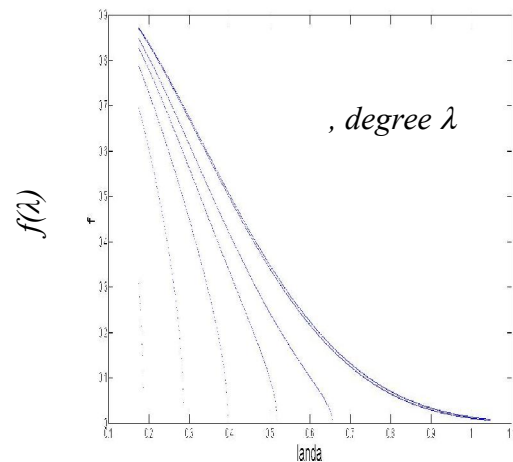
Fig.3. Representation of $f(\lambda)$ in function of λ

α is related to λ by:

$$\alpha = Sin^{-1}\left[\sqrt{\frac{B}{B_{eq}}\left\{1 - [1 - \chi_\alpha(1 - \sqrt{1 - \frac{B_{eq}}{B}})]^2\right\}}\right]$$

where α is the downward stochastic pitch angle, $\chi_\alpha = \frac{1 - Cos\,\alpha_{eq}}{1 - Cos\,\alpha_{eq}^{lc}}$ is the distribution function and $\alpha_{eq}^{lc} = Sin^{-1}\left[\sqrt{\frac{B_{eq}}{B}}\right]$ is the loss cone angle and $\frac{Sin\alpha}{Sin\alpha_{eq}} = \sqrt{\frac{B}{B_{eq}}}$ is the ratio between the local pitch angle

in the fallout point and equatorial pitch angle. λ is taken in the range of 10 -60 magnetic degree. The variation of α with λ is given in figure (4).
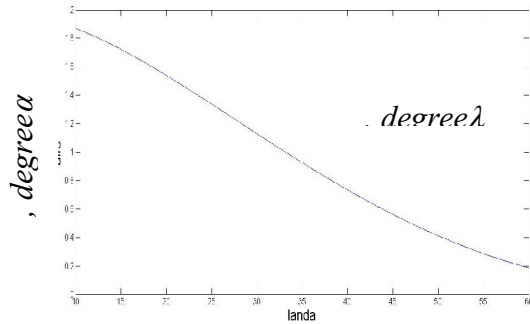
Fig.4. Variation of α versus λ

It is seen that the local pitch angle at fallout point decreases with the magnetic latitude λ. Energy dissipation of high energy electrons in a collisional gas resulting from excitation and ionization is characterized by dynamic friction $F_D(\varepsilon)$. Dynamic friction force presents a minimum for some values of energies and this friction force decreases for high energy electrons (Fig5).
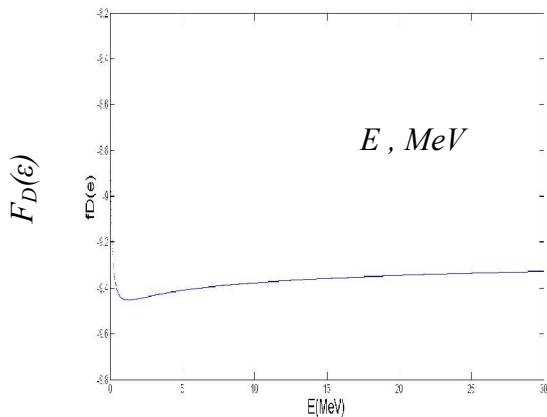
Fig.5. Variation of $F_D(E)$ in term of electrons energy

Electron beam radius is expanded due to the scattering diffusion and is given by:

$$r_b^2 = r_{b_0}^2 + \theta^2 \Delta z^2 + 0.025 \frac{(1 + 0.22 \ln \gamma)}{\beta^2 \gamma^2} (\Delta z)^2 P(atm)$$

Where r_{b_0} is the beam initial radius, θ the scattering angle, $\beta = v/c$ and γ is the relativistic factor. Variation of beam radius with altitude is shown in Fig. (6, 7)

It is seen that the radius of electron beam is expanded up to a high of $30\,Km$ and then starts to decrease beyond that. It can be explained by the fact that because of electrons high energies, the scattering is increased up to a high of $30\,Km$, so the beam radius increases to this altitude, but due to the decrease of electron energies in higher altitudes and

hence decrease in the density of scattering points, the scattering diffusion is reduced and the electron beam radius is also decreased. So, the number of runaway electrons (for the threshold electric field of runaway electrons avalanche E_{th}) is increased exponentially with distance.
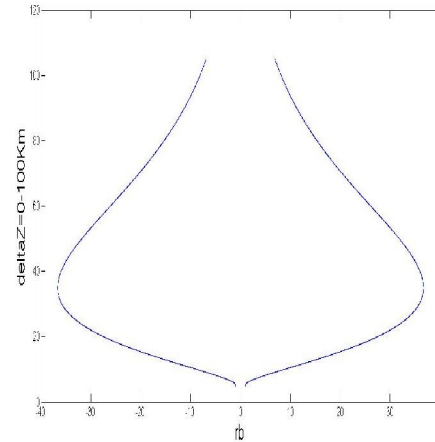
Fig.(6)
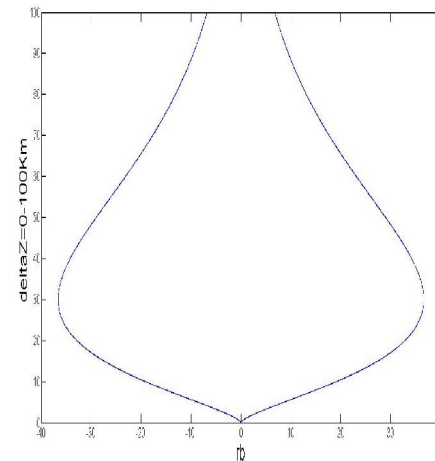
Fig.(7)

Fig. (6 and 7): diagrams showing the variation of runaway electrons beam's radius with the altitude from Earth surface.

In contrast with electrons, when the passage of positrons through a gas is considered, pair annihilation must occur. The total cross section for the annihilation is given by:

$$\sigma_{annih} = \frac{\pi r e^2}{\gamma + 1} \left| \frac{(\gamma^2 + 4\gamma + 1)}{(\gamma^2 - 1)} \ln\left(\gamma + \sqrt{\gamma^2 - 1}\right) - \frac{\gamma + 3}{\sqrt{\gamma^2 - 1}} \right|$$

Where γ is Lorentz factor . The variation of this cross-section with energy is given in figure (8).

This curve shows that due to positron electron annihilation, in the case of positron passage through a

gas, the total cross-section and hence the scattering is reduced.
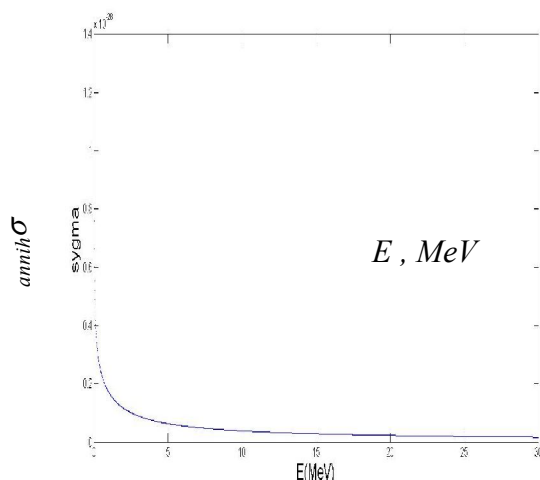
Fig.8. Variation of cross section of pair annihilation in term of energy.

3. Conclusion

In the electric fields beyond the threshold, the propagation of light columns grow exponentially. The potential difference depends directly to runaway electrons energies. Mont-Carlo simulation methods give an energy of about $100\ KeV$ to few MeV for runaway electrons. Optical emission from red sprites originates from energetic electrons. These electrons leave the Earth and reach the radiation belts. Electron beam falls out to the magnetically conjugate point in interaction with plasma waves and some of energetic electrons are trapped in the radiation belt. In the altitude higher than 5 times the earth radius, the fall out electrons are less studied. Whistler and electrostatic waves lead in these studies to energetic electrons acceleration. The mechanism for the terrestrial high energy gammas which give rise to X-ray production are investigated recently. The probability of interaction between runaway electrons and atomic particles is known as one of terrestrial γ flashes production mechanisms. Terrestrial γ ray flashes are produced during bremsstrahlung radiation. Electrons with energies about $1MeV$ produce γ ray along electron beam direction.

Energy distribution function for the relativistic electrons is plotted in figure (1). The angular distribution of electron beam passing along the magnetic line is also calculated and shown in the figure (2). $F(\alpha)$ function depends on the magnetic latitude and $f(\lambda)$ is shown in the figure (3). Here α is the pitch angle and λ is the magnetic latitude.

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The variation of dynamic friction force with runaway electrons kinetic energy is given in figure(5) and the results are discussed.

Electron beam radius is expanded to $30\ Km$ altitude due to scattering diffusion, but beyond this it decreases with altitude. It seems that it takes a pancake form. Due to high energy of electrons up to $50\ Km$ altitudes, electron scattering is increased hence electron beam radius also increased. But due to the reduction in the energy of electrons in high altitudes and also reduces in the density, the scattering diffusion is reduced and electron beam radius decreases.

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Chebyshev Galerkin method for approximate solution of a class of Fredholm hypersingular integral equations

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Abstract: A simple galerkin method based on second type Chebyshev polynomials approximation method is employed to obtain approximate solution of a class of hypersingular integral equations of the second kind. For a class of hypersingular integral equation of the second kind, this method avoids the complex function-theoretic, long computations of collocation polynomial-based methods and produces the known exact solution or high accurate approximate solution.

1 Introduction

Hypersingular integral equation is considered as an important tool in applied Mathematics as it finds application in solving a large class of mixed boundary value problems arising in mathematical physics. Particularly the crack problems in fracture mechanics or water wave scattering problems involving barriers, diffraction of electromagnetic waves and aerodynamics problems ([2,6,7]) could be reduced to hypersingular integral equations in single or disjoint multiple intervals.

A simple approximation method for solving a general hypersingular integral equation of the first kind where the kernel consists a hypersingular part and a regular part is introduced and developed in [10]. A method based on polynomial approximation is used in [9] to produce the approximate solution of a class of singular integral equations of the second kind. Dutta and Banerjea ([4]) have solved a hypersingular integral equation in two intervals by using the solution of Cauchy type singular integral equations in two disjoint intervals. Gori et.al. ([5]) have constructed a quadrature rule based on the use of suitable refinable quasi-interpolatory operators, for the numerical evaluation of Hadamard finite-part integrals. Chen and Zhou ([3]) have developed an efficient method for solving hypersingular integral equation of the fist kind in reproducing kernel space in order to eliminate the singularity of the equation.

In the present paper, we have considered the following two cases for hypersingular integral equation of the second kind.

Case A: We consider the following Fredholm hypersingular integral equation of the second kind ([9])

$$u(x) = f(x) + \frac{\alpha(1-x^2)^{1/2}}{\pi} \int_{-1}^{1} \frac{u(t)}{(t-x)^2} dt, \qquad -1 < x < 1 \quad (1\text{-}1)$$

on the finite interval $(-1,1)$ with the condition $u(\pm 1) = 0$. Equation (1-1) is generalized state for oval wing of Prandtl's equation, where $\alpha > 0$ is a known value, $f(x)$ and $u(x)$ are known and unknown functions respectively. Equation (1-1) is referred to as Hadamard finite part ([9])

$$\int_{-1}^{1} \frac{u(t)}{(t-x)^2} dt$$
$$= \lim_{\varepsilon \to 0^+} \left[\int_{-1}^{x-\varepsilon} \frac{u(t)}{(x-t)^2} dt + \int_{x+\varepsilon}^{1} \frac{u(t)}{(x-t)^2} dt - \frac{u(x+\varepsilon) + u(x-\varepsilon)}{\varepsilon} \right]. \quad (1\text{-}2)$$

Accurate solution of equation (1-1) was obtained by using a simple approximating polynomial for $u(x)$ in [9] and by reducing it to a differential problem of Riemann-Hilbert on the interval $(-1,1)$ in [1].

Case B: We also consider the following Fredholm hypersingular integral equation of the first kind

$$\frac{1}{\pi}\int_{-1}^{1}\frac{u(t)}{(x-t)^2}\,dt = f(x), \quad -1 < x < 1. \quad (1\text{-}3)$$

Equation (1-3) has been solved in a closed form in [8] as follows

$$u(x) = \frac{1}{\pi}\int_{-1}^{1}f(t)\ln\left|\frac{x-t}{1-xt+\left\{(1-x^2)(1-t^2)\right\}^{1/2}}\right|dt, \quad -1 < x < 1. \ (1\text{-}4)$$

The integral occurred in (1-4) is not straightforward for evaluation.

In this paper the equations (1-1) and (1-3) are solved using a Chebyshev Galerkin method. The numerical approximations satisfy with the exact solutions offered in [1,8,9].

2 Methods

Case A: In equation (1-1) it is assumed that

$$u(x) = (1-x^2)^{1/2}\psi(x), \quad\quad\quad (2\text{-}1)$$

where $\psi(x)$ is a smooth function (see [8]). Let us approximate $\psi(x)$ with a truncated series as follows

$$\psi(x) \approx \sum_{j=0}^{n}a_j U_j(x), \quad\quad\quad (2\text{-}2)$$

where $U_j(x)$, $j = 0,1,\ldots,n$ are Chebyshev polynomials of the second type defined as

$$U_j(x) = \frac{\sin(j+1)\theta}{\sin\theta}, \quad j=0,1,..n, \quad x=\cos\theta. \ (2\text{-}3)$$

The Chebyshev polynomials of the second type satisfy the following recursive relation

$$U_0(x) = 1,$$
$$U_1(x) = 2x, \quad\quad\quad\quad\quad (2\text{-}4)$$
$$U_{n+1}(x) = 2xU_n(x) - U_{n-1}(x), \quad n = 1,2,\ldots$$

These polynomials satisfy the following orthogonality property

$$\int_{-1}^{1}(1-x^2)^{1/2}U_i(x)U_j(x)dx = \begin{cases}\dfrac{\pi}{2}, & i = j \\[2mm] 0, & i \neq j\end{cases} \quad (2\text{-}5)$$

After substituting (2-1) in (1-1) and getting simplification we have

$$\sum_{j=0}^{n}a_j\left[U_j(x) - \frac{\alpha}{\pi}\int_{-1}^{1}\frac{(1-t^2)^{1/2}U_j(t)}{(t-x)^2}\,dt\right] = \frac{f(x)}{(1-x^2)^{1/2}}. \ (2\text{-}6)$$

Refereing to [9] we have

$$\frac{1}{\pi}\int_{-1}^{1}\frac{(1-t^2)^{1/2}U_j(t)}{(t-x)^2}\,dt = \frac{1}{\pi}\frac{d}{dx}\int_{-1}^{1}\frac{(1-t^2)^{1/2}U_j(t)}{(t-x)}\,dt$$
$$= -(j+1)U_j(x). \quad (2\text{-}7)$$

With substituting (2-7) in (2-6) we get

$$\sum_{j=0}^{n}a_j[1+\alpha(j+1)]U_j(x) = \frac{f(x)}{(1-x^2)^{1/2}}. \quad (2\text{-}8)$$

By multiplying (2-8) in $(1-x^2)^{1/2}U_i(x)$, $(i = 0,1,\ldots,n)$, integrating on the interval $(-1,1)$ and using the orthogonality property (2-5) we get

$$a_i = \frac{2f_i}{\pi(1+\alpha(i+1))}, \quad i = 0,1,\ldots,n \quad (2\text{-}9)$$

where

$$f_i = \int_{-1}^{1} f(x)U_i(x)dx, \quad i = 0,1,\ldots,n. \quad (2\text{-}10)$$

Case B: We can use the same approach to solve equation (1-3). With substituting (2-1) and (2-2) in (1-3) we have

$$\sum_{j=0}^{n} a_j \frac{1}{\pi} \frac{d}{dx} \int_{-1}^{1} \frac{(1-t^2)^{1/2}U_j(t)}{t-x} dt = f(x), \quad (2\text{-}11)$$

and using (2-7) yields

$$-\sum_{j=0}^{n} a_j (j+1)U_j(x) = f(x), \quad (2\text{-}12)$$

By multiplying (2-7) in $(1-x^2)^{1/2}U_i(x)$, $(i = 0,1,\ldots,n)$, integrating on the interval $(-1,1)$ and using the orthogonality property (2-5) we get

$$a_i = -\frac{2F_i}{(i+1)\pi}, \quad i = 0,1,\ldots,n \quad (2\text{-}13)$$

where

$$F_i = \int_{-1}^{1} (1-x^2)^{1/2} f(x)U_i(x)dx, \quad i = 0,1,\ldots,n. \quad (2\text{-}14)$$

3 Numerical Illustrations

Example 1: In the hypersingular integral equation (1-1) assuming

$$f(x) = 2\pi(1-x^2)^{1/2}, \quad \alpha = \pi. \quad (3\text{-}1)$$

With (2-9) and (2-10) we get

$$a_0 = \frac{4\pi}{\pi+2}, \quad a_j = 0, \ j = 1,2,\ldots \quad (3\text{-}2)$$

Thus from (2-2) we get

$$\psi(x) = \frac{4\pi}{\pi+2}, \quad (3\text{-}3)$$

and finally we get the approximate solution of the integral equation from (2-1) as

$$u_{app}(x) = \frac{4\pi}{\pi+2}(1-x^2)^{1/2}, \quad (3\text{-}4)$$

which is the exact solution of the equation.

Example 2: In the hypersingular integral equation (1-3) assume $f(x) = x^2$. In this case we get the exact solution with (1-4) as follows

$$u(x) = -\left(\frac{1}{3}x^2 + \frac{1}{6}\right)(1-x^2)^{1/2}, \quad (3\text{-}5)$$

With (2-9) and (2-10) we get

$$a_0 = -\frac{1}{4}, \quad a_2 = -\frac{1}{12}, \quad a_j = 0, \ j \neq 0,2 \quad (3\text{-}6)$$

then from (2-2) we get

$$\psi(x) = -\frac{1}{4}U_0(x) - \frac{1}{12}U_2(x) = -\left(\frac{1}{3}x^2 + \frac{1}{6}\right),$$

substituting in (2-1) which gives the same exact solution (3-5).

Example 3: In (1-3) assume $f(x) = \sin x$. For $n = 5$ we get

$$a_0 = a_2 = a_4 = 0,$$

$$a_1 = -0.2298069699, \ a_3 = 0.004953277928, \ a_5 = -0.000041876676,$$

then

$$u_{app}(x) = (1 - x^2)^{1/2} \sum_{j=0}^{5} a_j U_j(x)$$

$$= (1 - x^2)^{1/2}(-0.4796783115x + 0.0409662771x^3 - .0013400536x^5)$$

(3-7)

In this case the exact solution is not straightforward because the integral (1-4) is difficult. We evaluate $u(x)$ in (1-4) for any $x \in [-1,1]$, numerically. Table 1 shows absolute errors of the solution obtained by Chebyshev galerkin method comparing with the results obtained from (1-4) for different values of n at some $x \in [-1,1]$.

Absolute errors for Example 3

x	n=5	n=10	n=15	n=20
1	0	0	0	0
-0.8	0.17E-06	0.99E-12	0.23E-13	0.49E-27
-0.6	0.17E-06	0.99E-12	0.23E-13	0.35E-27
-0.4	0.29E-07	0.97E-12	0.90E-14	0.71E-28
-0.2	0.19E-06	0.66E-12	0.24E-14	0.22E-27
0	0	0	0	0
0.2	0.19E-06	0.66E-12	0.24E-14	0.22E-27
0.4	0.29E-07	0.97E-12	0.90E-14	0.71E-28
0.6	0.17E-06	0.99E-12	0.23E-13	0.35E-27
0.8	0.17E-06	0.99E-12	0.23E-13	0.49E-27
1	0	0	0	0

4 Conclusion

We have computed the approximate solution of hypersingular integral equations of the second kind easily and carefully. Our method have avoided the complex function-theoretic long computations.

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Validation of a New version for Memory Assessment in a Group of Farsi Speaking, Shiraz residents

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Abstract: The general population is increasing due to factors such as promotion of public health and advancement of medical technology. Thus, investigating problems of older people is of paramount importance. Dementia disorders and the related cognitive and memory problems and lack of valid instruments for evaluations of cognitive factors have created a need to validate memory test batteries for the age group of 65-75 years. The present study sample included 90 subjects consisting of 45 men and women suffering from dementia and 45 normal subjects in Shiraz. The instruments used were the new sub-tests adapted from Wechsler Memory Scale–Third Edition, California Verbal Learning Test (CVLT) and Mini-Mental State Examination. The results showed that the alpha coefficients was between (.66) and (.94) and for the memory subtest scores, and between (.51) and (.68) for Californian Verbal Learning Test. The validity indices for this scale were also assessed. The results were consistent with theoretical predictions. Taking into account the reported alpha coefficient and validity it can be concluded that the new memory test battery has satisfactory psychometric characteristics for 65-75 years population in Shiraz. [Fatemeh Hassani, Hassan Ahadi, Parviz Askari, Abdolhamid Shariat. **Validation of a New version for Memory Assessment in a Group of Farsi Speaking, Shiraz residents**. *Life Sci J* 2012;9(4):4353-4359]. (ISSN: 1097-8135). http://www.lifesciencesite.com. 654

Key words: memory, dementia, cognition, cognitive imparement

1. Introduction

The world's elderly population has been growing in recent years, so it is of great importance to take the disease and problem of aging into consideration. Among developing societies, the disease called dementia as a consequence of brain problems cause the affected to practically experience death twice. They die for the first time when they forget the whole past issues and memories especially the immediate past and even are not capable of managing their daily affairs and their second death is the common physical death experienced by every human. One of the important and also dangerous effects of dementia is the gradual loss and damage to cognitive functions which is remarkably evident as damage to memory. This problem emphasize on the necessity of study and increment of instruments which could inspect the memory, measure the level of damage to the brain and identify the areas in which the memory has suffered disorders. Determining the damaged parts, quantitative estimation of level of damage and distinguish it from the individual's natural mental disorders has significant importance in clinical diagnosis and adjustment of treatment process. Although a major part of the peoples' cognitive abilities increases during adulthood or is in a stable flow at least, however most of the people start to experience some cognitive defects after sixty years of age.

2. Literature review

In this direction Shein (1996; quoting from Berger1998) concluded in an longitudinal research that most of elderly have shown significant reductions in some of several major mental abilities such as verbal means, spatial orientation, deductive reasoning, numerical ability and fluent speech. Cognitive disorder happens when there is significant difference between the level of individual performance in the present time and his ability before the happening of mental disorder (Nelson and Vilson, 1991; quoting from Lezak1995).

Among all the neural-behavioral syndromes, the problem of dementia and the age-related changes are the most well known and harmful ones for the public health of society (Ernest Vahy, 1994). Memory is one of the parts that could be affected with the cognitive problem of dementia. Therefore it is essential to measure this cognitive factor in the recognition and treatment process of disorders from which the memory disorder is the most important one.

Among the most well-known instruments for measuring memory we can point to the Wechsler test that is a collection of compound tests which is run individually and is designed for the better comprehension of different parts of memory. Now the

third edition is normalized with WAIS-III. Since it provides a complete domain of memory function, Wechsler test is considered the essential part of the full cognitive assessment process (Marnet, 2003).

America, Canada, Australia, New Zealand, and England and any of these countries, depend on cultural characteristi Now the fourth edition of Wechsler memory scale (WMS-IV) is applied in several countries such as cs of their own society, has created some changes.

Also these tests are used for diagnosing memory impairments among the elderly in Iran and today revised edition WMS-R is being used. The purpose of this research is to give the highest norm of the evaluations for clients, and also maintaining the high level of credit, lasting and assuring of the most effective usage type in these examination in that used in Iran from Wechsler test from first to forth edition.

In the revised text of forth edition, diagnostic and statically guide of dementia psychosis is specified with multiple deficiency knowledge including paramnesia but there is not any destruction awareness. Severe brain damage, passenger vascular diseases, and stroke include the main symptoms of dementia. Cognitive functions which may be damaged in dementia include general intelligence (G factor), learning and memory, language and problem-solving, navigation, conception, concentration and judging (Kaplan, 2003)

Dementia as a disease had multiple deficiency cognitive function including damage to memory or at least one of cognitive problems was recognized such as apraxia, aphasia, and tilt executive task brain. About 5% of the people in America suffer from sever dementia at the age over 65 and about 15% of elderly suffer from slight dementia. Increasing the age is the most important factor in this regard. The most prevalent cause for dementia after Oxidative stress consequence is vascular diseases or alcoholic trauma and the other cases.

The most prevalent type of Alzheimer and second type of prevalent dementia is vascular dementia (Kaplan, 2003; translated by Mohseni Fard). Alzheimer and vascular dementia in some dementia type altogether formed 75% of total dementia cases (ibid). In early twentieth century, Alovis Alzaymer reported that one of his patients named Agovest D shows sever impairment in his memory. He found some plaques album in his autopsy. Research about Alzheimer began seriously. Comprehensively pathology and neurology was studied and new and important information was evident (Volesh, Boohemran & Vanes, 2006).

Dementia syndrome is introduced as a problem that follows mal-functioning of the brain cortex or nerve system. The most important disorder occurs in the most part of brain cortex which is the result of aggressive memory disorder, behavioral changes, language functions and all consequences of cellular death that is usually worsen in older ages. (Jones series, 2004)

Perhaps memory is the most essential cognitive function that relates to dementia and can be described through different methods and in various abstract levels. Memory is one of the brain functions in cognitive category in dementia pathology that is highly studied in dementia pathology researches.. Free psychology dictionary, memory is defined as: the ability of reminding past experience or learned information that might include advanced mental processes like learning, maintaining, reminding and recognition that result from chemical changes between neurons and several different areas in the brain like hippocampus. Immediate memory only maintains information for few seconds. Short term memory saves and processes information for several minute and then transfers them to long term memory and can be settled for many years. Whenever the stored information was used repeatedly the neorochemical changes are facilitated to help the individual remember them. Losing memory as the result of diseases and brain impairment is called amnesia.

Dementia is so destructive for his family and relatives. To the extent that it affects the whole society. While dementia may be beginning with considerable symptoms like slight memorial impairments, it finally leads to sever general cognitive impairment so that they cannot do their works only. At the present time there is no curable method for dementia. At best some medicines can lessen these symptoms and lessen the recognition symptoms but the disorder returns again (Quming, 2004).

Without having any cognitive and mental instrument for saving and processing past events, human being cannot his past experiences. (Kelstorm, 1998)

Herman Ebinghavense is the foremost memory researcher that studied it through a practical and precise scientific method. (Solsoo, 2002)

William James (1901) divided memory into primary and secondary. Sometimes later, he called the former short term memory and the latter long term memory.

Atkinson and Shiffren (1968) divided memory to sensory memory, short term memory and long term memory (Ness, 2003). It is clear that for executing and giving any treatment we need instruments to collect essential and description data. Collecting initial data in psychology especially in examinations related to group distinctions and the role living factors play requires their application. However, psychology examinations are useful in diagnosis and treatment

(Kaplan, Sadook; 1996). In the present time memory evaluation and determining the degree and type of disorder is the most important area in neurology, psychology and psychometric. The lack of memory measurement instrument in Iran thus leads us to provide the tools to solve the problem. According to the above mentioned discussion, the main purpose of this study is the scale study for examining psychometric characteristic of new memorial examination. Elderly people who suffer from dementia and healthy old people were examined by differential diagnosis of this examination.

3. Material and Method

The method used in this research is field research. Observation instrument include the new memorial tests part of which is taken from Wechsler tests along with mini mental statuses examination (MMSE), and California verbal learning examination (CVLT) which provide the measuring memorial test and verbal learning that is done by giving questionnaires to the respondents. The data is recorded by the tester after it is answered by the respondents. The scores for each respondent show the memory status for him/her so that memorial impairment will be examined.

3-1.subject

Statistical population in this research was considered all elderly between 65 to 75 ages that live in Shiraz as a sample group and their education at least were reading and writing. The sample group includes 90 people. It includes 45 male and female who were determined as suffering from dementia, and 45 male and female healthy respondents.

3-2measurement tools

In this study, the collection of new memory tests includes several quizzes that together form the memorial measurement test. Some selected quizzes from Wechsler memory scale (third and forth ed.) for measuring active memory indices, immediate memory (immediate audio, immediate visual), delay (inconsistent audio, visual inconsistent, delayed audio) was given with some changes. According to following description:

Information and navigation, logical memory I, II, lists I, II, mental control, audio inconsistent II, numerical consult.

To study the validity of these scales the researcher paid attention to 3 aspects of criterion-related validity, constructed validity, and interrelationship correlation. In 1997, psychological corporation of criterion-related validity examined the validity of this scale through examining its correlation with Wechsler memory scale revised (WMS_R), child memory scale (CMS) and Wechsler adult intelligence scale (third edition) (WAIS-III). The result of this study shows a mean correlation coefficient between WAIS-III and these

scales that shows the validity of this criterion. Factorial analyses conducted so far confirms these validity scales (Wild et al, 2003; Toleski et al, 2004).

Saed (2007) examined Wechsler memory scale (third edition) characteristics during his studying on students in Shahed University and Teacher Training University of Tehran. This study was conducted on a sample of 266 individuals. For estimating the reliability of the test, similar interior methods (Cronbach's Alpha), partition methods, and adaption method between evaluators were used. For estimating the validity of the criterion-related test, as well as examining the inter-correlation between sub-scales, factorial analysis was conducted. For determining the reliability the Cronbach's Alpha was used the result of which shows an alpha coefficient of 94% to 96% for memory components.

CVLT that quantifies the below parameters:

Reminding and recognition level in all attempts, learning inclination for all attempts, memorizing information along short pauses and long pauses, reinforcing reminding function through some clues, classification and recognition examination(adult version of the test is appropriate for individuals who had 17-80 years (Asprin & Astres, 1998).

In this research Cronbach's alpha was used to determine the reliability of the measures. So the results show alpha coefficient between 0.51 to 0.68 for CVLT which proves the validity of this scale.

MMSE examination was used for examining and initial estimating and general estimating of public mental statues examinations.

For examining the reliability of this factor, Cronbach's alpha and retesting was used. The results are shown in Table 3-4.

Table 1. The results of reliability test for memory scale

Variable	Cronbach's alpha
Information	88%
Logical I memory	91%
Story B Logical memory I	92%
faces I recognition	80%
Visual reproduction I	86%
Mental control	66%
Digit span	84%
Logical memoryII	92%
Story B Logical memory II	84%
Logical memory cued recognition	86%
Faces II recognition	86%
Visual reproductionII	88%
MMSE	92%

As the results show for the memory component Cronbach's alpha coefficient was obtained between 66% -94% components.

For determining the reliability of CVLT scale Cronbach's alpha coefficient and retesting was used. The results are shown in Table 2.

Table 2. Result for the reliability of CVLT

variable	Cronbach's alpha
Learning slope	65%
Words list B	65%
Immediate free recall	51%
Immediate cued recall	60%
Short Delay free recall	60%
Short delay cued recall	59%
Irrelevant words in free recall	60%
Irrelevant words in cued recall	60%
Whole irrelevant words	60%
Repeated words	65%
Long Delay recognition	68%
Positive mendacious in long delay recognition	65%

As the results of the table shows, Cronbach's alpha coefficient between 51%-68% was created for component CVLT which shows the reliability of this component. While these coefficients are not highly significant, but they prove the relative reliability of this test.

3-4.Data analysis

In table 3, mean and standard derivation and mean of examinations scores was shown for the memory component in the sub-test. As table 3 shows, you consider means of participators in this study generally or separately were gathered. Findings of this table clearly show how participants function. As you see non dementia had more scores than dementia group in a little scales of memory.

According to table 4, the scores of dementia and non dementia group in indices of learning inclination, list B, reminding clues, delay of free reminding, delay reminding with clues, inconsistent delay, positive mendacious are significantly different. That is non dementia group in all indices- except Positive mendacious - had higher scores than dementia group. In other indices like irrelevant reminding and repeated reminding difference between two groups is not meaningful. These results, on the one hand, show the difference between the two groups. On the other hand, examination authority mentioned according to diagnosis characteristic of individuals who suffered dementia acted weakly in learning and memory. Another method for discriminating dementia and non dementia groups is

diagnosis analysis. For this purpose a sub-test scales of memory was analyzed as variant for dividing two groups. In this analysis, an equation in formulated through regressing the dependent variable on independent variable. The equation determines the maximum discrimination between the two groups which is used for determining the group membership in future. We need to mention that the researcher examined that presumptions were analyzed before congenial variance and covariance. The results show that presumptions are good.

In fact Welcinz lambda is the proportion of total in-group squares to total squares ratio that is a proportion of the variance that cannot be stated by the distinction of groups. The fewer lambdas are, the more is meaningful possibility. As you see in the above table, all values for lambda are small so that the two groups have meaningful differences in sub-scales of memorial examination. Also another method for discriminating the two groups of dementia and non dementia is using diagnosis analysis method. For this purpose CVLT was analyzed as a predictive variable in order to distinct the two groups. In this analysis, the type of dependent variable (criterion) leads into an equation that creates maximum distinction between the two groups and the equation is used for predicating membership group in the future. We need to mention that before analysis, presumptions - including congenial variance and covariance - were examined where presumption was appropriate.

Table 6 shows Welcinz lambda and one direction variance analysis and the level of meaningfulness.

In fact Welcinz lambda is the proportion of total in-group squares to total squares ratio that is a proportion of the variance that cannot be stated by the distinction of groups. The fewer lambdas are, the less is the possibility of meaningfulness. As you see in the above table, all scales of lambda are small to delay reminding with clues, delay of free reminding, reminding clues, immediate reminding, and learning inclination that these scales by delay inconsistent and positive mendacious can create a distinction between two groups if there is not any distinction between two groups of irrelevant reminding of indexes, whole irrelevant words and repeated words.

4. Result and discussion

The purpose of present study is examining the validity of memorial examination in a group of elderly individuals who suffered dementia and disorder of Persian language from Shiraz. Using the obtained scores from this measurement which include examination scores in memory sub-test and CVLT, this study calculated and reported validity indices and reliability scales and also terminal indices. The results for Cronbach's alpha test shows sub- scales of

memorial examination that obtained coefficient in mini memorial examination are 0.94 and in scale of verbal leaning in high surface is 0.68 and all emphasized interring parallelism of whole scales. Earned alpha coefficient in Saeed project (2007) was reported Wechsler memory scales (third edition) is 0.93. Orangi (1999) also reported reliability coefficient of 0.28 to 0.98.

To examine research questions, in line with examining the ability of these tests in diagnosis of old people suffering from dementia and health old group, the results show that by using memory sub-tests in 97.8 percent of evaluations, we can create correct distinction between elderly individuals who suffered dementia and normal individuals. CVLT is another part of this study in Delay reminding with clues, immediate reminding, immediate of free reminding in this manner had high weight in diagnosis of two groups that had 94.9 percent of evaluation can be created correct distinction between elderly individuals who suffered dementia and disorder.

The result on a subject of whole function of elderly individuals who suffered dementia compared to normal individuals show that function of dementia groups have lower level than normal individuals. This difference in function of whole memory sub-tests and all total indices include verbal memorial, visual memory, audio memory, delay memory and public memory, and in all obtained cases were meaningful. These results are in line with the results for researches done by Laung &Clawm (2006); Gonzled, Joudar & Predrics (2009), Backe, Esstin & Davins (2003).

The results of this study much in line with previous researches emphasized the fact that elderly individuals who suffered cortical dementia lose their different ability of diagnosis. This problem was created limitation to person and has great cost.

According to findings of the research we can say that all results have proper reliability and validity for examination and by using these findings we can evaluate elderly function to diasgnosis pathology scales.

Some limitation of this study necessitates further investigations on the subject. The main problem was accessing elderly individuals suffering from dementia with the ability to cooperate with this research that led to a fewer sample.

Table 3. Mean and standard derivation examination scores for the memory component

variable	Mean			Standard deivation		
	dementia	non dementia	total	dementia	non dementia	total
Information	8.2	13.51	10.8	3.02	0.62	3.4
Logical memoryI	6.5	16.1	11.3	3.7	2.8	5.9
Story B Logical memory I	6.7	16.9	11.8	3.8	3.2	6.2
faces I	11.5	20.28	15.9	3.5	3.5	5.6
Visual reproduction I	7.2	24.2	15.6	7.3	8.1	11.6
Mental control	4.3	5.6	4.9	1.2	0.8	1.2
Digit span	5.3	11.7	8.5	2.5	3.3	4.4
Logical memory II	4.9	15.5	10.2	3.1	3.4	6.2
Story B Logical memory II	4.8	16.6	10.7	3.9	2.9	6.8
Logical memory cued recognition	13	24.7	19.2	6.05	2.7	7.2
faces II	9.8	19.2	14.5	3.5	2.5	5.6
Visual reproduction II	6.4	21.7	14.1	7.6	6.9	10.5
MMSE	14.7	27.7	21.2	5.4	1.6	7.6

Table 4.The results for variance analysis in CVLT

variable	SS	Df	MS	F	Sig
Learning slope	8744.3	1	8744.9	21.28	0.0001
Words list B	133.5	1	133.5	80.26	0.0001
Immediate free recall	738.1	1	738.1	110.8	0.0001
Immediate cued recall	774.5	1	774.5	100.58	0.0001
Short Delay free recall	787.7	1	787.7	106.5	0.0001
Short delay cued recall	803.2	1	8.03.2	123.6	0.0001
Irrelevant words in free recall	0.06	1	0.06	0.006	N.S
Irrelevant words in cued recall	0.26	1	0.26	0.15	N.S
Whole irrelevant words	0.46	1	0.46	0.04	N.S
Repeated words	3.67	1	2.67	0.52	N.S
Long Delay recognition	191.3	1	191.3	15.3	0.0001
Positive mendacious in long delay recognition	455.34	1	455.34	11.58	0.0001

Table 5. Shows Welcinz lambda and variance analysis of one direction memorial components

Variable	Welcinz lambda	Emancipation degree (I)	Emancipation degree (II)	F	meaningful
Information	0.39	1	88	134.1	0.001
Logical I memory	0.32	1	88	185.1	0.001
Story B Logical memory I	0.32	1	88	182	0.001
faces I recognition	0.39	1	88	138.8	0.001
Visual reproduction I	0.44	1	88	110.5	0.001
Mental control	0.73	1	88	32.1	0.001
Digit span	0.45	1	88	106.5	0.001
Logical memoryII	0.27	1	88	234.4	0.001
Story B Logical memory II	0.25	1	88	253.7	0.001
Logical memory cued recognition	0.42	1	88	122.1	0.001
Faces II	0.30	1	88	203.6	0.001
Visual reproductionII	0.47	1	88	98.8	0.001
MMSE	0.27	1	88	238.1	0.001

Table 6. Welcinz lambda and one direction variance analysis and the level of meaningfulness in CVLT

variable	Welcinz lambda	Emancipation degree (I)	Emancipation degree (II)	F	meaningfulness
Learning slope	0.72	1	57	21.9	0.0001
Words list B	0.40	1	57	83.7	0.0001
Immediate free recall	0.34	1	57	110.8	0.0001
Immediate cued recall	0.36	1	57	100.58	0.0001
Short Delay free recall	0.34	1	57	107.59	0.0001
Short delay cued recall	0.31	1	57	123.16	N.S
Irrelevant words in free recall	1	1	57	0.009	N.S
Irrelevant words in cued recall	0.99	1	57	0.15	N.S
Whole irrelevant words	0.999	1	57	0.03	N.S
Repeated words	0.99	1	57	0.52	0.0001
Long Delay recognition	0.79	1	57	15.2	0.0001
Positive mendacious in long delay recognition	0.83	1	57	21.9	0.0001

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The Effects of Low-Dose Lithium Carbonate on the Spermatogenic Parameter in the adults Male Wistar Rats

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Abstract: Lithium and its salt have been frequently used in the treatment of neurodegenerative disorders. Many studies explain side effects of treatment with high-dose of lithium in testes but effect of low-dose on testes was ambiguous. This study examined the adverse effect of low-dose of lithium carbonate on testicular tissue and its effects on the three hormones of LH, FSH and testosterone. Wistar adult male rats with mean weight of 200-250 g were divided into four groups, each group with 6 rats.Wistar adult male rats were treated for 48 days using three doses of10, 20 and 30 mg/kg BW by gavage and control group treated with sterile distilled water (solvent of lithium carbonate). Twenty four (24) hours after the last gavage, blood sample was drawn from the heart and the two testicles were removed from rats' body. Once the tissue was fixed with Bouin's fixative solution and the section slides were stained with hematoxylin and eosin. Hormones were measured using a kit. The results showed that, compared to the control group, taking lithium carbonate in a 48-day period at all three doses resulted in a significant difference in the number of spermatogonia, primary spermatocytes, spermatid and spermatozoa cells and in a specific dose-dependent decrease. Lithium carbonate could reduce the concentration of LH, FSH and testosterone hormones in a dose-dependent manner. Based on the results of this study, it can be concluded that through considerably decreasing testosterone production and preventing normal development of spermatogenic cells, lithium carbonate causes spermatogenic dysfunction through reducing the level of LH and FSH hormones that adjust this process.

1. Introduction

The use of lithium and its salts to treat mania – depression was first introduced in Australia in 1949. Lithium chloride was registered as a drug for treatment of mania – depression in 1960s.Lithium chloride was commonly used at 900-1200 mg/day doses in Europe and the United States up to 1970. In the European Union classification, lithium carbonate is classified in category 3. According European Union classification, lithium carbonate is identified as R62 that can affect fertility. Long-term use of lithium at therapeutic doses may cause complications such as neurotoxicity (Chen et al., 2004) and hypothyroidism (Henry 2002). The use of lithium and its salts in the high-dose (therapeutic dose) may cause complications such as infertility, nephrogenic diabetes ,nephrotoxicity and damage to urethra cells (Markowitz et al., 2000; Li et al.,2006;Nciri et al., 2008) but few studies available about side effects of low-dose of lithium carbonate on the testes.

Normal function of the reproductive system depends on the harmonious regulatory activities of hypothalamus and anterior pituitary gonadotropin cells and subsequent secretion of steroids and essential molecules in the testicles known as hypothalamic–pituitary–gonadal axis (Cevik et al., 2004). Many studies have proved the reciprocal relationship between pituitary and testicular function and believe that changes in testosterone level and testicular histology during the 48-day of spermatogenesis in rats is associated with the plasma level of LH and FSH (Lee et al., 1975 ; Gholami et al., 2012). Secretion of gonadotropin-releasing hormone (GnRH) from hypothalamus causes an increase in transcription of genes encoding α and β subunits related to LH and FSH hormones and an increase in their secretion from the pituitary (Freeman et al., 2000). The presence of the two LH and FSH gonadotropins in combination is essential for activation of spermatogenesis process as maturation of germinal cells in seminiferous tubules in the presence of FSH and production of testosterone in Leydig cells occur under the influence of LH hormone (Rago, 2008).

Concurrent activity LH and FSH induces the secretion of testosterone and necessary trophic factors on Lydia and Sertoli cells. Therefore, maintaining the normal concentration of the LH and

FSH for initiation of the complete spermatogenesis is necessary (Shalet, 2009). The long term use of high-dose lithium and its salts decrease the level of LH, FSH, testosterone and prolactin hormones. lithium and its salts in high-dose also prevent the production of testosterone through reducing the steroid-producing activity of testicles by decreasing the production of key steroidogenic enzymes delta 5-3 β hydroxysteroid dehydrogenase and 17-betahydroxysteroid dehydroxygenase(Lee et al., 1999; Shupnik and Weck 1998; Sharpe et al.,2003; Stanton et al., 1992). Another study showed a decrease in the level of LH, FSH and testosterone of Wistar rats treated with lithium chloride that returned to normal under a prolactin-compensating treatment.

Disorders in proliferation and differentiation of male germinal cells and changes in spermatogenesis regulatory mechanisms may occur in any stage of the process. (Lithium in the high-dose can reduce the plasma level of testosterone and gonadotropin hormones through both direct and indirect mechanisms. The direct mechanism involves developing germinal cells. The indirect mechanism involves decreasing activities of hypothalamic–pituitary–gonadal axis, and it can also disturb the germinal cell development by influencing spermatogenesis-supporting somatic cells in the testicles (Zarrindast et al., 2006). Lithium carbonate is used in different doses depending on the intensity of the mania-depression disease (Rybakowski, 2012). Low-dose of lithium carbonate used for treatment of neurodegenerative disease (Marmol, 2008). Low-doses of lithium carbonate have been studied in the kidney and heart (Evan, 1972; Nciri, 2008; Vijaimohan, 2010). Side effects of low-dose of lithium carbonate on the testes are known. In this study, the effect of three doses of 10, 20 and 30 mg/kgBw/day of lithium carbonateat histological and cellular modifications of testes and also on the level of LH, FSH and testosterone hormones was examined.

2. Material and Methods

All experiments were performed in accordance with principles of laboratory animal care. In this study, Wistar adult male rats with mean weight of 200-250 g and 7-8 weeks old (provided by Pasteur Institute of Tehran, Iran) were treated for 48 days. The rats were kept and treated at 23-25°C and 60-75% relative humidity for 48 days under 12h/12h dark/light cycles. All the rats received the same potable water and the standard rat feed pellet (supplied by Pars Animal Feed).Every effort was made to minimize the number of animals used and their suffering.

The study groups and preparation of lithium carbonate solution: The rats were randomly divided into 4 groups, each with 6 rats. Group 1 was determined as the control groups and groups 2, 3 and 4, as the experimental groups, received lithium carbonate at doses of 10, 20 and 30 mg/kgBw/day, respectively. In each gavage, 0.5 ml of lithium carbonate solution which was prepared by dissolving the specific amount of white powder of lithium carbonate (Tehran Darou Co. with serial no. 8808) for each group with sterile distilled water was given to the rats.

Blood sampling: rats were anesthetized intraperitoneally by ketamine HCl (80 mg/kg) and xylazine (10 mg/kg) (Pharmacia and Upiohn, Erlangen, Germany) (Gholami et al., 2012) 24 hours after termination of treatment in accordance with the protocols approved by the Lorestan University of Medical Science Animal Care and use committee. Blood sample was drawn from the heart and the testicular tissue was removed immediately.

Hormonal measurement: Blood sample of 4-5 ml was drawn from each rat and collected in glass tubes specific for centrifuges. The blood samples were maintained in the laboratory setting for 1 hour to form clots and then centrifuged for 2 min at 500 rpm. In this way, serum was separated from the blood and surfaced the clot. The serum was removed using a 1000 sampler and transmitted to smaller tubes. These tubes were kept in a freezer at -20°C in order to be used in ELISA kits for measurement of LH, FSH and testosterone hormones (Ghosh et al., 1991a; Ghosh et al., 1990b). Finally, optical absorption of the prepared solutions was recorded according to the kit guidelines at wavelength of 450 nm and concentration of each hormone was recorded in ng/ml.

Preparation of tissue sections: The removed testicular tissue was placed in Bouin's fixative solution for 24 hours after being weighed. Then, paraffin blocks and serial sections of the tissue were prepared and the slides were stained with hematoxylin and eosin.

Histological examination: The testicular tissue sections were observed and examined using an ordinary optical microscope (Hm-Lux3, Germany) with 10X, 40X and 100X magnification and the spermatogonia, primary spermatocytes, spermatozoa, Sertoli and Leydig cells were counted in each microscopic field in 10 seminiferous tubules which had a round shape and an appropriate cross-section. All sections selected for cell counting and histological analysis are located in the similar Stage. Morphological changes of the seminiferous tubules and germinal epithelium of the groups were compared with each other. In this study, besides counting cells and comparing mean germinal cell and testicular somatic cell count, the score count method

or Johnson's model was used for the level of spermatogenesis which is the common method for histopathological measurements (Johnson et al., 1980).

Statistical analysis of the results: The results obtained from the control and the experimental groups were analyzed in the form of mean ± SD (standard deviation) values and significant differences among groups were determined using one-way ANOVA and Duncan post hoc test through SPSS software.

3. Results

The relative weight of the testicular tissue had a direct relationship with spermatogenetic function and germinal cell count and is calculated using the following equation: Relative weight of testicular tissue = (mean weight of testes)/body weight × 100

This index was reduced in groups receiving lithium carbonate in that it reached 0.24936 ± 0.021927 g in the group receiving 30 mg/kgBw/day of lithium carbonate while it reached 0.54428 ± 0.02791 in the control group. This difference is Significant ($p<0.001$). This index reached 0.32121 ± 0.13154 in the group receiving 20 mg/kgBw/day of lithium carbonate, which is significantly different from that of the control group ($p<0.01$). Likewise, this index reached 0.42535 ± 0.04978 in the group receiving 10 mg/kgBw/day lithium carbonate, which has a Significant difference with that of the control group ($p<0.05$) (Figure 1).
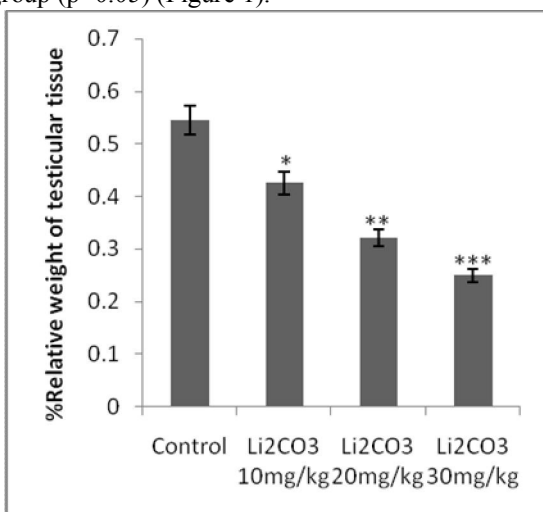
Figure 1: Mean ± SD values for relative weight of the testicular tissue (%). Compared to the control group, the testicular tissue weight in the experimental groups decreased significantly that indicates the destructive effect of lithium on testicular cell density. ***$p<0.001$, **$p<0.01$, *$p<0.05$

Analysis of microscopic images: Johnson's score count: In the method used in this study for histological examination, seminiferous tubules with complete spermatogenesis which were full of mature spermatids and sperms with regular accumulation received 10 score based on the score count for the spermatogenetic level.

According to the score count, density of germinal and somatic cells in seminiferous tubules was based for the scoring and is shown in Table 1. On the basis of the results, the control group scored 10, and the groups receiving 10, 20, and 30 mg/kgBw/day of lithium carbonate scored 8, 4.9 and 3.7, respectively.

Table 1: Johnson's scoring system for the level of spermatogenesis

Groups	Score
Control	**10**
10 mg/kgBW Lithium carbonate	**8**
20 mg/kgBW Lithium carbonate	**4.9**
30 mg/kgBW Lithium carbonate	**3.7**

Cell count and comparisons among control and experimental groups: Through considerable histological changes in testicles, lithium caused a decrease in the number of germ and somatic cells in seminiferous epithelium, an increase in interstitial space, and an increase in the number of cells being destroyed. The decreased number of cell count is shown in the table 2.

The number of spermatogonia near the basal membrane was 86 ± 4.42719 ($p<0.01$), 75.16 ± 4.44597 ($p<0.05$) and 69.33 ± 6.40833 ($p<0.001$) in groups receiving 10, 20 and 30 mg/kgBw/day of lithium carbonate, respectively, which is significantly different from that of the control group with the count of 119.7 ± 11.9443. Primary spermatocytes in seminiferous epithelium were 295.8 ± 22.89469 ($p<0.01$), 265 ± 15.49193 ($p<0.05$) and 168.5 ± 3.67423 ($p<0.001$) in groups receiving 10, 20 and 30 mg/kgBw/day of lithium carbonate, respectively while that was 357 ± 36.33180 in the control group. Furthermore, the number of spermatids was 108.8 ± 7.5476 ($p<0.01$), 98.5 ± 5.75326 ($p<0.001$) and 74.7 ± 6.9761 ($p<0.001$) in groups receiving 10, 20 and 30 mg/kgBw/day of lithium carbonate, respectively while that was significantly different (1173 ± 12.3288) in the compared control group (Figure 2).

The number of spermatozoids in groups receiving 10, 20 and 30 mg/kgBw/day of lithium carbonate were 1087.16 ± 294.307 ($p<0.01$), 1030.33 ± 70.5256 ($p<0.05$) and 772 ± 61231 ($p<0.001$), respectively, which was significantly different in the compared control group (Figure 3).

Table 2: Mean cell count of the tissue sections: germinal and Sertoli cells per seminiferous tubule and Leydig cells per circumference of seminiferous tubule are explained in the control and experimental groups in the form of mean ± SD. Groups defined with; A: control, B: 10 mg/kgBW Lithium carbonate, C: 20 mg/kgBW Lithium carbonate, D: 30 mg/kgBW Lithium carbonate.

Groups	Spermatogonia (Count± SD)	Primary spermatocyte (Count± SD)	spermatid (Count± SD)	Spermatozoa (Count± SD)	Sertoli (Count± SD)	Leydig (Count±SD)
A	119.6667±11.9443	357.000±36.33180	173.0000±12.3288	2550.5000±123.0670	11.5000±1.04881	8.66±2.42212
B	86.0000±4.42719	295.8333±22.89469	108.8333±7.5476	1087.1667±294.307	10.5000±0.8366	6.33±1.63299
C	75.1667±4.44597	265.0000±15.49193	98.5000±5.75326	1030.3300±70.5256	10.000±1.0236	6.05±0.30767
D	69.3333±6.40833	168.5000±3.67423	74.667±6.9761	772.+-61231	9.3±1.0366	5.47±1.75119

Table 3: Mean values for the level of LH, FSH and testosterone hormones in the control and the experimental groups (Mean ± SD). Groups defined with; A: control, B: 10 mg/kgBW Lithium carbonate, C: 20 mg/kgBW Lithium carbonate, D: 30 mg/kgBW Lithium carbonate.

Groups	Testosterone (ng/ml) ± SD	LH (ng/ml)± SD	FSH (ng/ml)± SD
A	6.200±0.16106	1.4886±0.07137	9.2461±0.16106
B	3.1744±0.33806	0.9089±0.07851	8.0094±0.33806
C	1.6704±0.0618	0.71640±0.07806	5.0633±0.06188
D	1.1839±0.16553	0.5844±0.03184	4.3556±0.01655
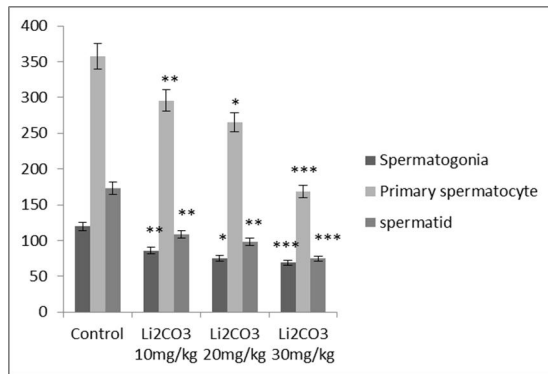
Figure 2: The results of changes in number of Spermatogonia and Primary spermatocyte and Spermatid cells in each seminiferous tubule treated with 10 mg/kg BW, 20 mg/kg BW and 30mg/kg BW doses. Data, mean ± SD, obtained from three various tests.***p<0.001, **p<0.01, *p<0.05.
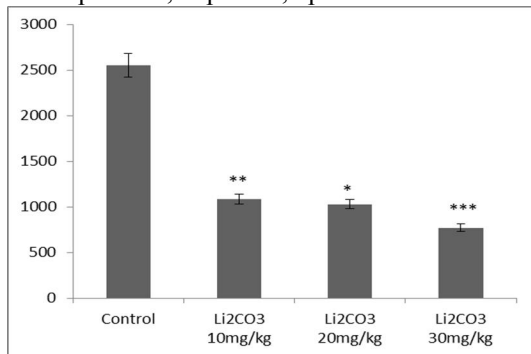
Figure 3: The results of changes in number of Spermatozoa cells in each seminiferous tubule under the treatment with 10 mg/kg BW, 20 mg/kg BW and 30mg/kg BW doses. Data, mean ± SD, obtained from three various tests. ***p<0.001, **p<0.01, *p<0.05

Comparison between groups (10, 20 and 30 mg/kg BW of lithium carbonate) and control showed that the number of Leydig and Sertoli cells were significant. The number of Sertoli cells was 10.5±0.8366 (p<0.01), 10±1.0236 (p<0.05) and 9.3±1.0366 (p<0.001) in groups receiving 10, 20 and 30 mg/kg BW of lithium carbonate, respectively while that was 11.5±1.04881 in the control group. The number of Leydig cells was reduced to 6.33±1.63299 (p<0.01), 6.05±0.30767 (p<0.01) and 5.47±1.75119 (p<0.05) in groups receiving 10, 20 and 30 mg/kg BW of lithium carbonate, respectively as compared with that in the control group (8.66±2.42212) (Figure 4).
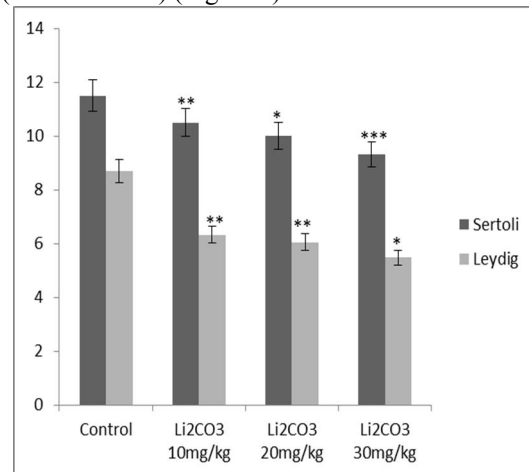
Figur4: The results of changes in number of Sertoli and Leydig cells per seminiferous tubule treated with 10 mg/kg BW, 20 mg/kg BW and 30mg/kg BW doses. Data, mean ± SD obtained from three different tests. ***p<0.001, **p<0.01, *p<0.05

Histological changes of lithium carbonate on the number of cells can be seen in Figure 5.In the section B, treated with 10, spermatid and sperm cells are visible but are not seen in section C and D, treated with 20 and 30 mg/kg, respectively. Basement membrane arranged regularly and spermatogonia stem cells, in all groups, be seen on the basement membrane regularly.
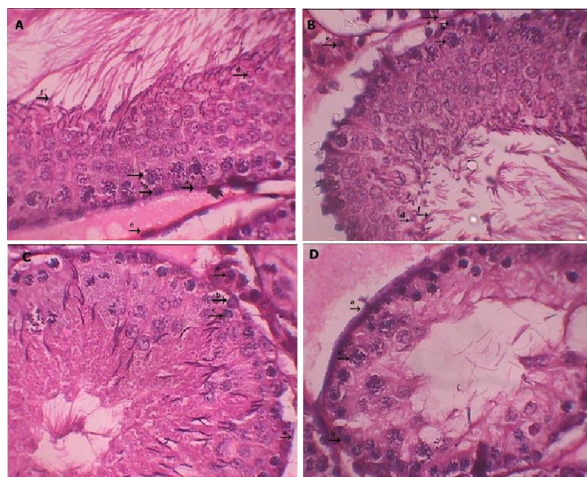
Figure 5: hematoxylin and eosin staining of testes from rats treated with lithium carbonate at dose 10(B), 20(C) and 30(D) mg/kgBW revealed loss of spermatid and cessation of spermatogenesis. Section A related to Control group. a: basement membrane, b: spermatogonia cell, c: primary spermatocyte cell, d: spermatid, e: Leydig cell, f: spermatozoa.

Results of the hormonal measurement: The one-way ANOVA analysis of the hormonal measurement results showed that, compared to the control group, mean ± SD concentration of LH, FSH and testosterone hormones in groups receiving lithium carbonate reduced significantly (Table3).

The lowest level of LH belongs to the group receiving 30 mg/kg BW lithium carbonate (0.584±0.03184 ng/mg, $p<0.001$).Mean ± SD values of LH hormone (ng/ml) in the groups receiving 20 and 10 mg/kg BW of lithium carbonate and the control groups were 0.716±0.07806 ($p<0.05$), 0.908±0.07851 ($p<0.01$) and 1.49±0.07137 ng/ml, respectively (Figure 6).

With regards to FSH, it had such regular decrease in the same order as for LH. So, the lowest rate was recorded for the group receiving 30 mg/kg BW of lithium carbonate as 4.355±0.01655ng/ml ($p<0.001$).Mean ± SD values of FSH hormone (ng/ml) in the groups receiving 20 and 10 mg/kg BW of lithium carbonate were 5.063±0.06188 ($p<0.05$), 8.009±0.33806 ($p<0.01$). This reduction was

significant as compared with the control group with 9.246±0.16106 ng/ml of FSH (Figure 7).
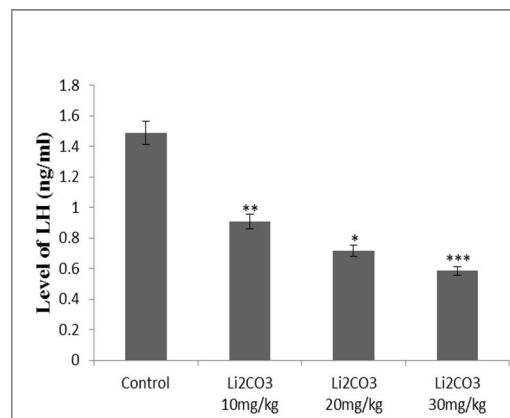
Figure 6: Compared to the control group, Mean ± SD values of LH hormone (ng/ml) in the experimental groups had a significant dose-dependent decrease that showed the reducing effect of lithium on hypothalamus- pituitary –gonad axis.***$p<0.001$, **$p<0.01$, *$p<0.05$
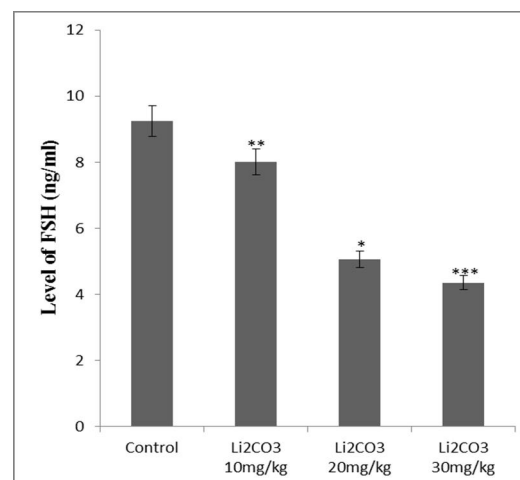
Figure 7: Compared to the control group, Mean ± SD values of FSH hormone (ng/ml) in the experimental groups had a significant dose-dependent decrease that showed the reducing effect of lithium on hypothalamic neurons and pituitary and its indirect effect on gonad.***$p<0.001$, **$p<0.01$, *$p<0.05$

Testosterone level was reduced significantly in the experimental groups as compared with that in the control group. It was 1.183±0.16553 ($p<0.001$), 1.67±0.0618 ($p<0.05$) and 3.17±0.33806 ($p<0.01$) ng/ml in the groups receiving 30, 20, and 10 mg/kg BW of lithium carbonate, and 6.2±0.16106 ng/ml in the control group (Figure 8).
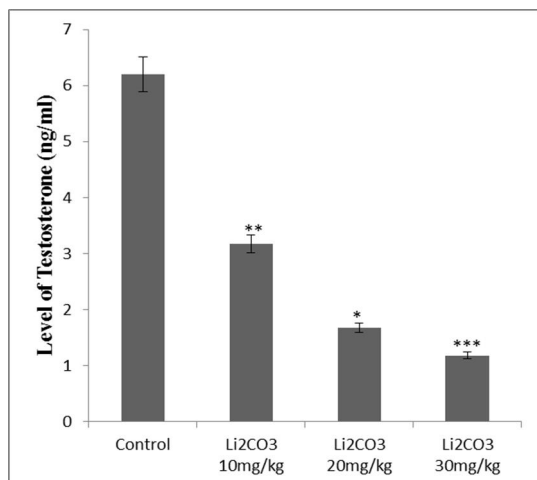
Figure 8: Compared to the control group, Mean ± SD values of testosterone hormone (ng/ml) in the experimental groups had a significant dose-dependent decrease that showed the reducing effect of lithium on hypothalamus- pituitary –gonad axis.***$p<0.001$, **$p<0.01$, *$p<0.05$

Discussions

Long-term treatment with high-dose lithium is associated with the incidence of toxic side effects in many tissues including the reproductive system. A study on lithium carbonate toxicity in rat reproductive system, doses at 500, 800 and 1100 mg/kg of diet were used for 90 days and the obtained results showed a considerable reduction of testicular weight, changes of cell destruction in seminiferous tubules, absence of spermatozoa cells in testicles, epididymis and Vas deferens and lack of secretions in the lumen of the seminal vesicles and prostate. Therefore, hypospermatogenesis and formation of abnormal spermatozoa along with reduced level of testosterone are among the side effects of using high doses of lithium (Zarrindast et al.,2006). Another study examined the weight loss of testicular tissue and other sexual organs, which is largely a representative of dysfunction and extensive changes in the number of developing germinal cells in seminiferous tubules and epididymis (Romera et al., 2002).

A 21-day treatment with lithium carbonate at 35 mg/kgBW dose in an electromicroscopic study showed testicular atrophy, loss of spermatogenic cell adhesion and formation of multiple intercellular spaces in germinal epithelium and also showed that cells in the early development of germinal lineage became inflamed and disintegrated with outward expanding of the nuclear outer membrane. There were round spermatid cells with transformed and abnormal acrosomes and reduced sub-acrosomal space in the above study, and also a large number of destroyed mature spermatids scattered in the sections (Zarnescu and Zamfirescu2006).

The mechanism through lithium controls mania symptoms is mostly attributed to inhibition of Gsk3-β enzyme in WNT signaling pathway. Once the WNT signaling pathway is activated in neurons and the enzyme is inhibited, breakdown of β-catenine molecules will be prevented. The accumulation of β-catenine in cells results in its entrance into the nucleus and involvement in the mechanisms regulating expression of genes (Gould et al., 2007). For instance, neuroprotective effects of lithium are due to the increased expression of bcl-2 (cytoprotective protein) and cause an increase in neural viability and function (N-acetylaspar) in grey matter (Xu et al., 2003). In addition to this mechanism, proximity of lithium ionic radius to those of sodium and potassium and their competition for passing through the plasma membrane cause changes in neuronal membrane potential and disorders in cellular signaling mechanisms such as protein kinaseC, CAMP and CGMP, and prevention of these mediator molecules (Thakur et al.,2003). This ionic competition also prevents the activity of the enzymes such as DNA polymerase and topoisomerase I and II which are activated by cationic cofactors (Ncri et al., 2009). As the synthesis and secretion of LH, FSH and GnRH hormones are possible through this mechanism, lithium can considerably reduce the concentration of these hormones. Lithium at high concentrations and plasma level higher than 2.5 mM causes life-threatening side effects and at plasma level of 6-9.6 mM causes acute toxicity (Suwalky et al., 2007). These concentrations lead to excessive expression of WNT signaling pathway in cells including male and female germinal cells and disturb their development and vital functions. In ovarian follicular cells, lithium inhibits estrogen functioning by deactivating estrogen receptors in their membrane (Medunjanin et al., 2005). In another way, lithium causes an excessive expression of WNT/CTNNB1 signaling pathway in Sertoli and Leydig cells. The accumulated stable form of the product of this pathway modifies the gene expression, stops the cell cycle in G2/M, and induces apoptosis genetically or by inhibiting the destruction. A study showed that igniting this pathway in Sertoli and Leydig cells culture prevents the expression of steroidogenic acute regulatory protein (STAR) and reduces capability of these two types of cells for supporting spermatogenesis and thorough functioning through induction of apoptosis (Boyer et al.,2008). Lithium is influential in a way other than direct targeting testicular tissue cells and modification of intracellular signaling pathways. Lithium affects the testicular somatic cells through reducing the activity of

hypothalamic–pituitary–gonadal axis. This axis stimulates secretion of LH and FSH through synthesizing GNRH hormone which is transmitted from the hypophyseal portal system to the anterior pituitary. These two glycoproteins activate the cyclic AMP (adenosine monophosphate) secondary messenger system in testicular somatic cells and stimulate all their functions including secretion of testosterone. Reduced level of these two glycoproteins in blood results in the reduction of secretory activities of spermatogenesis-supporting cells (Sertoli) and testosterone-producing cells (Leydig) (Rago 2008; Ghosh et al., 1991).

Based on the results of the present study, it can be concluded that through significant decrease in testosterone production and preventing normal development of spermatogenic cells, lithium carbonate causes spermatogenic dysfunction through reducing the level of LH and FSH hormones that adjust this process. Hypospermatogenesis and production of abnormal spermatozoa in treatment with lithium are attributed to the significant reduction of plasma level of testosterone and capability of this ion to pass through blood-testis barrier. Lithium reduces the production of trophic factors and testosterone which are directly involved in protection, differentiation and survival of germinal cells, through either disturbing the function of Sertoli and Leydig cells or induction of apoptosis in these cells. Furthermore, lithium disturbs the natural development and differentiation of spermatogenetic cells through affecting the germinal lineage cells directly. Low-dose of lithium carbonate similar to high-dose may causes side effects at testes such as reduce level of LH, FSH and testosterone, cessation of spermatogenesis and abnormal histological changes in the testes.

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An Adaptive Stabilizer Based on Static Synchronous Series Compensator

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Abstract: Low frequency oscillations (LFO) are mainly occurred in power systems due to insufficient damping torque. In order to damp out LFO, a supplementary stabilizing signal is required to be injected into power system. In this paper the application of Static Synchronous Series Compensator (SSSC) to damp out the LFO is investigated. A supplementary stabilizer based on SSSC is assumed. An adaptive method is used to design the proposed stabilizer. The nonlinear time domain simulation results show the ability of the method in damping power system oscillations. [Shoorangiz Shams Shamsabad Farahani, Mehdi Nikzad, Mohammad Bigdeli Tabar, Hossein Tourang, Behrang Yousefpour. **An Adaptive Stabilizer Based on Static Synchronous Series Compensator.** *Life Sci J* 2012;9(4):4368-4372]. (ISSN: 1097-8135). http://www.lifesciencesite.com. 656

1. Introduction

The ability of synchronous machines of an interconnected power system to remain synchronism after being subjected to a small disturbance is known as small signal stability that is subclass of phase angle related instability problem. It depends on the ability to maintain equilibrium between electromagnetic and mechanical torques of each synchronous machine connected to power system. The change in electromagnetic torque of synchronous machine following a perturbation or disturbance can be resolved into two components: (i) a synchronizing torque component in phase with rotor angle deviation and (ii) a damping torque component in phase with speed deviation. Lack of sufficient synchronizing torque results in non-oscillatory instability; where lack of damping torque results in low frequency oscillations.

Low frequency oscillations are generator rotor angle oscillations having a frequency between 0.1 - 2.0 Hz and are classified based on the source of the oscillation. The root cause of electrical power oscillations are the unbalance between power demand and available power at a period of time. In the earliest era of power system development, the power oscillations are almost non observable because generators are closely connected to loads, but nowadays, large demand of power to the farthest end of the system that forces to transmit huge power through a long transmission line, which results an increasing power oscillations.

The phenomenon involves mechanical oscillation of the rotor phase angle with respective to a rotating frame. Increasing and decreasing phase angle with a low frequency will be reflected in power transferred from a synchronous machine as phase angle is strong coupled to power transferred. The LFO can be classified as local and inter-area mode.

Local modes are associated with the swinging of units at a generating station with respect to the rest of the power system. Oscillations occurred only to the small part of the power system. Typically, the frequency range is 1-2 Hz.

Inter-area modes are associated with swinging of many machines in one part of the system against machines in other parts. It generally occurs in weak interconnected power systems through long tie lines. Typically frequency range is 0.1-1 Hz.

With regard to the proposed LFO, many methods have been investigated to damp out such oscillations in power systems. Recently, with development of flexible AC transmission system (FACTS) devices, these devices have been widely used to damp out the oscillations [1-5].With the practical applications of converter-based FACTS controllers such as the static synchronous compensator (STATCOM), static synchronous series compensator (SSSC) and unified power- flow controller (UPFC), modeling and analysis of these FACTS controllers in power-system operation and control is of great interest. Power-flow calculations are fundamental to the operation, planning and control of power systems. In recent years, significant work has been done in the modeling of the FACTS controllers in power flow and optimal-power-flow studies [6-11].

SSSC is a voltage-sourced converter-based series compensator and was proposed within the concept of using converter-based technology uniformly for shunt and series compensation, as well as for transmission angle control. It has been successfully applied in power systems.

In this paper, SSSC is used to increase power system stability. A supplementary stabilizer is equipped based on SSSC. The proposed stabilizer is designed by using adaptive control method.

2. Test system

Figure 1 shows a two area system installed with SSSC. Bus 4 is aggregation of a large number of generators and it can be modeled as an infinite bus. The SSSC is installed in one of two parallel lines. The system data are given in [12].
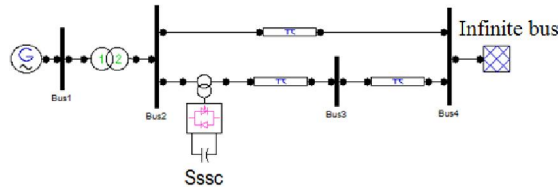
Figure 1: power system installed with SSSC

3. Static Synchronous Series Compensator (SSSC)

SSSC is one of the most important FACTS devices. It is installed in series with transmission line. This device has a voltage source converter serially connected to a transmission line through a transformer. It is necessary an energy source to provide a continuous voltage through a condenser and to compensate the losses of the VSC. A SSSC is able to exchange active and reactive power with the transmission system. But if our only aim is to balance the reactive power, the energy source could be quite small. The injected voltage can be controlled in phase and magnitude if we have an energy source that is big enough for the purpose. With reactive power compensation only the voltage is controllable, because the voltage vector forms 90º degrees with the line intensity. In this case the serial injected voltage can delay or advanced the line current. This means that the SSSC can be uniformly controlled in any value, in the VSC working slot [13].

The Static Synchronous Series Compensator (SSSC) uses a VSC interfaced in series to a transmission line, as shown in the Figure 2. Again, the active power exchanged with the line has to be maintained at zero hence, in steady state operation, SSSC is a functional equivalent of an infinitely variable series connected capacitor. The SSSC offers fast control and it is inherently neutral to sub-synchronous resonance [13].
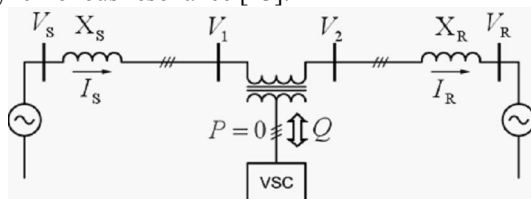
Figure 2: SSSC - A VSC interfaced in series to a transmission line

As mentioned, Static Synchronous Series Compensator (SSSC) is placed in the group of series connected FACTS devices. As shown in Figure 3, SSSC consists of a voltage source inverter connected in series through a coupling transformer to the transmission line. A source of energy is required for providing and maintaining the DC voltage across the DC capacitor and compensation of SSSC losses. Figure 4 shows the model of SSSC which consists of a series connected voltage source in series with impedance. This impedance represents the impedance of coupling transformer.
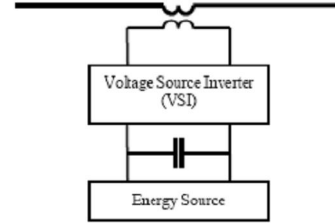
Figure 3: basic configuration of SSSC
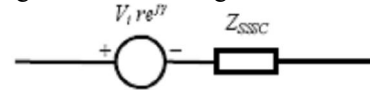
Figure 4: equivalent circuit of SSSC

The SSSC when operated with an appropriate DC supply (an energy source and/or sink, or suitable energy storage) can inject a component of voltage in anti-phase with the voltage developed across the line resistance, to counteract the effect of the resistive voltage drop on the power transmission.

4. Model Reference Adaptive System

The general idea behind Model Reference Adaptive Control (MRAC) or Model Reference Adaptive System (MRAS) is to create a closed loop controller with parameters that can be updated to change the response of the system. The output of the system is compared to a desired response from a reference model. The control parameters are update based on this error. The goal is for the parameters to converge to ideal values that cause the plant response to match the response of the reference model. Figure 5 shows the general diagram of MRAS [14].
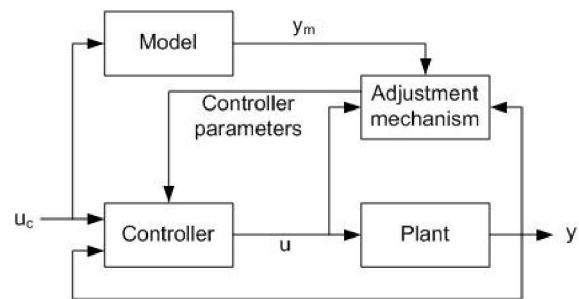
Figure 5: General diagram of MRAS

The idea behind MRAS is to create a closed loop controller with parameters that can be updated to change the response of the system to match a desired model. There are many different methods for designing such a controller. This tutorial will cover design using the MIT rule in continuous time. When designing an MRAS using the MIT rule, the designer chooses: the reference model, the controller structure and the tuning gains for the adjustment mechanism. MRAS begins by defining the tracking error, *e*. This is simply the difference between the plant output and the reference model output [14]:

$$e = y_{plant} - y_{model} \qquad (1)$$

From this error a cost function of *theta* ($J(\Theta)$) can be formed. *J* is given as a function of theta, with theta being the parameter that will be adapted inside the controller. The choice of this cost function will later determine how the parameters are updated. Below, a typical cost function is displayed.

$$J(\theta) = \frac{1}{2} e^2(\theta) \qquad (2)$$

To find out how to update the parameter *theta*, an equation needs to be formed for the change in *theta*. If the goal is to minimize this cost related to the error, it is sensible to move in the direction of the negative gradient of *J*. This change in *J* is assumed to be proportional to the change in *theta*. Thus, the derivative of *theta* is equal to the negative change in *J*. The result for the cost function chosen above is:

$$\frac{d\theta}{dt} = -\gamma \frac{\delta J}{\delta \theta} = -\gamma e \frac{\delta e}{\delta \theta} \qquad (3)$$

This relationship between the change in theta and the cost function is known as the MIT rule. The MIT rule is central to adaptive nature of the controller. Note the term pointed out in the equation above labeled "sensitivity derivative". This term is the partial derivative of the error with respect to *theta*. This determines how the parameter *theta* will be updated. A controller may contain several different parameters that require updating. Some may be acting n the input. Others may be acting on the output. The sensitivity derivative would need to be calculated for each of these parameters. The choice above leads to all of the sensitivity derivatives being multiplied by the error. Another example is shown below to contrast the effect of the choice of cost function:

$$J(\theta) = |e(\theta)|$$

$$\frac{d\theta}{dt} = -\gamma \frac{\delta e}{\delta \theta_c} sign(e)$$

where $\qquad\qquad\qquad (4)$

$$sign(e) = \begin{cases} 1, & e > 0 \\ 0 & e = 0 \\ -1 & e < 0 \end{cases}$$

To see how the MIT rule can be used to form an adaptive controller, consider a system with an adaptive feed word gain. The block diagram is given as Figure 6. The plant model can be given as (5).
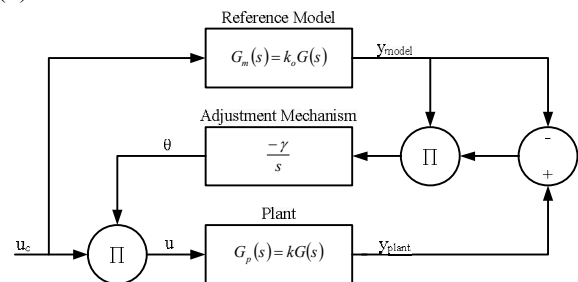
Figure 6: Adaptive feed forward gain

$$\frac{Y(s)}{U(s)} = kG(s) \qquad (5)$$

The constant *k* for this plant is unknown. However, a reference model can be formed with a desired value of *k*, and through adaptation of a feed forward gain, the response of the plant can be made to match this model. The reference model is therefore chosen as the plant multiplied by a desired constant *ko*:

$$\frac{Y(s)}{U_c(s)} = k_o G(s) \qquad (6)$$

The same cost function as above is chosen and the derivative is shown:

$$J(\theta) = \frac{1}{2} e^2(\theta) \rightarrow \frac{d\theta}{dt} = -\gamma e \frac{\delta e}{\delta \theta} \qquad (7)$$

The error is then restated in terms of the transfer functions multiplied by their inputs.

$$e = y - y_m = kGU - G_m U_c$$
$$= kG\theta U_c - k_o G U_c \qquad (8)$$

As can be seen, this expression for the error contains the parameter *theta* which is to be updated. To determine the update rule, the sensitivity derivative is calculated and restated in terms of the model output:

$$\frac{\delta e}{\delta \theta} = kGU_c = \frac{k}{k_o} y_m \tag{9}$$

Finally, the MIT rule is applied to give an expression for updating *theta*. The constants k and ko are combined into *gamma*.

$$\frac{d\theta}{dt} = \gamma' \frac{k}{k_o} y_m e = -\gamma y_m e \tag{10}$$

The block diagram for this system is the same as the diagram given in Figure 6. To tune this system, the values of ko and *gamma* can be varied [14].

5. Stabilizer design

5.1. Adaptive stabilizer

To get a suitable performance and tracking characteristics, a reference model should be adopted for MRAS system. In this paper, since the SSSC supplementary stabilizer is a regulatory controller, thus, the reference model should have a regulatory nature. In this regard, the reference model is defined as below;

$$y = \frac{0.05s(s + 2)}{s^2 + 2s + 2} u \tag{11}$$

5.2. Conventional stabilizer

In order to comparison, a conventional stabilizer is designed based on SSSC. The transfer function model of a conventional stabilizer is as (12). This model contains two lead–lag compensators with time constants, T_1–T_4 and an additional gain K_{DC}. The parameters of the proposed stabilizer are tuned by using GA. The detailed procedure of stabilizer design by using optimization methods can be found in [15]. The proposed stabilizer is obtained as table 1.

$$U_{out} = K_{DC} \frac{ST_W}{1 + ST_W} \frac{1 + ST_1}{1 + ST_2} \frac{1 + ST_3}{1 + ST_4} \Delta\omega \tag{12}$$

Table 1: Optimal parameters of conventional stabilizer

Parameter	K_{DC}	T_1	T_2	T_3	T_4
Optimal value	1.037	0.4	0.2	0.45	0.2

6. Simulation result

The proposed stabilizer is evaluated based on the test system. A large signal disturbance is considered to show effectiveness of the proposed stabilizer. The simulation results are depicted in figures 7-9. It is seen that the system with conventional stabilizer contains insufficient damping and the responses are pendulous. But the adaptive stabilizer can greatly enhance power system stability and damp out the oscillations and the advantages of the proposed stabilizer are visibly seen.
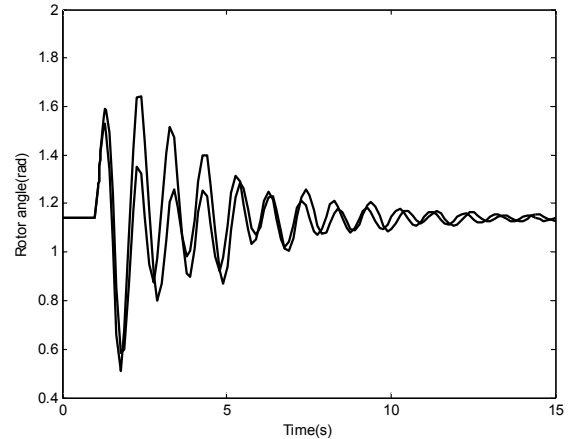
Figure 7: rotor angle following 10 cycle three phase short circuit in bus 3
Solid: adaptive stabilizer **dashed**: conventional stabilizer
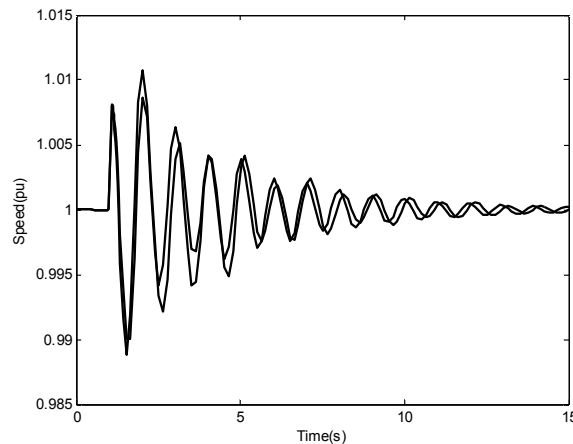
Figure 8: speed following 10 cycle three phase short circuit in bus 3
Solid: adaptive stabilizer **dashed**: conventional stabilizer
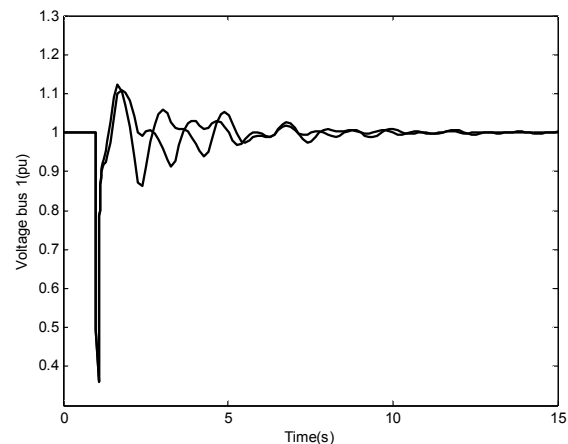
Figure 9: voltage of bus 1 following 10 cycle three phase short circuit in bus 3
Solid: adaptive stabilizer **dashed**: conventional stabilizer

7. Conclusion

A supplementary stabilizer based on SSSC presented. A two area power system assumed to show the ability of the proposed method. Non linear simulation results demonstrated that the designed stabilizer capable to guarantee the robust stability and robust performance under disturbances. Also, simulation results show that the adaptive method is a suitable tool to design stabilizer parameters.

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The Effect of Artificial Pollination and Different Dosages of Cycocel on Yield Components and Seed Yield in Hamedanian Alfalfa

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Abstract: In order to study effect of difference dosages of Cycocel (CCC) and artificial pollination in yield Components and Seed yield in Hamedanian alfalfa in both purposes (forage-seed)an experiment in Agricultural Research Station of Borujerd under 2011-2012 years using split plot design by Randomized Complete Block Design (RCBD) with three replications was carried out. In this experiment main treatments including Artificial pollination with Pulling rope under two stages with 70% levels pollination that this treatment in 100% pollination was repeated and 100% pollination and without artificial pollination was performed and sub treatments including difference dosages of cycocel hormones including levels (0- 1.6-3.2 -6.4) liter per hectare were performed. The results of analyses of variance were showed that artificial pollination effect in seed yield in 1% level probability and number of pods per plant, number of seed per pods and harvest index in 5% lever were significant. Also effect of hormone and interaction effect them with artificial pollination per seed yield and harvest index in 1% probability level and number of seed per pods in 5% probability lever were significant but number of pod per plant non significant. In this study the highest of seed yield in artificial pollination treatment in 100% + 70% levels and 3.2liter per hectare were found.

Key words: Cycocel (CCC); Artificial Pollination; Alfalfa Seed

1. Introduction

Alfalfa (*Medicago Sativa L.)* is originated from Iran and it is one of the most important forage species in this country. Breeding for improving yield and quality traits are important objectives in herbage breeding programs [1]. In reference [2], forage traits have been ranked in terms of their nutritional value for dairy production. Improved digestibility was the most important criteria and high crude protein and low fiber content was ranked as moderate priority in terms of quality objectives. High leaf to stem ratio (LSR) is also desirable because leaves are more palatable and retain higher digestibility much time then stems. There are positive correlations between LSR ratio and digestibility in alfalfa [3]. Alfalfa (*medicago sativa l.)* is originated from Iran and it is one of the most important forage species with cultivated area 600.000 ha with average annual 7200 kg ha-l dm yield. Improved quality traits are an important goal in alfalfa breeding programs. Data from animal nutrition studies show the need to focus more attention on nutritive value to improve new varieties; improved DMD, WSC and CP couple with low fiber content had higher priority in terms of forage quality for live weight gain and dairy production [2]. Genetic correlation between digestibility and fibre content is negative and correlation with crude protein is positively high and

significant [3-5]. Increasing of planted area of this valuable plant required to provide sufficient seed. Alfalfa is an autotetraploid and cross pollinated plant and forage legume plants. Area of alfalfa planted in Iran over 616000 hectares [6]. Choloromacovat Cholorid (CCC) one of derived clurin that produced from reaction between trimethyle amin and halid aliphatic as 1, 2 dicholoromate is produced. Choloromacovat Choloride or Cycosel is an Onovi component group and is very consumption growth reduction of plant especially in European and today used for reduced lodging and vegetative growth control in crops that very frequent applied [7]. Choloromacovat Cholorid with stopped in path of biosynthesis of giberlic acid as a barrier for activity of enzyme ant-carvin synthetase and reduction of plant height [8]. The increase of seed yield in plants treatment with CCC due to was increase root growth, stomata resistance and water potential in leaf [7]. According to results some of researchers, CCC was induced reduction stem height and increased numbers of seed in spike [8]. An experiment was carried out in onion indicated that in pollination with honey bees, pollinated more 25-75% than artificial pollination and 44.38 more than was checked. The aim of present research is determined of the better content of Cycosel dosage and the best of artificial level in order to

increasing grain yield and study reaction yield components and yield in Hamedanian alfalfa in bi purposed fields (forage and seed) .

2. Materials and Methods

The investigation was carried out in Research Field of Hamedanian Seed Production was placed on Borojerd Agriculture Research Station that this station had cooled and humid winter and summers relatively template and dry and variety for planted was Hamedanian. An experiment was carried out in the base on split plot design with three replications. Every treatment in a plot with dimension six meter length and two meter width was performed. Main treatment including artificial pollination with rope in two stages with 70% pollination levels that them in 100% pollination and without artificial pollination and liquid spread in 25 cm plant height using atomizer with 1 atmosphere was performed sub treatment including different dosages of Cycosel hormone (0, 1.6, 3.2, 6.4) liter per hectare that CCC treatment in form of liquid spry was performed. The traits studied in this study including: numbers of pods per plant, numbers of seed per pod, seed yield, harvest index. After normality test for data (Kolmogorov Smirnov method) analyses of variance was performed with Minitab 16, SAS 9, SPSS18 software's, also means compared used Tukey method.

3. Discussion

3.1. Numbers pod in plant: The result of analysis of variance was showed about this trait artificial pollination was significant in 5% level but CCC treatment and interaction between hormone and artificial pollination was not significant (table 1). Also mean comparison to Tukey method was indicated that the highest content related to check (table 2) and for CCC had not significant difference between treatments (table 3) and about interaction in 5% probability level the highest related to check and the lowest related to 70%+ 100% pollination level and 1.6 lither per hectare CCC. The results were showed that plants treatment by artificial pollination and CCC hormone had low numbers pod per plant related to check and it was not affected on numbers pod per plant trait.

3.2. Numbers seed in pod: The results of analysis of variance was indicated there were significant difference between artificial pollination and hormone in 5% probability level and interaction between two factors was significant in 1% probability level (table 1). Means comparison was showed that the highest and lowest related to check and pollination level, respectively (table 2). Also the highest and lowest contents for hormone levels related to 3.2 lit.ha^{-1} and 1.6 lit.ha^{-1} levels, respectively (table 3) and interaction the highest and lowest contents related to 100%

artificial pollination and hormone check level and 70% + 100% artificial pollination and 6.4 lit.ha^{-1} hormone level, respectively (table 4). The results were indicated that plant was treatment artificial pollination had lower seed per pod in compared with check and hormone increased caused increased seed numbers per pod especially in 3.2 lit.ha^{-1} level that may be related to increased potential sink power means seeds had before flowering [9].

Table 1: Analysis of variance for evaluated traits
(Mean of squares for evaluated traits)

Source of variation (S.O.V)	(df)	Numbers of pod in plant	Numbers of seed in pod	Grain Yield	Harvest index
Block	2	0.06	2745.85	1.53	0.05
Artificial pollination	2	4.28*	667.86*	45.15**	0.169*
Error(a)	4	0.49	103.72	0.81	0.02
Hormone	3	1.76	278.43*	8.52**	0.22**
Hormone × Artificial pollination	6	1.49	4086.92**	28.09**	0.25**
Error(b)	18	0.69	73.24	0.272	0.008
CV%	-	12.84	4.49	3.88	14.58

ns, *, ** Non-significant, Significant at probability level 5% and 1% , respectively.

Table 2: Comparison of means for artificial pollination (at 5% level)

Artificial pollination	Numbers of pod in plant (no.m²)	Numbers of seed in pod (no.m²)	Grain yield (g/m²)	Harvest index (%)
Check	7.19a	198.33a	11.84b	0.76a
Artificial pollination treatment 2	6.15b	183.52b	12.87b	0.56b
Artificial pollination treatment 3	6.16b	189.37b	15.59a	0.55b

3.3. Grain yield: The results of analysis of variance were showed that effects artificial pollination, hormone and interaction between them in 1% probability level were significant (table 1). Mean comparison to Tukey method for pollination levels for grain yield was showed that the highest and lowest contents related to 100% artificial pollination level and check, respectively, (table 2) and about hormone levels also 3.2 lit.ha^{-1} and check level, respectively (table 3) and mean comparison for interaction in 5% probability level and 70% + 100% pollination and 3.2

lit.ha^{-1} hormone and check pollination and 3.2 lit.ha^{-1} hormone (table4). The results were showed increased artificial pollination cause to increase grain yield so that the highest yield had 70% + 100% artificial level also with increasing hormone rate grain yield increased that it could be cause increase seed numbers per pod related to increasing physiological method induction that before pollination stage was determined [9-10].

Table 3: Comparison of means for hormone treatment (at 5% level)

Hormone treatment	Numbers of pod per plant (no.m^2)	The numbers of seed per pod (no.m^2)	Grain yield (g/m^2)	Harvest index (%)
Check	7.02a	193.86a	12.74b	0.71a
Hormone treatment 2	5.94a	182.38b	12.99b	0.42c
Hormone treatment 3	6.51a	194.44a	14.78a	0.741b
Hormone treatment 4	6.53a	190.94a	13.13b	0.78a

3.4. Harvest Index: The results of analysis of variance for this trait was showed artificial pollination in 5% probability level and hormone and interaction between them in 1% probability level were significant (table 1). Comparison means were showed that the highest and lowest for artificial pollination levels related to check and artificial pollination levels (table 2). Also for hormone the highest and lowest content related to 6.4 lit.ha^{-1} and 1.6 lit.ha^{-1} levels, respectively (table 3). Comparison interaction effect mean two factors with using Tukey test in 5% probability level was showed that the highest and lowest related to check add 6.4 lit.ha^{-1} hormone and 100% +70% pollination add 3.2 lit.ha^{-1} , respectively (table 4). The results were showed increasing harvest index effect hormone using that cause metabolism activities improvement, enzyme, protein and osmotic adjustment seedling [11]. Alfalfa cause decrease seed production in hectare one of extension barriers area plant them efficiency and expensive desirable seed, so plant density in area unit proportion with forage production (high density) consider that cause increase vegetative growth that reduce light penetrance into canopy and latent reproduction phase in result, reduce seed production with harvest index. Therefore, for solve this problem if we can growth in field alfalfa forage production with preventer material is reduced also by used artificial pollination can be increased seed yield and increase harvest index.

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Table 4: Comparison of means for interaction between two factors (at 5% level)

Comparison of means for two treatments	Numbers of pod in plant (no.m^2)	Numbers of seed in pod (no.m^2)	Grain yield (g/m^2)	Harvest index (%)
Check	8.61a	167.50cde	11.26de	0.79b
P1c2	6.27ab	192.50bc	12.45d	0.37d
P1c3	7.15ab	200b	9.34f	0.53bcd
P1c4	6.73ab	233.33a	14.32c	1.36a
P2c1	6.77ac	178.75bcd	12.10d	0.62bcd
P2c2	5.20b	176.66b-e	10.27e	0.43cd
P2c3	6.14b	226.667a	18.81a	0.81b
P2c4	6.51ab	152e	10.29ef	0.38d
P3c1	5.70b	235.33a	14.85bc	0.71bc
P3c2	6.35ab	178b-e	16.28b	0.46cd
P3c3	6.24ab	156.66d-e	16.48b	0.41d
P3c4	6.34ab	187.5bc	14.479bc	0.62bcd

P: Artificial pollination   C: Hormone CCC

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The application of research methods in physical education and exercise science master's thesis, University of Uremia and Tabriz (1384-1389)

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Abstract: The purpose of this study the research methods used in the Graduate Student Theses of Physical Education and Sports Science, University of Uremia and Tabriz. Methods This study is content analysis and Bi biometric**.** The findings that The272thesesdefended Betweentheyears1384-1389Indicates that Most methods used by students Of then in research methods used Survey with relative abundance40%have been. And while the three methods of historical research, content analysis, and Bibliometric   in thesis has not been used .It is widely distributed in different courses, and other methods are also used Men without exception one of the methods used in the thesis is a survey. The present findings indicate that the method over other methods have been used by students.
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Keywords: Methodology, Research Methodology, Dissertation, Graduate Course, University of Uremia, Tabriz University.

Introduction:

One of the most important issues in the world today, not only in physical education and sports science, but there are other sciences. It is research. Run a search on the subject and goal setting important and sensitive work research method, the way to achieve research objectives. Thus, by examining the quantity and quality studies, the characteristics of good research that is based on The necessity of dealing with the reality and definitions, analysis and interpretation of the results, each researcher brings to the study And most importantly, the research methodology implemented and the formation of the research process plays a significant role, Specified. In other words, the methodology of our study shows that in any period of time, what methods are used and how it is ups and downs.

Faculty of Physical Education and Sports Science, University of Uremia and Tabriz in the years 1368 and 1367 respectively established and that graduate students in order to graduate, are required to carry out the research in the thesis Research and selection process is very important that the students It actually represents the desire and the willingness of students to choose a research method And also shows that more students are using what methods dissertation research has been done Also becomes clear when using some of the methods with the decline and when the peak is reached.

In other words, the process of using research methods at MSc thesis, University of Uremia and Tabriz during the years 1384 to 1389 is characterized

that methods in the investigation had to be overcome and therefore it is subject to further consideration.

Statement of the problem:

The study in order to graduate thesis and graduate students is essential Therefore, the research methodology implemented and the formation of the research process is inevitable. Considering the importance of using research methods and the decline and fall of the student's thesis research methods, A review of the research methods employed in the master's thesis, University of Uremia and Tabriz during the years 1384-1389 was conducted. To determine what research methods have over come and why other methods neglected what have been. This causes repeatability of visual methods in research and a comprehensive survey of the methods used to prevent and also causes the variation in research arise It is a developed country requires a variety of methods that can be applied in several studies. The trend is a result of some of the issues that can actually bring change in the community, should be ignored.

The overall aim of the research:

The overall goal of research is to study the application of research methods in theses Master of Physical Education and Sports Science, University of Uremia and Tabriz, is from the year 1384 until the end of 1389.

Methods:

The relevant information from the individual master's thesis in Physical Education and Sports Science, University of Uremia and Tabriz were

extracted. Then, using content analysis, research methods used in the thesis is examined the nusesbibliometrics and content analysis method was calculated to compare the extracted data.

 Study population:

Community study, 272 students in the master's thesis, University of Uremia and Tabriz is during 1384-1389.

The basic research questions:

1 - The overall trend in terms of what research methods

2 - The evolution of the methods used in the thesis is how the review period

3 - Find new ways to enter the field when the letters were finished.

History of Iran:

Kiyan Mehr (1376) reviewed the LIS master's thesis at the University of Tehran during the years 1366 till 1375, has done Below are the results of his review: Dissertation of 286 cases reviewed, 127 as belonging to the Tehran University of Medical Sciences in Iran as the 93, 38 and 28 as belonging to the Islamic Azad University of Tarbiat Modarres University and Most of the research method and the method described by 4/79 percent.

Padyar (1380) The distribution of scholarships to accounting with emphasis on the existing models and methods used in the study are discussed. The results of this study show that 95 percent of non-experimental research methods used in the thesis is the Hey.

Pursany (1380) Content analysis Science Thesis in Nutrition and Health Sciences and Nutrition martyr Beheshti University of Medical Sciences, Tehran And compare them in terms of addressing the research priorities in the fields of nutrition, after reviewing 246 results found in this thesis. Most applied dissertations and theses are only two basic types of nutrition science, In both fields of descriptive research method over other methods have been used Analytical and experimental methods in the field of food science and a degree in health science degree in nutrition from the analytical methods of the experimental method is used.

Syed Mehrdad Seyyedin and Fahimeh Babalhvayjy (1388) The content analysis of LIS master's thesis, Islamic Azad University, North Tehran, Science and Research Branch of Tehran, Hamadan, Ahvaz Science and Research in the years 1372 - 1386 524 The largest of the investigative methods that belong to the survey .

Background study abroad:

Global scale as well as studies of the methodology of research in different disciplines have Some of them have been studied in this research such Bluma Prytz (1980) to examine 39 research papers in

the Journal, 1950, 1960, 1965, 1970, and 1975 will be published. Selected core journals based on his reading of the "Social Science Citation Index", "Abstract Information", "current knowledge", "Information and Library Review," and "Text Library" And this is achieved through a 1272 research paper. Results show that the eleven methods used in the investigation of which the largest share belongs to the survey (28 percent) and the historical method (with 18 percent).

Kafarla (1999) 2689 the field of educational technology through the use of content analysis techniques have been investigated during the years 1977-1998. in the thesis studied He, Mainly issues related to computers, evolution, development, training, video and television were discussed. There search method ologyin the study showed a decrease in number comparative studies and empirical and increase the number of qualitative studies. Studies Sheinthe late 70's Comparative studies, about seven per centre search thesis was to allocated and In the late 80's and early 90's the number of comparative studies was reduced to five per cent In recent years, comparative studies, only three percent of the study was devoted to a dissertation Another study also reduce the number of empirical studies and qualitative studies increased. Shows the results of his investigation. In the late 70s, very few qualitative studies have been conducted by the students. But now, in qualitative research, theses, a huge portion of their   accounts And seems to be a number of empirical studies .

Merighi,Goncalves,Ferreira (2007), based on a survey of books, nursing dissertations published, During the years1981-2002wereanalyzedwith a phenomenological approach. They used the method to analyze the descriptive thesis, was retrospective and bibliometricsAnd since both qualitative and quantitative methods will lead to a result better and more complete. Thus, in their review of qualitative and quantitative methods were used to analyze the results of the thesis: The study of 217 156 cases (9/71%) for graduate and 61 (1/28%) for the Ph.D. and Most notable was that the abstracts, theses, research methodology, there was no specific framework and just 10 percent was in the framework of the thesis.

Results:

According to Table 1ofthe9 types of research methods in theses Physical Education and Sports Science, University of Urmia , have been usedMostofthesurveymethodandcomparedwith89(34% and 32%) is allocated and titles belong to evaluative research methods are asonly5(3%) .Also, historicalresearchmethods, content analysis and citation analysisinthis studyisnotgreat.

Table 1: Distribution of research methods in Theses of Uremia University

Research methods	Number	Percent
Survey	46	34٪
historical	0	0
case study	11	9٪
Empirical	11	14٪
evaluative	5	3٪
comparative	43	32٪
Sandy (Library	12	8٪
content analysis	0	0
citation analysis (bibliometrics)	0	0
Sum	136	100٪

Theresearchmethodbased on the 9 Theses Physical Education and Sport Sciences, University Tabriz, Survey with 65asthe most common method (47%) is allocated and titles belonging to the research methodology documentasonly8(6%) are. Also, the methods of historical research, content analysis and citation analysisinthis study is not great. Have been used. A review of Table 3withcomplete information

on the number andtypesof research methods used during the course of each year and 84 to 89 are achievedThisisthe marker of the beginning of the survey methodologyanda comparison of 1384 to 1389, therelative abundance of34%and 32% Consistently accounted fourth largest share.

Table 2: Distribution of research method sat the Theses University Tabriz

Research methods	Number	Percent
Survey	65	47%
historical	0	0
case study	11	8%
Empirical	18	13%
evaluative	10	8%
comparative	24	18%
Sandy (Library	8	6%
content analysis	0	0
citation analysis (bibliometrics)	0	0
Sum	136	100%

Table 3: Thedistributionof researchmethodsatthe University Uremia

Research methods	1384	1385	1386	1387	1388	1389	Sum	Percent
Survey	7	8	9	8	6	8	46	34%
historical	_	_	_	_	_	_	0	0
case study	_	2	3	4	1	1	11	9%
Empirical	3	3	2	3	3	5	19	14%
evaluative	1	_	2	_	2	-	5	3%
comparative	6	7	6	9	10	5	43	32%
Sandy (Library	3	3	_	1	4	1	12	8%
content analysis	_	_	_	_	_	_	0	0
citation analysis (bibliometrics)	_	_	_	_	_	_	0	0
Sum	20	23	22	25	26	20	136	100%
Percent	15%	17%	15%	18%	18%	16%	100%	34%

Table 4:Distribution of research methods the University Tabriz

Research methods	1384	1385	1386	1387	1388	1389	Sum	Percent
Survey	10	12	10	10	12	13	65	47%
historical	_	_	_	_	_	_	0	0
case study	1	2	1	1	3	2	11	8%
Empirical	3	2	4	4	3	5	18	13%
evaluative	1	2	1	1	3	1	10	8%
comparative	2	4	5	5	6	4	24	18%
Sandy (Library	2	1	1	1	2	1	8	6%
content analysis	_	_	_	_	_	_	0	0
citation analysis (bibliometrics)	_	_	_	_	_	_	0	0
Sum	19	23	22	22	29	26	136	100%
Percent	15%	16%	16%	16%	20%	17%	100%	

Thistablecontainscomplete information on the number andtypesof researchmethodsused in each of the years 84 to 89years andthetrendisin the University, The table shows that 47% of survey method andsurveymethod,comparedwith 18% accounted fourth largest share.

Table 5: Distributionofresearchmethodsat the University of Tabriz and Urmia

Research methods	Number	Abundance
Survey	111	40%
historical	0	0
case study	22	12%
Empirical	37	12%
evaluative	15	5%
comparative	67	25%
Sandy (Library	20	6%
content analysis	0	0
citation analysis (bibliometrics)	0	0
Sum	272	100%

According to the table,bothwith 40% of the maximum frequencyisthesurvey research method.

Comparativestudyofthebackgroundresearch:

TheresultsPursany(1380)that toThecontent analysis ofthehealthsciences,food scienceandnutrition in AttendingmedicaMartyrBeheshti,Tehran And comparison Mostoftheresearchmethod Which is owned by thesurveyThisresultissomewhatsimilar to the results of this study with this difference that addition tosurveymethods(40% percent) compared with the method(25% percent)As one of the researchmethodsused inthesurveyisthesecond.

In studies conducted by Syed M.Seyyedin and Fahimeh BobAlhvayjy(1388) that to content analysis of LIS master'sthesis,Islamic Azad University, North Tehran Science and Research Branch of Tehran, Hamadan, AhvazScience and Research in the years 1372-1386 have beenMost Shares owned survey research methodsthatare consistent with the results

ThereviewBlumaPrytz(1980)to examine 39 research papersintheJournal, 1950, 1960, 1965, 1970, and 1975 will be published showed that from betweenElevenmethod used in this research Most Shares owned to The survey(28 percent) and the historical method(with 18 percent)compared with the results of the present study isslightlydifferent.Inthe present study in thesis examines 40%ofsurveyand 18% of the comparative methods used And it is noteworthyTheresearch resultsBlumaPrytz(18%) used thehistorical method, while thestudyofthe historical method slacking.

Discussion:

9 investigativemethodsused in themasterthesisof Physical Education and Sports Science, University of Uremia andTabrizfrom Years1384until the end of 1389, the largest shareofthesurvey(40% percent)And thencomparewith(18%), respectively. Historical method, content analysis and citation analysis Lacking AbundanceareInthis study. Andevaluative research methods, evidenceandcase studieswitha dramatic fallAAbundance5 ,6and 12%havebeen Whilethe experimentalmethodologyhasbeengrowing.
9/6/2012

Another important point to be note disthatinthe early establishment of the University of Uremia and Tabriz Methods used in thethesisis lessvariation Theonly witnesstothe use of survey method, we compare theexperimentalAnd other methods are rarely used. And notethatHistoricalmethod, contentanalysis, citation analysis have not been considered.

Suggestions:

The results of the present study was to further explore And more accurate results require further research in this area is felt. Recommendations and strategies fororganizingand following careful assessment of the thesisis to summarize. Further research to answer thesequestionsWhether the criteriaof scientific studiesarenecessary? And studies are applied? What are the criteriaforchoosing aresearchit is considered? How manythesesWithin a yeararereferredtoasupervisor?

Provideimportantpracticalissuesbased onneedand academic centers and publicTheUniversityTo be presented tothestudentsin order tograduateRequired are to carry out the research in the thesis. In this research Accordancewith therequirementsof country Preparation and Runs. WiththisBesidesthe cost and timenotspentin vain And other researchers Will meet the needs of the community.

Resources:

1. Keyanmehr, Shiba(1376). "Themaster'sthesis onthesubject of Library and Information Scienceatthe UniversityofTehran during the years1366till1375

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Improved quality of service processes using the logic of Six Sigma (Case study)

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Abstract: Six Sigma is a powerful management tool In order to make changes in the organization and also meet the needs of customers is essential. Six Sigma is not just a method but a perspective. In addition, Six Sigma is a tool for strategy formulation. In this study, the effect of applying six-sigma accuracy, reducing the number of customer complaints, saving cost, Savings in staff time Marand city gas company meter reading has been studied. Therefore the following four hypotheses have been proposed: 1- Applying Six Sigma to increase the accuracy of the meter readings are employees. 2 - Applying Six Sigma is to reduce the number of customer complaints. 3 - Applying Six Sigma saves costs. 4 - Applying Six Sigma saves time be. In order to collect information from the data of 1387 is used to Marand city Gas Company. Using SPSS software statistical hypotheses were analyzed and the following results were obtained: 1 - Applying Six Sigma to increase the accuracy of the meter reading staff was. 2 - Applying Six Sigma to reduce the number of customer complaints in the meter reading. 3 - Applying Six Sigma saves the cost of meter reading was. 4 - Applying Six Sigma saves staff time meter was read.
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Keywords: Six Sigma, accuracy, cost, Complaint, meter reading

Introduction

Despite the challenges of customer satisfaction and commercial conquest of competitive markets, the need for reliable products and services is increasingly more. Six Sigma methodologies is a tool for quality improvement. As we get closer to six sigma, inspection requirements and reduce test costs are lower, shorter production cycles and will provide better customer satisfaction. To achieve Six Sigma is said to be a target It is a horizon that always the way towards greater excellence to our show (www.fekreno.org.com).

One way to improve in the third millennium, which can push the organization towards achieving excellence Effective implementation of Six Sigma projects Six Sigma, is a methodology to improve satisfaction the maximum value for customers by solving problems and interests through understanding customer needs important indicators of performance and operational processes and improve business processes and deals. So customer satisfaction through increased customer satisfaction And trying to become loyal customers by reducing costs and improving quality is the most important six sigma projects Six Sigma strategy, in fact, the deviation from the target can measure each Processors. (samuel, 1385, 32). However, experts believe that a significant portion of revenues related to services due to the intangible nature of services, but unfortunately it is. Process and the need for improvement in these areas compared

with the manufacturing sector has been much slower Fortunately in recent years due to the rapid development of the service Process and the need for improvement in this area is evident Six Sigma is a methodology that is primarily produced in the reduction of defects, cost and cycle time were able to quickly introduce the work place in the organizations to stabilize the production of Six Sigma successes and achievements in the production of small and large service organizations also noted that this methodology is It can be stated that now dared to use Six Sigma in service to various reasons such as the difficulty in correcting or compensating for lack of service, customer satisfaction has caused adverse The application of this methodology to the field with a much faster process than expand production (Venice, 1385,1).

English physicist Lord Kelvin defined the necessary measures to Whenever we talk about what it could be measured in terms of numbers, we can say that we know something about the subject Otherwise, our knowledge is incomplete and will not ever mature "Without a way to measure progress is not possible.

Due to insufficiency of service of process and the difficulty in Marand city gas company Numerous complaints from customers about the status of their clientele gas meter reading wrong and against the Company pending receipt of the sent Statements caused Processes and services delivered with serious difficulties with respect to the application of Six

Sigma techniques in the processes necessary to implement Six Sigma techniques Processes for improved service (meter reading) studied the gas company to Marand city through this to identify errors in the Statements equipment and manpower related to meter reading as well as recipes and ways to improve the assessment and control of six Sigma techniques will be presented by In other words, Six Sigma is a concept through which you can get a lot of valuable and distinct concepts and managerial experience to get integrated in the. Some of these concepts include systems thinking, continuous improvement, and knowledge management, customer friendly and activity-based management (Peter pand and Associates 1385, 96).

Six Sigma can be a powerful and comprehensive management tools to change and adapt to the demands of the customer call. Unlike other approaches to Six Sigma quality methods not only a vision, purpose, and it also contains symbols (www.iiend.com).

Applying Six Sigma methodology to reduce time to repair (Case study on behalf of CAR) in the paper by selecting one of the authorized agencies in the city of Shiraz, Iran Khodro Company has been trying Using the five stages of Six Sigma methodology - define, measure, analyze, improve and control techniques, such as the Charter, the failure mode and effects analysis, fish bone diagram to discover the main causes of the increase in service time and eventually solutions were proposed to improve the current situation. Thus the main objectives of the research: 1 - reduced repair times as much a day for each vehicle. 2 - Increase customer satisfaction by offering services that customers consider to be priorities. 3 - Increased revenue by accepting more car dealers every day (Mustafa Khawaja, 1383).

1 - Determination of Effect Applying Six Sigma The accuracy of the meter reading staff is.

2 - Determine the impact of Six Sigma is to reduce the number of customer complaints.

3 - The effect of applying Six Sigma saves costs.

4 - The effect is applying Six Sigma saves time.

Tools and Materials

The overall goal of this method is that the researcher can determine what method or methods to select Faster and more accurate response possible so he can assist in achieving that goal, and this is dependent on the nature of research and administrative facilities, The purpose of this research is based on the type of applied research is descriptive in nature and do field studies of specific features tailored which is the subject, To collect information about the Library ¬ Six Sigma methods are used in order to explain the Six Sigma methodology and data that has been collected from various sources in a library And methods of

measurement as a comparison done by the first performance of the meter readings in 87 mining and then using the six sigma errors of the meter readings to identify and provide solutions and training the meter read 88 years from and then compare the performance of year 87 and 88 and have been able to do this.

Analysis of hypotheses: The meter reading method of analyzing performance data from 87 years to 88 years, with the implementation of Six Sigma results obtained data with the help of SPSS software and research hypotheses being normal initially identified using the Kolmogorov Smirnov and then compared using paired T-test and compared and evaluated and the results have been analyzed.

The first hypothesis test

The first hypothesis tests the accuracy of meter reading staff that year is divided into six two-month period And meter readings are shown in Table 87, using the SPSS software Smirnov Kolmogorov test on 87 years of data After 88 years on data done in 87 normal and 88 employees to carefully review and then we'll compare.

Applying Six Sigma to increase the accuracy of the meter readings are not employees [H0:$\mu x \leq \mu 0$ Applying Six Sigma to increase the accuracy of the meter reading staff is [H1: $\mu x > \mu 0$

Table (1-1) the accuracy of meter reading staff 87 years

Period	Year 87 (A1)
First Period	5
Second Period	2
Third Period	24
Fourth Period	67
Fifth Period	85
Sixth Period	71

Attention

A1 = accurate meter reading staff 87 years

Nonparametric test KS, A1 is normal.

NPar Tests

One-Sample Kolmogorov-Smirnov Test

Table (1-2) accurately Kolmogorov-Smirnov

	A1
N	6
Normal parameters[a] mean	42.3333
Std. deviation	3.63520E1
Most extreme differences Absolute	.251
Positive	.193
Negative	-.251
Kolmogorov–smirnov Z	.616
Asymp.sig.(2-tailed)	.843
a. Test distribution is Normal.	

The Table 1-2 shows the Kolmogorov-Smirnov normal.

Period	Year 88 (A2)
First Period	4
Second Period	9
Third Period	29
Fourth Period	79
Fifth Period	91
Sixth Period	93

Table (1-3) the accuracy of meter reading staff 88 years

Nonparametric test KS, A2 is normal. NPar Tests
One-Sample Kolmogorov-Smirnov Test

	A2
N	6
Normal parameters^a mean	50.8333
Std. deviation	
Most extreme differences Absolute	.251
Positive	.201
Negative	4.14845E1
Kolmogorov–smirnov Z	.616
Asymp.sig.(2-tailed)	.843
a. Test distribution is Normal.	

Table (1-4) accurately Kolmogorov-Smirnov

According to Table (1-4) shows the Kolmogorov-Smirnov normality.

After carefully reading the meter to employees 87 years and 88 years were examined in terms of normal we now turn to normal T-test for comparison between years 87 and 88 years will do.

T-TEST PAIRS=A2 WITH A1 (PAIRED)
MISSING=ANALYSIS.

T-Test

Output in Table (1-5), respectively, from left to right, average, count, standard deviation and standard error of the sample shows.

Table (1-5) Paired sample statistics of double Accuracy

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	A2	50.8333	6	41.48454	16.93599
	A1	42.3333	6	36.35198	14.84063

Paired Samples Statistics

Table (1-6) two paired-sample test accuracy
The output Table (1-6) Sig = .045 <0.05 after that H1 is accepted and approved.

Paired Samples Test

	Paired Differences							
				Confidence Interval of the Difference 95%				Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	
Pair 1 A2 - A1	8.50000	7.81665	3.19113	.29693	16.70307	2.664	5	.045

Compare the meter reading staff 87 years before and 88 years after the work is seen in Table Applying Six Sigma to increase the accuracy of meter readings to staff.

The second hypothesis test

The second hypothesis test meter reading staff is reducing the number of customer complaints that year is divided into six two-month period and 87 years of meter reading is given in Table using spss software Kolmogorov Smirnov test on data 87 years and then on data 88 years done Evaluation of normality and then Reduce the number of customer complaints Staff In Years 87 and 88 will be compared.

Applying Six Sigma to reduce the number of customer complaints is not part of meter reading [H0:μx≤ μ0

Applying Six Sigma to reduce the number of customer complaints is the meter reading. [H1: μx> μ0

Table (2-1) reduced the number of customer complaints meter readings in 87

Period	Year 87 (D1)
First Period	131
Second Period	229
Third Period	123
Fourth Period	248
Fifth Period	183
Sixth Period	170

NPar Tests
One-Sample Kolmogorov-Smirnov Test

	D1
N	6
Normal parameters^a mean	1.8067E2
Std. deviation	5.05595E1
Most extreme differences Absolute	.170
Positive	.170
Negative	-.164
Kolmogorov–smirnov Z	.417
Asymp.sig.(2-tailed)	.995
a. Test distribution is Normal.	

Kolmogorov Asmirnov number of complaints (2-2)
The Table 2-2 shows the Kolmogorov Asmirnov normal.

Period	Year 88 (D2)
First Period	133
Second Period	228
Third Period	128
Fourth Period	253
Fifth Period	185
Sixth Period	177

Table (2-3) reduced the number of customer complaints meter readings in 88
NPar Tests

One-Sample Kolmogorov-Smirnov Test

	D2
N	6
Normal parameters[a] mean	1.8400E2
Std. deviation	4.99680E1
Most extreme differences Absolute	.180
Positive	.180
Negative	-.144
Kolmogorov–smirnov Z	.440
Asymp.sig.(2-tailed)	.990
a. Test distribution is Normal.	

Table (2-4) Kolmogorov Smirnov number of complaints

According to Table (2-4) shows the Kolmogorov asmirnov normal.

After reducing the number of customer complaints meter readings in 87 and 88 years were examined in terms of normal now turn to the T-test for comparison between years 87 and 88 years do
TEST PAIRS=D2 WITH D1 (PAIRED)
MISSING=ANALYSIS.
T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	D2	1.8400E2	6	49.96799	20.39935
	D1	1.8067E2	6	50.55954	20.64084

Table (2-5) hit two-paired samples of complaints

Output in Table (2-5), respectively, from left to right, average, count, standard deviation and standard error of the sample shows.

Paired Samples Test

	Paired Differences							
				Confidence Interval of the Difference 95%				Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	
Pair 1 D2 - D1	3.33333	2.87518	1.17379	.31602	6.35065	2.840	5	.036

Table (2-6), two paired samples of complaints

The output Table (2-6) Sig = .036 <0.05 so allegedly accepting H1 is approved.

With attention Compared to the reduction in the number of customer complaints meter reading 87 years before and 88 years after do the work Seen in the table applying Six Sigma to reduce the number of customer complaints is the meter reading.

The third hypothesis test

The third hypothesis test cost is the meter reading that year is divided into six two-month period and 87 years of meter reading is given in Table using spss software Kolmogorov Smirnov test on data 87 years and then on data 88 years done Evaluation of normality and then saving the cost of In Years 87 and 88 will be compared.

Applying Six Sigma saves on the cost of the meter is not read. [H0:µx≤ µ0

Applying Six Sigma saves on the cost of the meter is read. [H1: µx> µ0

Period	Year 87 (C1)
First Period	127
Second Period	227
Third Period	99
Fourth Period	181
Fifth Period	98
Sixth Period	102

Table (3-1) Meter reading costs 87 years
NPar Tests

One-Sample Kolmogorov-Smirnov Test

	C1
N	6
Normal parameters[a] mean	1.3900E2
Std. deviation	5.34827E1
Most extreme differences Absolute	.255
Positive	.255
Negative	-.222
Kolmogorov–smirnov Z	.626
Asymp.sig.(2-tailed)	.828
a. Test distribution is Normal.	

Table (3-2) Kolmogorov Smirnov cost

According to Table (3-2) shows the Kolmogorov Smirnov normal.

Period	Year 88 (C2)
First Period	127
Second Period	227
Third Period	99
Fourth Period	181
Fifth Period	98
Sixth Period	102

Table (3-3) Meter reading costs 88 years
Nonparametric test K-S, C2 is normal
NPar Tests

One-Sample Kolmogorov-Smirnov Test

	C2
N	6
Normal parameters[a] mean	1.2400E2
Std. deviation	4.96709E1
Most extreme differences Absolute	.246
Positive	.246
Negative	-.182
Kolmogorov–smirnov Z	.604
Asymp.sig.(2-tailed)	.859
a. Test distribution is Normal.	

Table (3-4) Kolmogorov Smirnov cost

According to Table (3-4) shows the Kolmogorov normal Smirnov

After the cost of meter reading 87 years and 88 years were examined in terms of normal now the T-test to compare Year 87 and Year 88 will do.
T -TEST PAIRS=C2 WITH C1 (PAIRED)
MISSING=ANALYSIS.
T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	C2	1.3900E2	6	53.48271	21.83422
	C1	1.2400E2	6	49.67092	20.27807

Table (3-5) hit a two-paired sample fee

Output in Table (3-5), respectively, from left to right, average, count, standard deviation and standard error of the sample shows.

Paired Samples Test

	Paired Differences							
	Mean	Std. Deviation	Std. Error Mean	Confidence Interval of the Difference 95%		t	df	Sig. (2-tailed)
				Lower	Upper			
Pair 1 C2 - C1	1.50000E1	6.35610	2.59487	8.32968	21.67032	5.781	5	.002

Table (3-6) two paired-sample test cost

The output Table (3-6) Sig = .002 <0.05 after that H1 is accepted and approved.

Compare the cost of meter reading 87 years before and 88 years after the work can be seen in Table Application of Six Sigma is to reduce the cost of meter reading.

The fourth hypothesis test

The fourth hypothesis testing saves time meter reading that year is divided into six two-month period and 87 years of meter reading is given in Table using spss software Kolmogorov Smirnov test on data 87 years and then on data 88 years done Evaluation of normality and then saves time In Years 87 and 88 will be compared.

Applying Six Sigma saves when the meter reading is not. [H0:μx≤ μ0

Applying Six Sigma Saves time the meter is read. [H1: μx> μ0

Period	Year 87 (T1)
First Period	110
Second Period	121
Third Period	131
Fourth Period	119
Fifth Period	101
Sixth Period	96

Table (4-1) took the meter readings in 87

NPar Tests

One-Sample Kolmogorov-Smirnov Test

		T1
N		6
Normal parameters[a] mean		1.1300E2
Std. deviation		1.31605E1
Most extreme differences	Absolute	.176
Positive		.152

Negative	-.176
Kolmogorov–smirnov Z	.431
Asymp.sig.(2-tailed)	.993
a. Test distribution is Normal.	

Table (4-2) Kolmogorov-Smirnov time

The Table (4-2) shows the Kolmogorov Smirnov normal.

Period	Year 88 (T2)
First Period	100
Second Period	123
Third Period	120
Fourth Period	110
Fifth Period	94
Sixth Period	89

Table (4-3) took the meter readings in 88

NPar Tests

One-Sample Kolmogorov-Smirnov Test

		T2
N		6
Normal parameters[a] mean		1.0600E2
Std. deviation		1.39284E1
Most extreme differences Absolute		.176
Positive		.167
Negative		-.176
Kolmogorov–smirnov Z		.431
Asymp.sig.(2-tailed)		.992
a. Test distribution is Normal.		

Table (4-4) Kolmogorov-Smirnov time

According to Table (4-4) shows the Kolmogorov-Smirnov normal.

After the time of meter reading 87 years and 88 years were examined in terms of normal now the T-test to compare Year 87 and Year 88 will do.

T-TEST PAIRS=T2 WITH T1 (PAIRED) MISSING=ANALYSIS.

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	T2	1.0600E2	6	13.92839	5.68624
	T1	1.1300E2	6	13.16055	5.37277

Table (4-5) hit a two-sample test of time

Output in Table (4-5), respectively, from left to right, average, count, standard deviation and standard error of the sample shows.

Paired Samples Test

	Paired Differences							
	Mean	Std. Deviation	Std. Error Mean	Confidence Interval of the Difference 95%		t	df	Sig. (2-tailed)
				Lower	Upper			

Paired Samples Test

	Paired Differences							
				Confidence Interval of the Difference 95%				Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	
Pair 1 T2 - T1	-7.00000	4.69042	1.91485	-11.92229	-2.07771	-3.656	5	.015

Table (4-6), two paired-sample test of time

The output Table (4-6) Sig = .015 <0.05 after that H1 is accepted and approved.

With attention Compared Part-time meter reading 87 years before and 88 years after do the work Seen in the table Applying Six Sigma to reduce the time the meter reading is.

The results:

After investigation and service process improvement using Six Sigma logic following results were obtained.

1 - Applying Six Sigma to increase the accuracy of the meter reading staff was.

2 - Applying Six Sigma to reduce the number of customer complaints in the meter reading.

3 - Applying Six Sigma saves cost in the meter reading.

4 - Applying Six Sigma saves staff cost in the meter reading.

Conclusion

Hypothesis tests show that the application of Six Sigma is to increase the precision of staff, reducing the number of customer complaints, save money and save time reading the meter is Marand city gas companies and to improve the meter reading process provides the following methods are proposed:

1 - Using IVR as Tabriz In the city of Marand In order to decrease not at home

2 - Providing timely counter alternative to replacement of defective meters were replaced and reduction meter and dial failure.

3 - Promote Quantification meter reader, compatible with subscriber growth.

4 - The quality meter reader, Training courses Meter Reading, Obtaining meter readings during the test work.

5 - Management of meter reader performance using reports Contour line, in order to decrease the difficulty and route.

6 - Cyclic control of meter readings method of sample selection and re-reading meter.

7 - Replacement of meter reading and meter readers a path in terms of variety and job rotation.

8 - Send a file timely meter readings to a computer service center at least one day before the scheduled date of completion.

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Novel CMOS Tunable Fuzzifier Circuit

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Abstract: A novel CMOS analog fuzzy membership function generator is designed. The fuzzifier generates the membership functions of a fuzzy system by converting the input analog signals to their corresponding predetermined grade of memberships. It takes voltage-mode inputs and produces current mode outputs and so it can be easily tuned with separate input voltages, for easy manipulations of the output fuzzy signals by the arithmetic operations that follow. Furthermore, the fuzzifier is so flexible that it can be readily adapted into most fuzzy systems, including neural networks, by changing the reference voltages and the number of building blocks used. The high speed of analog implementation also makes this fuzzier more attractive than software approaches.

1. Introduction

Fuzzy logic development has advanced in a fast pace in the past decade, and it has a wide range of applications. The major advantage of fuzzy logic is that it admits imprecision of data, thus, is able to model reality better than the traditional digital logic. In other words, traditional digital logic only describes black and white, while fuzzy logic describes the vast gray region in between black and white as well. In real life, situations are often described by linguistic terms. Fuzzy logic is capable to represent and process data given in these linguistic terms and generate results in these linguistic terms as well. Hence, fuzzy logic rules are more powerful in processing data. However, due to demand for higher speed and more compact hardware, analog VLSI is becoming more and more important in realization of fuzzy logic technologies. Hence, in this paper, we propose to develop an analog to fuzzy signal converter (fuzzifier) as a solution to convert ordinary analog signals into fuzzy signal in an efficient manner. It has the advantage of higher speed than the current software

2. Fuzzifier Block Diagram

As fuzzifier needs s-shape and z-shape membership functions, so to crate those functions two transconductor circuits are used, whichever to generate one of the z-shape or s-shape MFG's. Transconductor circuit is designed in a way that its slops and basis can be tuned easily with input control voltages. The block diagram of fuzzifierand working manner of it, are shown in Fig. 1.

As seen in Fig. 1 to generate trapezoidal membership functions a normal current is used and all three currents applied to minimum current selector block.

(a)

(b)
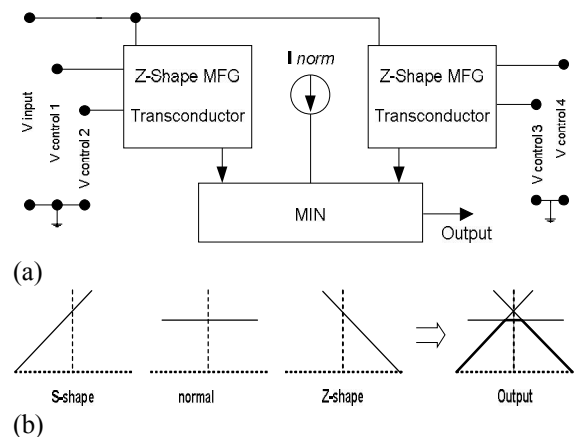
Fig. 1: (a) block diagram of fuzzifier circuit (b) working manner of fuzzifier circuit

3. Basic Circuit and the Transconductor

Fig. 2 shows a class-AB non-linear differential-input transconductor, which for $V_{CD} \geq \sqrt{I_B/\beta_1}$, has an output current defined by:

$$I_{OUT} = \beta_2 \left(V_{CD} + V_{eff1} \right)^2 \qquad (1)$$

Where $\beta_1 = 0.5\mu c_{ox}(W/L)$ is a MOSFET's transconductance parameter and $V_{eff1} = \sqrt{I_\beta/\beta_1}$ is an effective voltage of M1.

From the circuit arrangement, it can be seen that the circuit can be operated under $V_{sg} + 2V_{eff}$ supply voltage, which is compatible to low-voltage application.
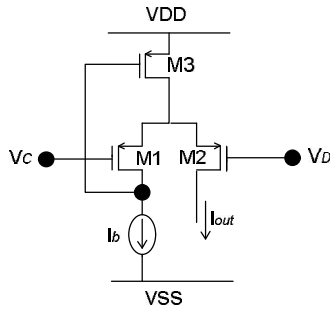
Fig. 2: Square-law differential-input transconductor

Fig. 3 shows the class AB linear transconductor realized by cross-coupling a pair of non-linear transconductors of Fig. 1 Assuming that M1-M4 are of identical dimensions, it can be found that for $|V_{AB}| \leq \sqrt{I_A/\beta}$, the differential output current is linearly dependent on the differential input voltage,

$$I_{out} = I_{o1} - I_{o2} = \beta(V_{AB} + V_{eff1})^2 - \beta(V_{BA} + V_{eff1})^2$$
$$= 4V_{AB}\sqrt{I_A \beta_A}$$
(2)

Where $\beta_A = \beta_1 = \beta_2 = \beta_3 = \beta_4$. According to (2), it is clearly seen that the transconductance gain is a square-root function of the bias current I_A.
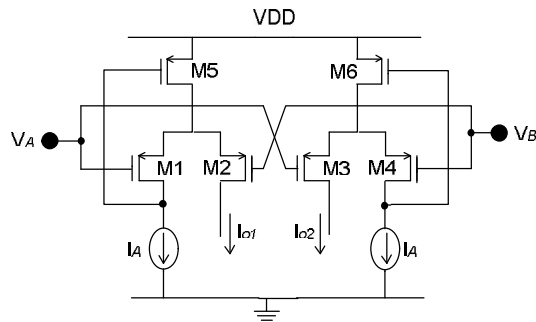
Fig. 3: Fully differential class-AB transconductor

Fig. 4 shows the proposed class-AB transconductor which utilizes the transconductor of Fig. 2 and 3 as the tuning circuit and the main voltage to current converter, respectively.

Referring to the transconductor in Fig. 4 current mirror Mb2-Mb4 is used to reflect the output current of the tuning circuit for biasing the main transconductor. If the dimensions of M7-M8 are identical, it can be shown that:

$$I_o = \beta_\beta \left(V_{CD} + \sqrt{\frac{I_\beta}{\beta_\beta}} \right)^2$$
(3)

Where $\beta_B = \beta_7 = \beta_8$. Substituting (3) into (2) and rearrange the result, we have

$$I_{out} = 4V_{AB}\sqrt{\beta\left[V_{CD} + \sqrt{\frac{I_D}{\beta}} \right]^2 \beta}$$
$$= 4V_{AB}\beta[V_{CD} + V_{eff}]$$
(4)

According to (4), we found that the value of I_{out} is linearly dependent upon the sum of the controlled voltage V_{CD} and the square-root of I_B/β_β.
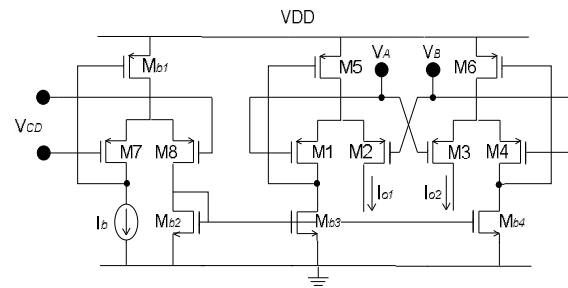
Fig. 4: Fully differential class-AB transconductor with tunable slop
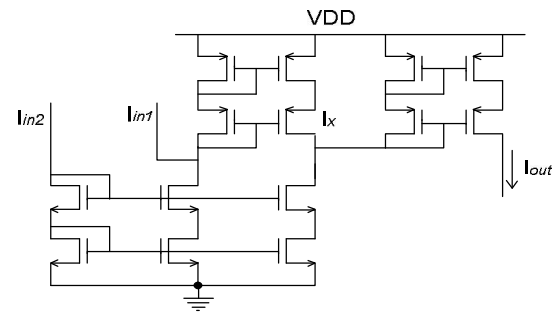
Fig. 5: Circuit diagram of the minimum current selector.

2. Minimum Current Selector

Circuit diagram of the used minimum current selector is shown in fig. 5. This block takes two sourcing currents and sources an output current which is equal to minimum of the inputs. The functionality of the circuit is simple and straightforward. If *Iin2 > Iin1*, then the difference current of *Iin2 – Iin1* in the input subtraction node flows in PMOS current mirror and then subtracted from *Iin2* in output subtraction node, resulting in:
Iout = I in2 − (I in2 − I in1) = I in1.

On the other hand, if *Iin1 > Iin2*, then there is no difference current flowing in PMOS current mirror; hence in output subtraction node we have:

Iout = I in2 − 0 = I in2.

As we see, the output current of the circuit is the minimum of two input currents.

The entire circuit of fuzzifier is shown in Fig. 6.

 2.   Simulation Results

The proposed fuzzifier has been simulated using Hspice and level 49 BSIM3V3 parameters. The circuit operates with a single supply voltage of 3.3V in a 0.35 μm CMOS technology.

Fig. 8 illustrates a simulated relationship between the differential output current and transconductance differential input voltage V_{AB}.

2.   Layout of Circuit

The layout of the fuzzifier is shown in Fig. 7.The complete layout occupies an area of 38.9μm by 21.5μm.
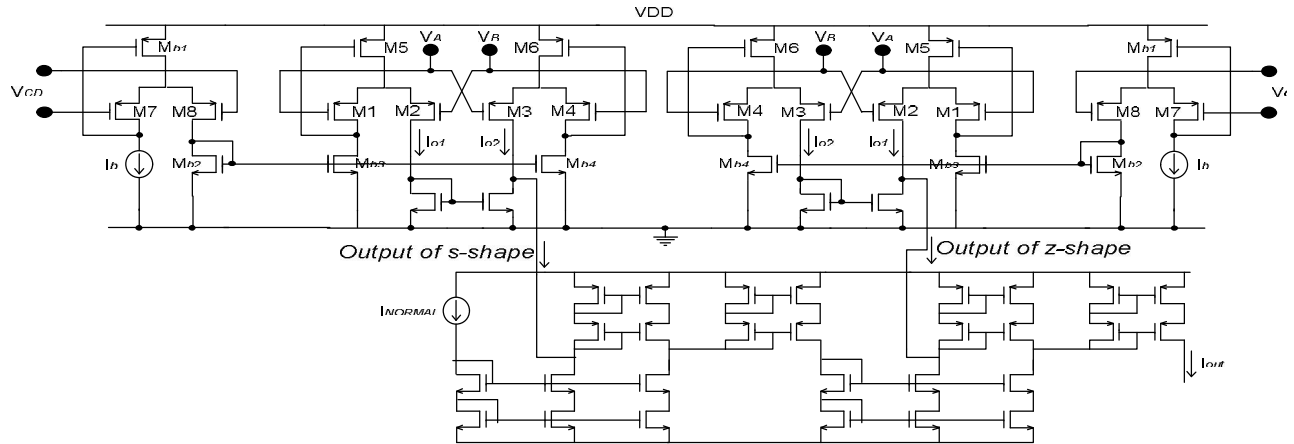
Fig. 6: The entire circuit of fuzzifier
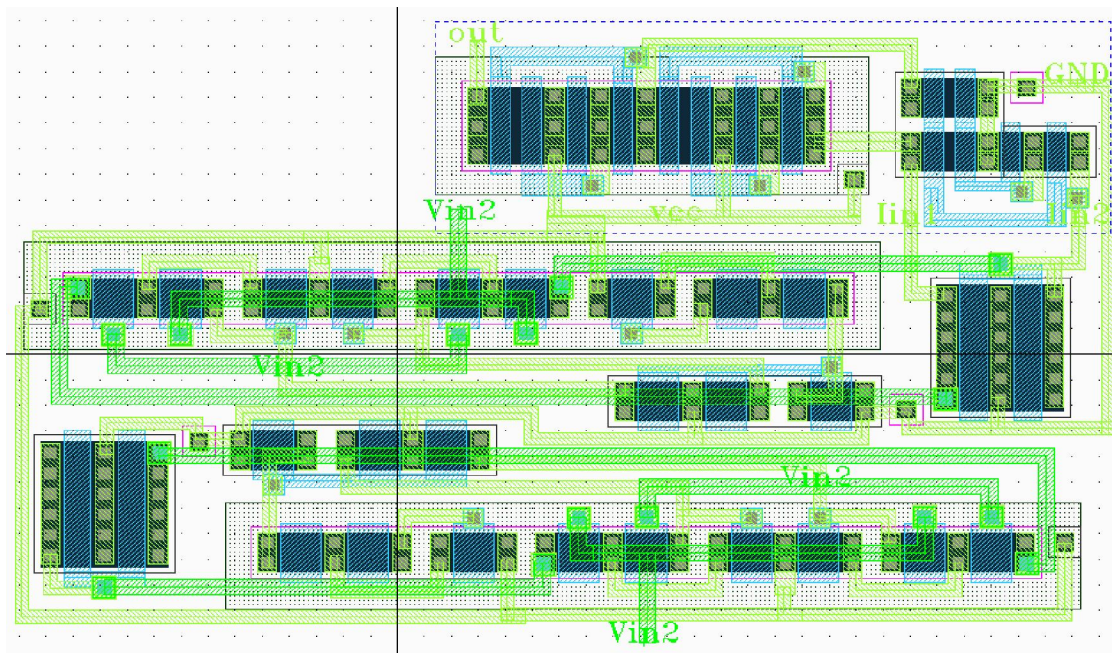
Fig. 7: Layout of fuzzifier circuit.
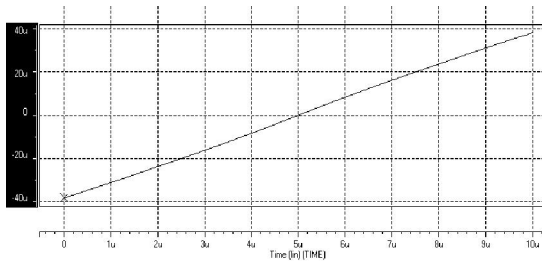
Fig. 8: The simulation result of transconductance

The simulation results of the membership function generator circuit for z-shape memberships with variable slops are shown in Fig. 9(a) and for s-shape memberships in Fig. 9(b). The input control voltage V_B (bases control voltage) is constant and the input control voltage V_{DC} (slops control voltage) is fixed in different value from 0-1.5 while $2V_{P-P}$ is applied to V_A input voltage.

(a)

(b)
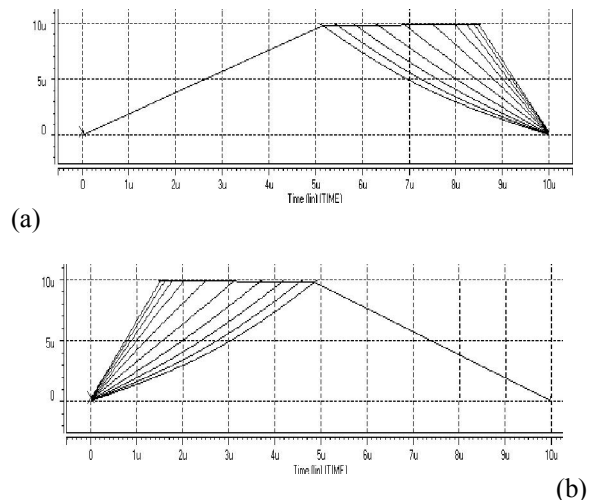
Fig. 9: The simulation result of fuzzifier with variable slop in (a) s-shape (b) z-shape membership functions

And the simulation results z-shape memberships with variable bases are shown in Fig. 10(a) and for s-shape memberships in Fig. 10(b). The input control voltage V_B (bases control voltage) is fixed in different value from 0.5-1.5 and the input control voltage V_{DC} (slops control voltage) is constant while $2V_{P-P}$ is applied to V_A input voltage.

Conclusions

A new CMOS voltage-input current-output fuzzy membership function has been presented. The fuzzyfier has input control voltages to tune the slops

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and bases of membership functions. The performances have been demonstrated using HSPICE simulations.

(a)

(b)
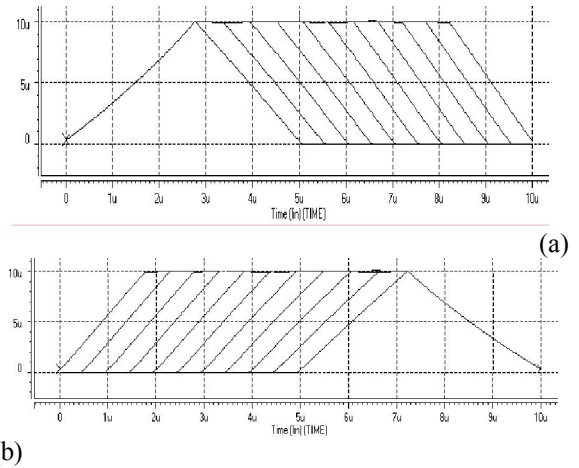
Fig. 10: The simulation result of fuzzifier with variable bases in (a) s-shape (b) z-shape membership functions

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Comparison and analysis of the School of Physical Education and Sports Science,Ph.D. Thesis, University of Urmia and Tabriz

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Abstract: The purpose of this study,thesis study of physical education university of Uremia and Tabriz is from 1384 to1389. Population and sample survey, all theses (at this stage, only the first page) is the nation's higher education institutions.In this study, the researcher used the descriptive method is to collect information.To identify and determine all titles dissertation, University of Uremia and Tabriz to visit libraries and information was collected.272 Statistical Society thesis in two university libraries that have been written between the years 1384 to 1389.Sample size in this study is the statistical community. Information about the sample Include name, gender, Thesis, in defense, environment and science oriented course of study.For data analysisis used descriptive statistics. The results are briefly distillers: Number of dissertation withsurvey methodin total 272 samples was 40%.Also 66% of students surveyed were female.

Key words: Analysis-Thesis-Physical Education and Sport Science- University of Uremia and Tabriz

Introduction:

A large volume of academic researchare conducted in the dissertation And many scientific papers, from theses and dissertations are extracted Therefore, theses are important in the production of new knowledge In other words, the thesis is not only to train students in research, produce new knowledge is one of the ways. (Feizi;geramipur .1390) . The only thing that might be useful in this thesis makes the process somewhat pale,They are not published in widely Because usually the version that will be provided to the judges for evaluation, Only a few limited editionof Each the thesis is.copy Usually a copy of the department and the college student version no longer in university library And another version with a few teachers and counselor to stay. Finally, a version of the National Centers of Academic countries thesis is borrowed. For example, a copy of theses students from all over the country Iranian students abroad, the Institute of Science and Technology (irandak) is maintained Thus, a total of about ten copies of each thesis may be copy This issue of the accessibility of content thesis reduces. However, Article extracted from dissertations effective strategy for improving the availability of their data. In some universities today full text dissertations in electronic form shall be kept And special provisions Electronic access to these works as expected.

Given thechoiceofresearchapproach inhigher education Beginning in1379 and changed to the Ministry of Science, Research and Technology study retrospectively All researchfaculty, higher education thesis And evaluate existing researchis necessary because Addressing thefundamentalissuesat the beginning ofa change in strategyresearch Oneof the most importantdepartmentsoftheorganization This entity should be doneinsmallorganizationsThat could be thebasis forfutureplanning andaction . Therefore, quantitative analysis of research graduate thesis titles Higher educationisTabriz and Urmia.

Theoretical Foundations:

In India, there areseveralresearch and development centers. The assessment criteria are not usually interested. Hence, the question remain sun answered in theminds. Thefundingofresearch into what is income? If theanswerstoquestionssuch astra in side by scholar Published article, a new formulation and identification aside, do not havethe answer yet. Because R & Dis notasystematicreview and evaluation. However, non-significant studieshave been conductedonsurveyresearch. The following are some of the fluid. (Imam Zadeh,1376).

Sharifi, M. (1367) Ageneralreviewof thestate's research universities do. AlsoF.MR(1379) The evolution of research indicators(77-1357) Regarding the number ofcenters, the number of research projects have been published inbooks andmagazinesmay be checked. Merecataloging of Physical Education. Theses by JudgeSoheilaZadeh (1376), The dissertational so describes aphysical Tuesday, academic centers (Tehran University, teacher training

and teacher training) ByMelonDreams(1377) have done. Noteworthythattworecentstudiesin the field of physical educationhave been Comprehensive studies regarding contentorare notgeographically .

The thesiswas tostudythecontentof them, wholly or partially, is devotedtoresearch methodology. Akram (1371) examined the methodsused in the thesis of three universities in the years1355to1370and The thesis found that80 percent of survey (descriptive), 12%of the historical method, 5%and 3% of thecase studies have usedcitation analysis. The finding softhe thesis in the years1366to1375 (Kyanmhr, 1376)also suggeststhat thelargestshare of research methods(79/7 percent**).** From Survey (descriptive) is. GracefulS.(1376) also have abook of essays that analyzesthe content) In the years1370 to1374 and thenotification of the research methods used to achieve this resultis The highest share of surveymethods (with 83/61percent) respectively. International scalestudies on the methodology ofthe research as been donein thefield of library and information Internationalscalestudies on the methodology ofthe researchhas been donein the field of library and information .

Shvgsexual (1976) toreviewthe 1970 Library of research deals. He describes this research strongly pragmatic Devoid oftheoretical under pinnings knows. One of thefindingsBlakeand Thomas (1990) about theways in which Students in applied research and dissertationabstractsare reflected. The author relies mainly on researchmethods" case study," "research," and "historical method" isdescribed. Blvma Prytz(1980)reviewedresearch papersin39 journals in theyears1950, 1960, 1965, 1970, and 1975 Published deals .Selectedcore journals based on his reading of the "Social Science Citation Index", "Abstract Information","CurrentAwareness", "Information and Library Review," and "Text Library" wasAnd thisis achievedthrougha1272 research paper. Resultsshow that the eleven methods used in this researchOf whichthe largestshare belonged to thesurvey (28 percent) andthehistorical method (with 18 percent).

 Part of theresearch findings Jarvlynand Walker (1993) also suggeststhatthe833research papers published in 37coreLISjournals, the majority (22percent) ofsurvey. KumarR(1995)Proceedings oftheLISin1994 and1995indicate acommon. And conquer method in this field.

Materials and Methods:

In thisstudy, the researcher has made use ofthe descriptive method ofdatacollection.The population of this study, all thetitles ofTabriz and Urmia University ofPhysical EducationTheses Thenumber 136 is thesupervisionoftheUniversity. Population of 272 dissertation.

At this stage, thesamplepopulationis the same.

To gatherinformation,referto thedocumentation available on theUniversity Libraries . Notethatthedata collection component, the reference accuracy as genera lresearchanddissertationishome. Aresearcher at a page that listsallof thedata were collectedon Informationon mostof thesecomponentsmay be easily studied, but thetendency ofcomponents within the scientific andobjectiveinvestigation ; According to the criteria and definitionsofphysical education, were targets of the investigationangle.

Field ofphysical education atthegraduatelevel main trends that include:Sportsmanagement, development and motor learning, exercisephysiology, biomechanics, sports,socialand philosophical foundation sofsport(Supreme Council of Planning, 1375). Nevertheless,themaincourseofa physical education curriculumas wellastrendsthatare Sports psychology, behavior modification, physical pathology, therapeutic exercises and, finally, the dissertation topic was dedicated to one of the above trends.

About the purposeof research, research methods, according to the definitionsof valid resources for researching different typesofangles,Theircategories. Classified according tothe research objectives, Before anything else,the"degree of generalizability of the findings and theirdirect applicationinother circumstances would beconsidered.

Types of researchare as follows: 1) basic research, 2) applied research, 3) Research,evaluation, and 4) developmentstudies, 5)actionresearch.

Results:

In Table 1. Distribution of genderIn formulating the thesis University of Uremia

Gender	Number	percent
Son	46	34٪
Girl	90	66٪
Sun	136	100٪

According to Table 1, a total of 136 theses Dissertation In 46 (34%) of the dissertation throughout the years of this study, the boys have written And Dissertation, 90 (66%) is written by the girls.

Table 2. Frequency Distribution of Gender In formulating the thesisUniversity of tabryz

Gender	Number	percent
Son	53	39٪
Girl	83	61٪
Sun	84	100٪

According to Table 2, a total of 84 theses at the University of Tabriz During the year under

review has been formulated39% (33) has been written by the boys and 61 percent (51 titles), the girls have written.

Table 3. Distribution of research methods in Thesis, University of Urmia

Research Methods	Number	percent
Survey	44	32٪
Historical	0	0
Case Study	22	17٪
Experimental	16	11٪
Evaluative		2٪
Comparative	43	32٪
Documentary	8	6٪
Content Analysis	0	0
Citation analysis (bibliometrics)	0	0
Sum	136	100٪

According to Table (3) among 10 types of research methods in theses Physical Education and Sports Science,University of Urmia, have been used. The most frequent Survey method and compared with 84dedicated The lowest frequency to the evaluation only with three isdevoted Also, the methods of

historical research, content analysis and citation analysis in this study is not great.

Table 4. Distribution dissertation research methods at the University of Tabriz

Research Methods	Number	Percent
Survey	64	44٪
Historical	0	0
Case Study	12	7٪
Experimental	18	12٪
Evaluative	10	7٪
Comparative	24	23٪
Documentary	8	6٪
Content Analysis	0	0
Citation analysis (bibliometrics)	0	0
Sum	136	100٪

Based on Table 4 Research Methods in Theses among Physical Education and Sport Sciences Tbryz have been used, The most frequentto The survey methodology. With 64 as Is dedicated and The lowest frequency to The document Only 8 titlesIs dedicated. Also, the methods of historicalresearch, content analysis and citation analysis in this study is not great.

Table 5: Distribution of research methods at the University of Urmia in different year

Methods	1384	1385	1386	3871	1388	1389	total	percent
Survey	7	7	9	7	6	7	43	32٪
Historical	_	_	_	_	_	_	0	0
Case Study	_	2	3	4	1	2	12	17٪
Experimental	3	2	2	3	2	6	18	11٪
Evaluative	1	_	2	_	_	-	3	2٪
Comparative	6	7	6	9	10	4	42	32٪
Documentary	3	2	3	4	2	4	18	0
Content Analysis	_	_	_	_	_	_	0	0
Citation analysis (bibliometrics)	_	_	_	_	_	_	0	0
total	20	20	25	27	21	23	136	100٪
percent	14٪	14٪	19٪	21٪	15٪	17٪	100٪	

Table 6: Distribution of research methods at the University of Tabriz in different years

Methods	1384	1385	1386	3871	1388	1389	total	percent
Survey	10	12	8	10	12	13	64	44٪
Historical	–	–	–	–	–	–	0	0
Case Study	1	2	2	1	3	2	12	17٪
Experimental	3	2	1	4	3	5	18	12٪
Evaluative	1	2	2	1	3	1	10	7٪
Comparative	2	4	2	5	6	4	23	23٪
Documentary	2	1	1	1	2	1	8	6٪
Content Analysis	–	–	–	–	–	–	0	0
Citation analysis (bibliometrics)	–	–	–	–	–	–	0	0
total	19	23	17	22	29	26	136	100٪
percent	15٪	16٪	15٪	16٪	20٪	17٪	100٪	

Table 7. Entire distribution of research methods at the University of Tabriz and Urmia

Research Methods	Number	Frequency
Survey	108	%40
Historical	0	0
Case Study	34	%12
Experimental	34	%12
Evaluative	13	%5
Comparative	67	%25
Documentary	16	%6
Content Analysis	0	0
Citation analysis (bibliometrics)	0	0

According to Table (7), both with 40% of the maximum frequency is the survey research method

Conclusions:

Since the of present Theses physical education in higher education institutions in more than a decade has passed Review the situation and how they can reference for researchers, research managers and Physical Education provides students.therefore, it has been tried,in The present study provides such authority.from the results of the aforementioned It follows

Which The first method survey that previous studies among the major methods of research in this field has been evaluated on a global scale. In Urmia and Tabriz,that the highest share of thesis of production in the field of physical education at the University of Urmia and Tabriz is true.and This shows that the method is more specific than the native population and the nature of the field. By comparing the results of this study found some similarities in the results above background is observed, Such that,in Research that malih about The research articles and LIS was carried The most abundant is of type "survey" . Kumar in his sKianMehr reach the conclusion that most methods used in the thesis is devoted to the description method.tudy concluded that the most practical method of study By he is kind of "survey".Mohsen Zadeh found that the results of his dissertation research methodology "survey" of the oldest methods are in the field. That did not undergo decay and has always followed the upward And "library" of the oldest methods is that unlike other methods in this field is downward journey. In this The study also found that the survey has been the most fortunate among students. The gender distribution of students' results 66% of female students He has been writing theses Note that the ratio of girls to boys in recent years favor of girls is partly predictable.

Suggestions:

Offer can be presented in two categories: one observer obtained optimal results and the recommendations for future research. Using the results of this study, the following may be important:

Compensate for the lack of research in the field of physical education requires are comprehensive policies and programs which The Department of Education, Centers and institutions responsible for

producing papers, theses and research projects should be put on the agenda.

The results of this study and previous research in the field of library and information science is suggested To further investigate the cause of the low number of dissertations, theses, research methods that either did not develop in them and Or the number of theses and research in this subject is very small note. And recommended that the Department of Physical Education and Sports Science Host university master's degree this major topics for students doing thesis research Accept That is important to the field of specialization. Also, teacher advisors Subjects are offered to students who are working less. The results of the research groups of the University of Physical Education recommended That Linked together

And every year Thesis and topics for other universities to describe In order to prevent duplication.

In future research, the following recommendations can be made:

Due to the short timeframe of this study, it is proposed in the future at a time (rather long) to be studied in a systematic process to determine the trend.

Review progress toward a master's thesis research topics and methods of physical education in Iranian universities.

The process of research methods in other areas of scientific research in order to identify the acceptance or non-acceptance theme and Or specific research methods In some universities, how entry-tracking research topic or methodology used in the research of a university and other universities.

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State Feedback Load Frequency Controller Design Using Artificial Bee Colony Algorithm

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Abstract: Load Frequency Control (LFC) is one of the major issues in the power system design and operation. In this paper a new method to solve load frequency control problem is proposed using the state feedback controller based on Artificial Bee Colony (ABC) Algorithm. For this, the designing problem is restructured as an optimization problem and an objective cost function is used to design the gains of the state feedback matrix. The proposed cost function decrease the frequency deviation and power flow variations. In this paper the ABC algorithm is employed to minimize the proposed cost function. For the purpose of the proposed method's evaluation, the design controller is applied to a two area power system with considerations regarding governor saturation and the results are compared to the one obtained by a classic PI controller. Moreover, the robustness of the proposed method is tested against change of parameters. The simulation studies show that the designed controller by suggested method has a very desirable dynamic performance, better operation and improved system parameters such as settling time and step response rise time even when the system parameters change.

1. Introduction

With the development of extensive power systems, especially with increasing size, changing structure and complexity of these interconnected systems, the Load Frequency Control (LFC) has become one of the important criterion in electric power system design and operation and has received a great deal of attention [1].

An interconnected modern power system with commercial and industrial loads, require operating at constant frequency with stable and reliable power. The fundamental goals of the LFC in an interconnected power system are to hold reasonably uniform frequency at each area and to maintain the tie-line power interchanges in a predefined tolerance in the presence of modeling uncertainties, system nonlinearities, area load disturbances and sudden changes in load demands [2].

During the past decades, several control approaches have been proposed and applied to the LFC design problem including; optimal control, adaptive control, model predictive control, sliding mode control and robust control which can be found in [2–6], respectively. Each of these techniques has their own advantages and disadvantages.

In [2] the optimal control strategy is presented for dealing with parameter variations. These controllers are based on state-space approach and require the full data related to the system states, whose measurement or estimation is not simple or might be impossible. The authors in [3] presented an implementation of adaptive technique for LFC controller design. Due to requirement of the prefect model, it is rather difficult to apply these techniques to the LFC in practical implementations.

In [4], a linear model predictive control is present to solve LFC problem. Power systems have a wide range of operating conditions that change frequently. So, MPC linear model will not be able to handle the dynamic behavior of them and nonlinear model must be used for better control performance. The sliding mode control is another approach that is used in LFC problem [5], the disadvantage of sliding mode control is sudden and large change of control variables during the process which leads to high stress for the system. Some authors have been employed robust control methodologies [6] to the solution of LFC problem. Although proposed methods gave good dynamical responses, but robustness in the presence of large modeling uncertainties was not considered and stability of the overall system was not guaranteed.

More recently, there has been a growing concern in Artificial Intelligence (AI) techniques, such as fuzzy logic control (FLC) [7], Artificial Neural Network (ANN) [8] and Biologically Inspired (BI) algorithms [9, 10] to design of load frequency controller in a power system by the researches around the world.

State feedback control method is one of the most commonly used techniques in the wide area of control problems and applications. The difficulty of this approach consists essentially in the determination

of the state feedback control gains so that the performance specifications, such as rise time, settling time, overshoot, and steady state error is well understood, are satisfied.

The computation of state feedback control gains is conventionally handled by pole placement method or LQR method via Riccati equation. Unfortunately, they still possess trial-and-error approach in choosing their parameters. Therefore, an intelligent method to resolve this problem is proposed by adopting ABC-based optimization.

ABC algorithm is a population-based stochastic optimization algorithm inspired from the particular intelligent behavior of honeybee swarms when searching for food source and proven its superior capabilities, such as faster convergence and better global minimum achievement [11].

This paper investigates the ability of ABC method to design and evaluation of a state feedback load frequency controller of power system. The design problem of state feedback load frequency controller is formulated as an optimization problem according with the time domain based objective function which is solved by the ABC technique that has fewer parameters and stronger search capability as well as is easy to implement. The proposed approach is implemented to a two-area interconnected power system with considerations regarding governor saturation. The results obtained by proposed approach are compared with those obtained by classic PI controller reported in the literature. Simulation studies show that the dynamic performance of the proposed controller is considerably desirable.

2. Overview of ABC algorithm

ABC algorithm, originally developed by Karabog in 2005 [11] which simulates the foraging behaviour of a bee colony. Due to the advantages of the ABC algorithm, such as simple in concept, easy for implementation, and fewer control parameters, it is being researched and utilized to solve different kinds of optimization problems by researchers around the world since 2005, such as data clustering [12], leaf-constrained minimum spanning tree problem [13], designing IIR filters in [14] and designing optimal parameters of power system stabilizer.

In ABC algorithm, the colony of artificial honey bees consists of three types of bees: employed bees, onlookers and scouts, which half of the colony population are employed bees and the remaining of them form the onlooker bees [11]. Each solution of optimization problem is called a food source in the search space. On the other word, the searching process of bees for the food source stands for the finding process for the optimum solution of problem

to be optimized. The fitness of solution corresponds to the profitability of food source. Also, the related profitability (fitness) of a food source (solution) is calculated by evaluation of the fitness function of the corresponding variables considering the related objective function. The number of solutions is known as SN and is considered equal to the number of employed bees or the onlookers. The employed bee whose food source has been abandoned by the bees becomes a scout [11, 12].

The main procedures of the ABC algorithm can be written as follows:

Step 1: Initialize population.

Step 2: Send the employed bees onto their food sources and evaluate their nectar amounts (fitness).

Step3: Place each onlooker bee on a food source according to her nectar amounts (quality of her solution), based on the information provided by employed bees

Step4: Determine the source to be abandoned and assign its employed bee as scout for searching area for discovering new food sources.

Step5: Memorize the best food source (solution) found so far.

Step6: Until the termination criterion is satisfied, repeat steps 2-5.

Similar to other evolutionary algorithms, this algorithm begins with an initial population of "SN" food source positions created randomly within the feasible space. Each food source corresponds to a solution in the search space. For D-dimensional problems (D variables), the position of the ith food source is represented as $X_i=[x_{i1},x_{i2},...,x_{iD}]^T$. Initial population of artificial bees are generated randomly within the range of the boundaries of the parameters, as follow.

$$X_{ij} = X_j^{min} + rand(0,1)\left(X_j^{max} - X_j^{min}\right) \tag{1}$$

Where, $i\in\{1,2,…, SN\}$ and, $j\in\{1,2,…, D\}$ which, D is the number of optimization parameters. X_j^{min} and X_j^{max} are the lower bound and upper bound of the parameter j, respectively. Also, rand () is a random number in rang of [0, 1].After initialization, all food sources (solutions) are subjected to repeat cycles of the search processes of the honeybees. The search process is continued until the termination criterion is met. The termination criterion could be maximum cycle number (MCN) or when an error tolerance (ε) is met [12].

In step 2, employed bees produce a modification on the position of the food sources (solutions) in their memories depending on local information (visual information) and produce new food source positions (new solutions), V_{ij}, in the

neighbourhood of old food source position (old solutions), X_{ij}, using the following equation:

$$V_{ij} = X_{ij} + r_{ij}(X_{ij} - X_{kj}) \qquad (2)$$

Where, $j \in \{1,2,\dots, D\}$ is a random integer in the interval [1, D]. $k \in \{1,2,\dots, SN\}$ is a randomly chosen index that $k \neq i$. Moreover, r_{ij} is a uniformly distributed real random number in the range [-1, 1]. It is an adaptively control parameter that controls the production of neighbour food sources around X_{ij} and determine the comparison of two food positions visually by a bee. As can be seen from (2), as the difference between X_{ij} and X_{kj} reduced, the perturbation on the position X_{ij} gets decreased, too. Thus, as the search find better solution, the step length is steadily decreased.

If this repositioning process produces sources (solutions) with higher nectar amounts (better fitness's) than that of the previous ones, the bees replace the position of new sources with the previous ones. Otherwise they keep the position of the previous sources food in their memories.

At third step, after all the employed bees complete their searches process, they communicate their information related to the nectar amounts (fitness's) and the positions of their sources food (solutions) with the onlooker bees. Then, the onlooker bees calculate the nectar information taken from all employed bees and select food sources by using a selection probability that depends on the fitness values of the solutions in the population. As the fitness of solution increases, the probability of that solution chosen also increases [13].

This probabilistic selection scheme might be a roulette wheel, stochastic universal, rank selection, disruptive selection, tournament selection or another selection method. The basic ABC algorithm uses the roulette wheel selection mechanism in which, the probability value associated with a food source, Pi, can be expressed by the following expression:

$$P_i = \frac{\text{fitness}_i}{\sum\limits_{i=1}^{SN} \text{fitness}_i} \qquad (3)$$

Where fitness$_i$ is the fitness value of the ith food source (solution) and is proportional to the nectar amount of the food source in the ith position. Also, SN denotes the number of food sources which is equal to the number of employed bees or onlooker bees.

After selecting the food source, as in the case of the employed bee, onlookers start to carry out the exploitation process and produce some modifications on the positions in their memories by using (2). Here, new positions V_{ij} are produced for the onlookers from the solutions X_{ij}, selected depending on Pi. Once again, if this repositioning

process produces sources food (solutions) with higher nectar amounts (better fitness's) than that of the previous ones, the bees replace the position of new sources with the previous ones. Otherwise they keep the position of the previous sources food in their memories [12, 13].

In ABC algorithm, there is a control parameter which is called "limit" for abandonment. Limit is a predetermined number of cycles that controls the times of updates of a certain solution and is used to determine if there is any exhausted source to be abandoned. For this, after all employed bees and onlooker bees complete their searches; the algorithm checks the counter value which has been updated during search. If the value of the counter is greater than the limit value and there is no improvement becomes possible in the food source position, then the source associated with this counter is assumed to be abandoned and the employed bee becomes a scout. Then scout starts to search a new food source to be replaced with abandoned one.

This is simulated by generating a site position randomly and replacing it with the abandoned one. If the abandoned source is Z_i, then the scout randomly discovers a new food source to be replaced with Z_i. This operation can be expressed as in (4). In basic ABC, it is assumed that only one source can be exhausted in each cycle, and only one employed bee can be a scout. These steps are repeated through maximum cycle number (MCN) or until a termination criterion is satisfied.

$$Z_i^j = Z_{min}^j + \text{rand}(0,1)\left(Z_{max}^j - Z_{min}^j\right) \qquad (4)$$

3. Power System Model

In actual power system operations, the load is varying randomly and continuously throughout the day. As a result, both frequencies in all areas and tie-line power flow between the areas are affected by these load changes at operating point. These changes create a mismatch between generations and demand that result in exact forecast of real power demand cannot be assured. Therefore, for good and stable power system operation, both the frequency and tie-line power flow should be kept constant against the sudden area load perturbations, system parameter uncertainties and unknown external disturbances. Therefore, to ensure the quality of power supply, a load frequency controller is needed to restoring the system frequency and the net interchanges to their desired values for each control area, still remain.

The area frequency deviation (Δf) and tie-line power deviation (ΔP_{tie}) are two important parameters of interest. The linear combinations of them are known as area control error (*ACE*). The measurements of all the generation and all load in the system for computation of the mismatch between the

generation and obligation in one area is so hard. The mismatch is measured at the area control center by using *ACE*. The *ACE* for the *i*th area is defined as:

$$ACE_i = P_{tie_i}^{act} - P_{tie_i}^{s} - 10B_i(f_i^{act} - f_i^{s}) = \Delta P_{tie_i} - 10B_i\Delta f_i \qquad (5)$$

Where $P_{tie_i}^{act}$ and $P_{tie_i}^{s}$ are the actual and scheduled (manually set) interchange of ith area with neighboring areas, respectively. Also, f_i^{act} and f_i^{s} are the area's actual and scheduled frequency, in ith area, and B is the frequency bias coefficient of ith area that is a negative number measured in MW per 0.1Hz. However, the ACE signal often is calculated using the area frequency response characteristic β instead of B: as follows:

$$ACE_i = \Delta P_{tiei} + \beta_i\Delta f_i \qquad (6)$$

$$\beta_i = \frac{1}{R_i} + D_i \qquad (7)$$

In which (D_i) is the damping ratio or the frequency sensitivity of the ith area's load and R_i is

the regulation due to governor action in the ith area, or droop characteristic. Also, β_i is frequency bias constant and should be high enough such that each area adequately contributes to frequency control [1].

The frequency and interchanged power are kept at their desired values by means of feedback of area control error containing deviation in frequency and error in tie- line power, and controlling the prime movers of generators. The main objective of control system is to damp these variations to zero as fast and smooth as possible and following a change in the load demand values.

A two-area interconnected power system with considering governor limiters is investigated in this study. Each area consists of three major components, which are turbine, governor, and generator. The detailed transfer function block diagram of uncontrolled two-area system is shown in Fig. 1.
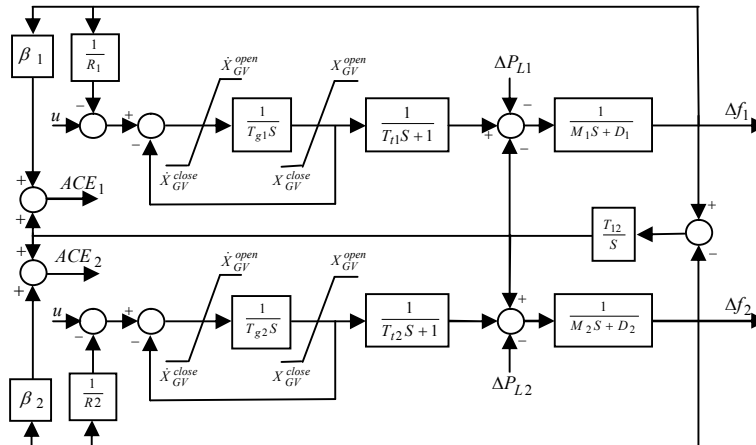
Figure 1. Two-area interconnected power system

Table 1.Two Area Interconnected Power System Parameters

Area	Parameters
Area# 1	M=10, D_1=0.8, T_g=0.2, T_t=0.5, R_1=0.05, $\dot{X}_{GV}^{open} = 0.4$, $\dot{X}_{GV}^{close} = 1.5$, $X_{GV}^{open} = 1.2$ $X_{GV}^{close} = 0.4$, T_{12}=2
Area# 2	M=8, D_2=0.9, T_g=0.3, T_t=0.6, R_2=0.0625, $\dot{X}_{GV}^{open} = 0.4$, $\dot{X}_{GV}^{close} = 1.5$, $X_{GV}^{open} = 1.2$, $X_{GV}^{close} = 0.4$, T_{12}=2

Where Δf_1 and Δf_2 are the frequency deviations in area 1 and area 2 respectively in Hz. Also ΔP_{L1} and ΔP_{L2} are the load demand changes in areas 1 and 2 respectively in per unit (p.u.). Moreover, T_{gi} , T_{ti} and M_i are speed governor time constant (s), turbine time constant (s), and power system time constant (s) of ith area, respectively. The

detailed transfer function models of the speed governors and turbines are discussed in [1]. Typical data for the system parameters and governor limiters, for nominal operation condition, are adopted from [1] and presented in Table 1.

The state-space model of foregoing power system can be modeled as multivariable system as the following equation:

$$\dot{x} = Ax(t) + Bu(t) + \Gamma d \tag{8}$$

Where $x(t)$, $u(t)$ and d are state, control and load changes disturbance vectors, respectively and represented as following form:

$$u = [\Delta\Delta_{ref1}\ \Delta P_{ref2}]$$
$$d = [\Delta\Delta_{L1}\ \Delta P_{L2}] \tag{9}$$
$$x = [\Delta\Delta_{v1}\ \Delta P_{m1}\ \Delta\omega_1\ \Delta P_{Tie}\ \Delta P_{v2}\ \Delta P_{m2}\ \Delta\omega_2\ \Delta E_1\ \Delta E_2]$$

Also, A, B and Γ are given in (10) and are respectively the system state, control input and disturbance constant matrixes of appropriate dimensions associated with above vectors. The corresponding coefficient matrices are given in Table 1.

$$
A = \begin{bmatrix}
\frac{-1}{\tau_{g1}} & 0 & \frac{-1}{R_1\tau_{g1}} & 0 & 0 & 0 & 0 & 0 & 0 \\
\frac{1}{\tau_{T1}} & \frac{-1}{\tau_{T1}} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & \frac{1}{M_1} & \frac{-D_1}{M_1} & \frac{-1}{M_1} & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & T_{12} & 0 & 0 & 0 & -T_{12} & 0 & 0 \\
0 & 0 & 0 & \frac{-1}{\tau_{g2}} & 0 & \frac{-1}{R_2\tau_{g2}} & 0 & 0 \\
0 & 0 & 0 & 0 & \frac{1}{\tau_{T2}} & \frac{-1}{\tau_{T2}} & 0 & 0 & 0 \\
0 & 0 & 0 & \frac{1}{M_2} & 0 & \frac{-1}{M_2} & \frac{-D_2}{M_2} & 0 & 0 \\
0 & 0 & B_1 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 & B_2 & 0 & 0
\end{bmatrix} \tag{10}
$$

$$
B = \begin{bmatrix}
\frac{1}{\tau_{g1}} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & \frac{1}{\tau_{g2}} & 0 & 0 & 0 & 0
\end{bmatrix}^T
$$

$$
C = \begin{bmatrix}
0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0
\end{bmatrix} \quad \Gamma = \begin{bmatrix} 0 & 0 & -1 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}^T
$$

In equation (9), ΔPref1 and ΔPref2 are output of state feedback controller that obtained from following equation:

$$u = \begin{bmatrix} \Delta P_{ref1} \\ \Delta P_{ref2} \end{bmatrix} = -Kx \tag{11}$$

Where K is state feedback matrix. To provide a reasonable dynamic performance for the system, tuning of feedback matrix parameters is done in the optimization process by using ABC.

4. Design of State Feedback Load Frequency Controller Using ABC

The goals are control of frequency and inter area tie- line power with good oscillation damping, also obtaining a good performance. Here, our task is to determine the state feedback control gains (K in Eq. 11) to satisfy performance specifications such as rise time, settling time, overshoot, and steady state error. So, the design problem is converted to an optimization problem and ABC is employed to solve this problem. Here, the state space model and available states are considered as (9) and (10),

respectively. The ABC is used to optimize the gains of state feedback controller with a fitness function based on integral of the square of the error (ISE) and the integral of time-multiplied absolute value of the error (ITAE) [1], which are respectively given by:

$$ISE = \int_0^{tf} (ACE_1^2 + ACE_2^2)dt \tag{12}$$

$$ITAE = \int_0^{tf} t(|ACE_1| + |ACE_2|)dt \tag{13}$$

The simulations are carried out with the feedback gains obtained from ABC with a fitness function as follow.

$$Fitness = w_1 \times ISE + w_2 \times ITAE \tag{14}$$

Where w_1 and w_2 are constant coefficient. A digital simulation is used in conjunction with the ABC optimization process to determine the optimum parameters of state feedback controller for the performance index considered. The first step to implement the ABC is generating the initial population where is considered to be 100. The number of employed bees and onlooker bees are considered 50. Also, the predetermined limit is set to 20.

5. Simulation Studies

A two-control area power system, shown in Fig. 1 is considered as a test system. The typical data for the system parameters and governor limiters for nominal operation condition can be given as Table 1.

In order to show the ability and effectiveness of the proposed method, a conventional PI controller by using the approach adopted from [1] is applied for comparison, too. It was found that $K_{I1}=K_{I2}=0.3$ were the best selections for having the best performance. Using ABC method for LFC design, the following results were obtained for state feedback controller parameters:

$$
K = \begin{bmatrix}
0.2646 & 1.766 & 27.8879 & -24.6821 \\
-0.1560 & -0.3998 & -14.9952 & 35.9892 \\
& -0.1778 & -0.4892 & -11.2231 & 5.1120 & -3.9871 \\
& 0.8733 & 3.1873 & 51.8614 & -4.7656 & 5.5638
\end{bmatrix}
$$

To show the effectiveness of the designed controllers, a time domain analysis is performed for the case study. To test the proposed method, a sudden small load perturbation which continuously disturbs the normal operation of the power system is applied to the system. Here we use a step load change of 0.01 p.u., (i.e. $\Delta P_{L1} = \Delta P_{L2} = 0.01$). The frequency deviation of both areas and tie-line power variation in nominal condition of the closed loop system are obtained and shown in Figs. 2, 3 and 4 respectively.

To show the robustness of the proposed approach and to investigate the effect of changing the system parameters on system performance, the

system parameters is considered as 25% increase for all system parameters. Figs 5-7 show response system for upper bound parameters condition including frequency deviation of areas 1 and 2, and also, tie-line power deviation.
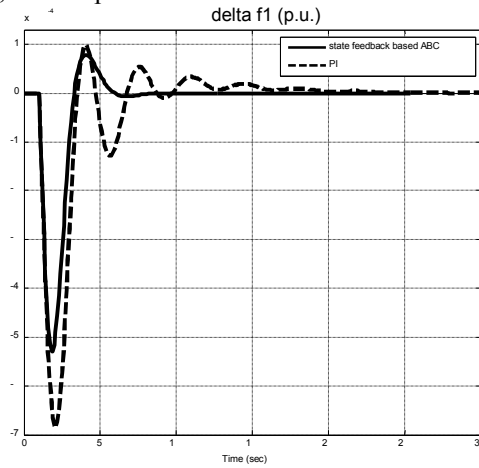
Figure 2. Frequency deviation of area 1
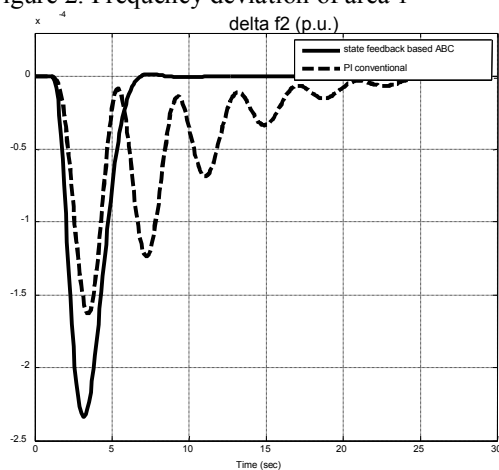
Figure 3. Frequency deviation of area 2
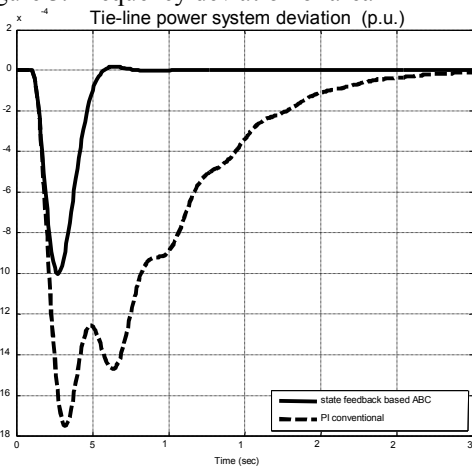
Figure 4. Tie-line power deviation
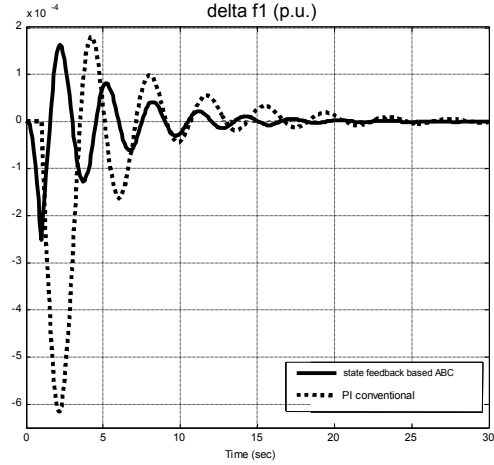
Figure 5. Frequency deviation of area 1 for upper bound of parameters
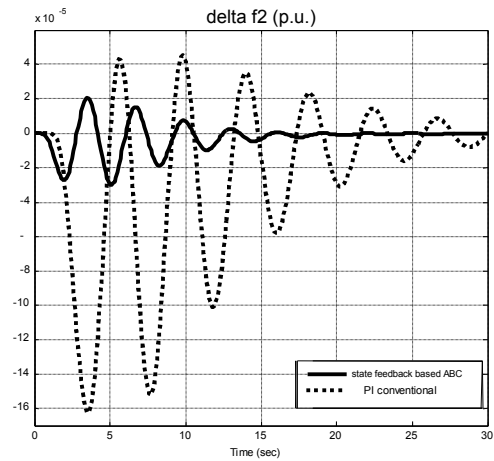
Figure 6. Frequency deviation of area 2 for upper bound of parameters
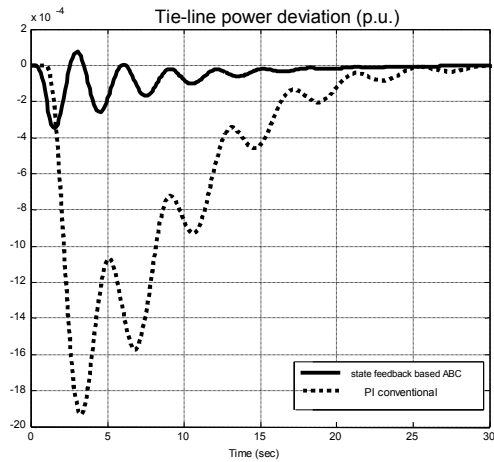
Figure 7. Tie-line power deviation for upper bound of parameters

From the comparing curves it can be seen, using the proposed method, the frequency deviation and tie-line power variation of two areas following the load changes and are quickly driven back to zero. It should be mentioned that although the overshoot of frequency response of classical PI controller shown in Fig. 4 is better than the proposed approach, but the settling time of the latter is better than the former. Generally, by looking at Figs. 4-6 it can be oncluded that the proposed method gives a better performance than the classical LFC.

Conclusions

In this paper a new control system incorporating the state feedback control and artificial bee colony algorithm is used for control of frequency and damping inter area tie-line power variation in a multi-machine power system. The performance of designed controller is tested on a two-area power system with considering governor limiters and the results obtained are compared with the classical PI controller. The simulation studies show that the designed controllers by proposed method have a very desirable dynamic performance over the PI controller in terms of settling time and step response rise time, even when the system parameters change.

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Comparing menstruation disorders between A and B behavioral types of university female athletes and non-athletes

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Abstract: The aim of this study was to compare menstruation disorders between A and B behavioral types of university female athletes and non-athletes. 250 university girl students were selected randomly and divided into two athlete and non-athlete groups in terms of systematical exercise and history during two years ago. After providing exact and required information from questionnaires, the volunteers were randomly selected and 150 questionnaires were distributed between the two groups. 250 questionnaires (inventories) were statistically analyzed after collecting and monitoring the questionnaires. This study was performed by the technique of, correlation and analyzed by the use of descriptive and inferential statistical methods (K-square test). The results showed that: 1. The level of primary amenorrhea outbreak in athletes was meaningfully more than non-athletes ($p<0.05$). 2. The level of primary amenorrhea outbreak in A type individuals was observed more than B type individuals, but the difference wasn't meaningful between the two types ($p>0.05$). 3. The level of secondary amenorrhea outbreak in non-athletes was observed more than athletes but the difference wasn't meaningful between the two groups ($p>0.05$). 4. The level of secondary amenorrhea outbreak in type A individuals was observed more than B type individuals but the difference wasn't meaningful between the two types.($p>\%$ 5). 5. The level of amenorrhea outbreak in non-athletes was observed more than athletes but the difference wasn't meaningful between the two types ($p>0.05$). 6. The level of amenorrhea outbreak in A type individuals was observed more than B type individuals but the difference wasn't meaningful ($p>0.05$). 7. The level of loss of weight outbreak before menstruation in non-athletes was observed more than athletes but the difference wasn't meaningful between the two groups ($p>0.05$). 8. The level of loss of weight outbreak before menstruation type B individuals was observed more than type A individuals, but the difference wasn't meaningful between the two types ($p>0.05$).

Key words: menstruation, A and B behavioral types, female

1. Introduction

Menstrual disorders such as amenorrhea/oligmenrrhea depend on many factors, including race, genetic make-up, BMI, and family history. However, the literature also shows that amenorrhea/oligomenorrhea is more prevalent among athletes than in the general population (Sherman & Thompson, 2006; Goodman & Warren, 2005). Despite discrepancies in the reported frequencies, which are attributable mainly to different definitions of amenorrhea/oligomenorrhea, unreported minor menstrual irregularities, and selection bias (Goodman & Warren, 2005), this is commonly accepted. To our knowledge, no study has evaluated amenorrhea/oligomenorrhea in Iranian female athletes, a group that is particularly interesting because the nature and practice of women's sports differ from those in the majority of other countries. This is due partly to the fact that women's professional sports – in the sense that sport is a woman's main profession – have almost no place in Iran. Women's participation in sports has increased substantially over the past few years, and this growth, especially on a competitive level, has been accompanied by a number of health concerns including disordered eating and menstrual disorders. 1,2 Apart from the societal pressure on women to be beautiful and thin, many female athletes are also pressured by coaches or the type of sport they are competing in (i.e. lean-build sports) to maintain a low body weight for aesthetic and/or performance purposes. This often contributes towards the development of DE and pathogenic bodyweight-control behaviors (i.e. restrictive eating, fasting, use of diet pills, laxatives and diuretics, binge-eating followed by purging) that can result in clinical eating disorders (i.e. anorexia nervosa and bulimia nervosa) and alterations in menstrual patterns.1 Potential long-term health consequences of DE and menstrual disorders include chronic fatigue, anaemia, endocrine abnormalities, and osteoporosis, to name a few (Nattiv et al., 2007; Beals & Meyer, 2007). Female student athletes may be at an even higher risk for DE owing to the added pressure of maintaining an

attractive and culturally acceptable body shape, and adapting to the new social and academic environment of a tertiary educational institution (e.g. college or university). Reported prevalence of DE and menstrual disorders in female university athletes varies and depends on a number of factors, including type of sport, level of participation, and type of questionnaire used to screen for DE (Nattiv et al., 2007; Coelho et al., 2010). Although a number of studies have reported a higher prevalence of DE and menstrual disorders in female university athletes compared with non-athletes, particularly in elite female athletes competing in aesthetic, weight class and endurance sports where leanness is emphasized (Sundgot-Borgen, 2004; Sundgot-Borgen & Torstveit, 2004) other studies failed to demonstrate differences in the frequency of DE and menstrual disorders between athletes and non-athletes, especially in sports where leanness is considered less important (Beals & Meyer, 2007; Coelho et al., 2010). The primary aim of this study was therefore to determine the prevalence of DE behavior and menstrual disorders in a group of provincial-to national level student netball players.

The data show that stress and emotional disorders are related to menstrual disorders. Almost all women who have been exposed to hazards for a long time have experiences menstrual disorders. Sometimes, minor changes in living style such as changing the job, family conflicts and financial troubles result in menstrual disorders. There are variable individual differences in understanding these stresses and how to face them and the level of vulnerability against these stresses among women, which result in these disorders (Wells, 2000). Psychologically people are divided into two groups in terms of understanding the stress and anxiety. Type A people are pugnacious, vying, impatient and aggressive. They feel that they are being pushed and are under stress. In most cases, when they have appointment they come before the determined time, they eat fast, they walk fast, they twitter and they will lose their patience if others work slowly. They press themselves to do more work in less period and these stresses finally result in most of diseases including cardiac diseases (Conrad Mellam & Arild Espne, 2003). Unlike type A people, there are type B people who take the problems easy and emphasize on the quality of life, they are not ambitious and impatient instead they are cautious and tidy (Spencera, 2000). Type B people are quiet, they don't hasten, never suffer from the feel of urgency and never evaluate themselves with successes. It seems that sport, as a factor for decreasing psychological problems, correcting negative personality traits, creating jollity and happiness, can be an important factor in adjusting

negative behaviors especially type A behaviors. On the other side, it has been observed that sport and physical activities cause some menstrual disorders including delay, interruption and irregularity in menstruation and beside physical activities, the stresses of competitions in athletes increases these disorders. The relation between sport and type of personality has attracted the attention of some researchers in the field of psychology. This needs more study and research about women than men, as women are mentally and physically different from men. On the other side, it has been shown that excessive exercise and physical activity at menstruation period, increases menstrual pains and causes menstrual disorders like interruption and irregularity. It seems that a research in this regard, which can study menstrual disorders taking into account the personality and behavior of women and evaluate the effect of sport, was very important and made the researcher to compare the menstrual disorders between type A and type B among athlete and non-athlete female university students. Gharakhanlu (2000) made a research about the relation between menstruation period, intensity of exercises and damages resulting from exercise. In this research 284 elite female athletes from 26 cities of Iran in 13 athletic fields were studied. The results of the research show that: 55% of the subjects believe that the probable effects of the intensity of exercise on menstruation depend on physical and mental differences. On the other hand 20% and 8% of the subjects, respectively, experienced the negative and positive effects of intensive exercises on their menstruation. Bollbolin et al. (1994) made a research on 21 women between 14-18 years and divided them into types A and B. The subjects exercised on a treadmill for 20 minutes with 60% Vo_{2max} and measurements included electromyography (EMG), blood pressure and psychometry data. It was observed that diastolic pressure in type B people was less than that in type A people during their activity. These data together with psychometry data suggested that physiologic and homodynamic exercise in women has high correspondence with the relation between the type of behavior and different physiological factors. Bolen et al. (2002) observed that 24 women out of 28 women who had irregular menstruation periods returned to their natural state after six months through decreasing their exercise.

2.　Methods
2.1.　Participants
The present study is correlative descriptive made through questionnaires. The statistical society of this research included 500 female athletes and 1500 non-athletes from university students.

Considering the high number of subjects in statistical society, 150 athletes and 150 non-athletes were selected randomly selection as samples of research.

2.2. Research Method

Considering the descriptive nature of the present research, questionnaire was used as a tool to perform this research. First a questionnaire was used to determine the individual qualifications and athletic records of subjects and Fredman Walmer standard questionnaire was used to determine the behavioral type of subjects and researcher-made questionnaire was used for menstruation. While one of the questionnaires was standard, the validity of each questionnaire was confirmed by experienced university professors. Chronbach alpha coefficient was used to measure the reliability of the other two questionnaires. The results of the research show that there is an internal correlation between two tools used in this research (α=662 and α=794). The researchers personally refereed to sport clubs of university (where the subjects were studying) to collect the data and randomly distributed the questionnaires between the subjects. The researcher also referred to the faculties of non-athlete subjects and randomly distributed the questionnaire between them and then collected the questionnaires and started to analyze the data of research.

2.3. Data Analysis

Inferential statistics and descriptive statistics were used to analyze the data of research such that statistical test of chi-square was used to analyze the hypotheses of research and relation between variables and descriptive statistics was used describe the findings.

3. Results

Table 1. Distribution of frequency percentage of behavioral types A and B

	Frequency	Percentage	Cumulative Percentage
Athlete Type A	94	37.6	37.6
Athlete Type B	31	12.4	50
Non-Athlete Type A	70	28	78
Non-Athlete Type B	55	22	100
Total	250	100	

In table 1, it is observed that among all the samples selected equally among athletes and non-athletes, 12% was type B and 38% was type A and it is concluded that the behavioral pattern of most of the athletes is type A and among 50% of non-athletes, 22% was type B and 28% was type A. As it is observed, behavioral pattern A is high among non-athletes but the difference is not significant.

Table 2. Data related to emergence of primary amenorrhea among athletes and non-Athletes

		Athlete (125 individuals)	Non-Athlete (125 individuals)	
Primary Amenorrhea	Yes (37)	Fo=25 Fe=18.5	Fo=12 Fe=18.5	x^2=5.77 α=0.016
	No (223)	Fo=100 Fe=111.5	Fo=113 Fe=111.5	

As it is observed in Table 2, the chi-square (5.77) obtained through comparison between emergence rates of primary between athletes and non-athletes is significant and acceptable in statistical level of 0.05 (X^2=0.05, df=1=3.48), so we can conclude that there is a significant relation between emergence of primary amenorrhea and the fact that the subject is athlete or non-athlete.

Table 3. Data related to emergence of primary amenorrhea among behavioral types A and B

		Type A (164 individuals)	Type B (86 individuals)	
Primary Amenorrhea	Yes (37)	Fo=28 Fe=24.27	Fo=9 Fe=12.73	x^2=1.96 α=0.162
	No (223)	Fo=136 Fe=139.73	Fo=77 Fe=73.27	

As it is observed in Table 3, the chi-square (1.96) obtained through comparison between emergence rates of primary amenorrhea between behavioral types A and B is not significant and acceptable in statistical level of 0.05 (X^2=0.05, df=1=3.48), so we can conclude that there is not a significant relation between emergence of primary amenorrhea and behavioral types A and B.

The following table is used for general testing of hypothesis No.1 based on investigation between emergence of primary amenorrhea, being athlete and non-athlete, behavioral types A and B:

Table 4. Data related to emergence of primary amenorrhea among behavioral types A and B among athletes and non-athletes

		Athletes (125 individuals)		Non-Athletes (125 individuals)		
		Type A (94 individuals)	Type B (31 individuals)	Type A (70 individuals)	Type B (55 individuals)	
Primary Amenorrhea	Yes (37)	Fo=25 Fe=18.5	Fo=25 Fe=18.5	Fo=12 Fe=18.5	Fo=25 Fe=18.5	x^2=5.77 α=0.016
	No (223)	Fo=100 Fe=111.5	Fo=25 Fe=18.5	Fo=113 Fe=111.5	Fo=25 Fe=18.5	

As it is observed in Table 4, the chi-square (6.27) obtained through comparison between emergence rates of primary amenorrhea between behavioral types A and B among athletes and non-athletes is not significant and acceptable in statistical level of 0.05 (X^2=0.05, df=3=7.28), so we can conclude that there is not a significant relation between emergence of primary amenorrhea and behavioral types A and B among athletes and non-athletes.

Table 5. Data related to emergence of secondary amenorrhea among athletes and non-athletes

		Athlete (125 individuals)	Non-Athlete (125 individuals)	
Secondary Amenorrhea	Yes (81)	Fo=38 Fe=40.5	Fo=43 Fe=40.5	x^2=0.457 α=0.499
	No (169)	Fo=87 Fe=84.5	Fo=82 Fe=84.5	

As it is observed in Table 5, the chi-square (0.457) obtained through comparison between emergence rates of secondary amenorrhea between athletes and non-athletes is not significant and acceptable in statistical level of 0.05 (X^2=0.05, df=1=3.48), so we can conclude that there is not a significant relation between emergence of secondary amenorrhea and the fact that the subject is athlete or non-athlete.

Table 6. Data related to emergence of secondary amenorrhea among behavioral types A and B

		Type A (164 individuals)	Type B (86 individuals)	
Primary Amenorrhea	Yes (81)	Fo=59 Fe=53.14	Fo=22 Fe=27.86	x^2=1.96 α=0.162
	No (169)	Fo=125 Fe=110.86	Fo=64 Fe=58.14	

As it is observed in Table 6, the chi-square (2.78) obtained through comparison between emergence rates of secondary amenorrhea between behavioral types A and B is not significant and acceptable in statistical level of 0.05 (X^2=0.05, df=1=3.48), so we can conclude that there is not a significant relation between emergence of secondary amenorrhea and behavioral types A and B.

The following table is used for general testing of hypothesis No.2 based on investigation between emergence of secondary amenorrhea, being athlete and non-athlete, behavioral types A and B:

Table 7. Data related to emergence of secondary amenorrhea among behavioral types A and B among athletes and non-athletes

		Athletes (125 individuals)		Non-Athletes (125 individuals)		
		Type A (94 individuals)	Type B (31 individuals)	Type A (70 individuals)	Type B (55 individuals)	
Secondary Amenorrhea	Yes (81)	Fo=31 Fe=30.46	Fo=7 Fe=10.04	Fo=28 Fe=22.68	Fo=15 Fe=17.82	x^2=3.88 α=0.274
	No (169)	Fo=63 Fe=63.54	Fo=24 Fe=20.96	Fo=42 Fe=47.32	Fo=40 Fe=37.18	

As it is observed in Table 7, chi-square (3.88) obtained through comparison between emergence rates of secondary amenorrhea between behavioral types A and B among athletes and non-athletes is not significant and acceptable in statistical level of 0.05 (X^2=0.05, df=3=7.28), so we can conclude that there is not a significant relation between emergence of

secondary amenorrhea and behavioral types A and B among athletes and non-athletes.

5. Discussion and Conclusion

After investigations, it was determined that the tendency of type A people for exercise is more than that in type B people, such that 76% of athletes are type A and 24% are type B. This finding is correspondent with the results of the researches performed by Karo, Ebi, Bachma and Yang based on high tendency of type A people for physical activity. It seems that people with behavioral pattern type A have more tendency for participation in athletic competitions because of their competitive and contest nature and understanding of high stress.

According to the investigations about menstrual disorders in behavioral patterns type A and B, considerable results are obtained. As it was observed about the rate of primary amenorrhea among behavioral types of athletes and non-athletes, the rate of primary amenorrhea in type A people is more than that in type B people. Although this difference was not statistically important, it showed that behavioral pattern type A is effective in delays of menstruation. It seems that during commencement of menstruation, behaviors type A can not have more effects on menstruation of girls because of inconstancy of personality, so it is suggested that a research should be done on 16-year-old athlete and non-athlete girls of behavioral types A and B with high confidence about constancy of personality of subjects.

When comparing the rate of primary amenorrhea between athletes and non-athletes, it was observed that there is a significant difference between these two groups: delay in commencement of the first menstruation among athletes is more than that among non-athletes. This finding is correspondent with the results of the researches carried out by Dil, Gerlash, Martin, Alexander, Malina, Harber, Avent and Campbell based on delay in commencement of menstruation among athlete girls. About the rate of menstrual interruption (secondary amenorrhea), no significant difference was observed between behavioral types A and B among athlete and non-athlete groups. This finding is not like most of the available researches including those of Dil, Blumberg, Spork and Martin, based on emergence of secondary amenorrhea among athletes. On the other hand, the results of this research showed that the rate of menstrual interruption among type A individuals is more than that among type B people. Although this difference is not statistically important, it shows that the stress and behavioral characteristics of type A can cause menstrual disorders among girls. This finding is correspondent with the results of the researches carried out by Kont Foreman and Doroty Harris that introduced the anxiety and psychological stresses as important factor in menstrual disorders. But considering the nature of the present research and definition of the research offered for secondary amenorrhea, there is no significant relation between type A and B athlete and non-athlete girls. While the findings of research show that there is irregularity of menstruation among girls, especially among type A, so it is suggested that another research should be done about menstrual disorders among types A and B athlete and non-athlete girls including increase or decrease of menstrual period or medical examinations and control.

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Effect of Corrective exercises on body indexes and some fitness factors in girls with scoliosis

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Abstract: The purpose of this study was to evaluate the impact of corrective exercises on body indexes (flexibility and back muscle strength) in girls (12-15 years old) with scoliosis. 40 girls (12-15 years old) with scoliosis were selected randomly from a guidance school and divided to two groups, 20 in experimental and 20 in control ones. All participants filled out the form to ensure that they had no heart and cardiovascular disease, in order to perform the required tests. After measuring the height and weight of participants, they were familiar with the tests. The pre-test consisted of the scoliosis evaluation, static strength and flexibility of back muscles and range of bending motion. Both groups practiced training programs for four weeks, each week four sessions for an hour and a half. Data were analyzed by paired t and independent t test and chi-square test (chi square). The research results demonstrated that the spinal flexibility and back muscles strength increased in the experimental group after a period of corrective movements, but there was not a significant difference between experimental and control groups. Corrective exercises had a positive impact on the level of the posterior superior iliac spine and there was significant difference between experimental and control groups. Corrective exercises had a positive impact on the shoulders surface, but there was not a significant difference between experimental and control groups. Lateral bending in the subjects of our research was asymmetrical and the results of corrective exercises did not show any significant difference in both groups.

1. Introduction

The term scoliosis is originated from Greek word meaning crooked; it is one of the most common changes of the spinal cords that its recovery very difficult. The human spine is located in the vertical situation due to supporting muscles and balanced position and degrees of kyphosis or lordosis is normal and there is no any lateral curvature in these natural spines (Anderson, 1992). Scoliosis is consisted of the lateral deviation and rotational series of verterbrae from the midline axis, (Frymoyer, 2004; Pehrson et al, 1991; Jackson et al 1989). Adolescent Idiopathic Scoliosis (AIS) is the most common of scoliosis and it includes more than 70% (Anthony, 2002). This change includes a three dimensional change of the spine with lateral curvature and vertebral rotation (Frymoyer, 2004). The prevalence of Scoliosis depends on the size of curvature so that the much more curvature makes its prevalence lower. There is a definite relationship between the prevalence of Idiopathic scoliosis and type. In the lowest degrees, the prevalence rate is equal in two types but how the degree of curvature becomes high, this prevalence gets high in girls (Anthony, 2002; Karol et al., 1993). The cases higher than 40, causes the related incidence in girls 10 times higher than boys (Frymoyer, 2004; Terry, 2003; Anthony, 2002).

The progression rate of deformation is higher in females (Anthony, 2002). Idiopathic scoliosis is seen in 2-3 % of children under sixteen years old (Terry, 2003). Increasing the size of curvature leads to the low prevalence so that the above 40 degree angler is seen in one-tenth percent of under sixteen years old (Weinstein, 1989). One of the most considerable complications of scoliosis can be Cardiac- respiratory dysfunction. This malfunction is due to the mechanism of chest following functional inability, Cardiac – respiratory disorders and finally early death would take place (Person et al., 1991; Jackson et al., 1989). Scoliosis causes to decrease the vital capacity in the thoracic lobe and impaired exercise capacity. Given the known cases, the effect of scoliosis is easily found on individual performance. Obviously, to increase physical performance of Cardiac– respiratory, the correction of scoliosis is exercise and scoliosis corrective movements have been shown as followings: Romano (2008) showed that among several proposed programs such as massage, manual exercise and so on, people who actively participated in the exercise group showed a reduction in the size of kab angle indicating the rate of scoliosis recovery after active exercises. Negrini (2008) in a review study stated that exercising can be effective in the prevention and

progression of Scoliosis. Corrective exercises with the aim of relieving pain is recommended for the prevention of deformation, creation of beautiful appearance, improved respiratory, increased chest expansion improved mobility and increase range of spine lateral motion and reduction of mechanical stress on the spine. Barrios et al (2006) have carried out the comparison between normal subjects and Idiopathic Scoliosis in terms of respiratory functional limitations and maximal oxygen uptake; he concluded that , the limitations of respiratory function and maximal oxygen uptake test in idiopathic Scoliosis patients is higher in compare to healthy individuals. Although the emphasis of emergency correction is based on radiographically cliche or using non – aggressive methods such as chess sheet, the effects of deformation on the respiratory and Cardiovascular physiology and also the effects of flexibility deformation on the respiratory physiology has been emphasized ; The researcher will attempt to demonstrate that how these corrective exercises will be effective on improving the circulatory and respiratory systems. Accordingly and due to the high statistical anomaly scoliosis in girls, this study aims to answer this question whether the corrective exercises can effect on the posture of spinal cord and some physical fitness or not?

2. Methods

The study population is consisted of all female students ranging 12 – 15 year old of – middle school who had referred to the institute of corrective movements in Tehran education department , District 4 ; The total number of these students was 643 one ; After the diagnosis of these student by the help of the institution of – Corrective motions, it is specified 257 ones with scoliosis trauma which 84 ones were structural and 173 had situational scoliosis ; finally , Among these people with Scoliosis , 40 ones were Voluntarily taken up in two groups: 20 ones as an experimental and the rest as control group were considered.

2.3. The method of performing test

In order to Collect data, all the Subject were invited to the test location at 8:00 morning after filling the health questionnaire from and being confident of any cardiovascular disease ; the Subjects get familiar with the method of performing tests after measuring the relaxed heartbeat, age height and weight and finally they were asked to fulfill pre-test step; then, these subjects were randomly divided into two experimental and control groups participating four weeks, four sessions a week for 1.5 hr in the corrective exercise program ; After finishing the

program, they were again invited and participated in the test at 8:00 morning. The t-test was used for the Comparison of data before and after corrective movements. In order to Compare two experimental and Control groups , the independent t- test was also applied ; To analyze `the descriptive data, k-z (square) test was used. The significant level of the test with 95%, x<0.05 and p<0.05 was considered.

3. Results

Table 1. The mean and standard deviation of the general profile of participants

Variable	Experimental		Control group		Sig
	mean	Criteria deviation	Mean	Std. dev	
Age	13.2	1.0	13.3	0.9	0.7
Weight	45.7	10.0	46.1	8.6	0.8
Height	157.6	6.2	157.4	6.1	0.9

The results of descriptive Statistics showed that the participants in these three characteristics in terms of- age weight in and height are homogeneous and no differences were found (P> 0.05).

Table 2. The results of paired variable t-test Of spinal flexibility and the power of back Muscles in experimental group

Variable	Pretest Std. dev	Post test Std. dev	Df	T	Sig
Spinal cord flexibility	24.4± 7.3	25.6 ±6.9	19	5.533	0.000
Power of back opening muscles	25.8±9.4	30.2±8.0	19	-5.03	0.000

The results of Table 3 show no any significant differences between two control and experimental groups in the mean variable of flexibility and back opening muscles (P > 0.05).

Table 3. The results of Independent t- test flexibility variable of spinal cords and power in both groups of Control and experimental

Variable	Control group Std. dev	Experimental group Std. dev	F	Sig	T	df	Sig
Flexibility of spine	24.7±6.0	25.6±6.0	0.057	0.8	0.450	38	0.6
Power of back opening muscles	29.0±8.0	29.0±8.0	0.002	0.9	0.452	38	0.6

The even t-test showed that the mean difference of – lateral bending movement range towards right before and after Corrective motions right before and after corrective motions is not statistically significant (P > 0.05); however, the mean difference of lateral bending moment range towards left before and after Corrective motions is statistically significant (P< 0.05).

Table 4. The results of the even t-test of lateral bending range in the experimental group

Variable	Pre –test	Post-test	Degree of freedom	T	Significance
	Stv. dev	Stv. dev			
Right bending range	19.2±3.9	20.3±5.5	19	-1.184	0.2
Left bending range	18.6±3.2	20.4±2.9	19	-5.377	0.000

T-test showing the significant difference between two control and experimental groups in terms of bending towards sides (P>05).

Table 5. The results of independent t-test of lateral bending movement range variable in both control and experimental groups

Variable	Control group	Experimental group	F	Variance Sig	T	df	Sig level
Right bending range	18.8±4.8	20.3±5.5	0.019	0.8	0.765	38	0.4
Left bending range	18.3±5.0	20.4±2.9	6.158	0.01	1.548	38	0.1

The result of descriptive statistics showed that before doing corrective exercises, each 20 ones (%100) participants in each group of corrective actions had non- equal shoulder surfaces. After corrective motions done, 12 ones (%60) had equal shoulder surface but 8 ones (40%) were non- equal in this regard. Fulfilling Chi-2 or k_2 square test showed that the difference between two control and experimental group was not significant in the variable of shoulders equalization.

Table 6. The results of k_2 variable of non – equalization of shoulders of non-equalization of shoulders

Group	equalization	Shoulders	Absolute	Percentage of	Total
	distribution	distribution	distribution	distribution	
experimental	12	60	8	40	20
Control	3	15	17	85	20

Variable	k_2	Df	Sig
Equalization of- shoulders	2.5	1	0.1

The results of- descriptive statics indicated that before doing corrective exercises , each 20 ones (%100) participants in each group of corrective movements had top posterior rib without any equalization Surfaces. After Corrective actions, 10 ones (50%) had also top posterior rib equally but 10 ones (%50) had unequal surfaces in the related areas of the Shoulders. Completing Chi_2 or K_2 square test showed that the difference between control and experimental group in the variable of equalization in top posterior hip rib was significant (P>0.05).

Table 7. The results of k_2 variable of Equalization in top posterior hip rib of non-equalization of shoulders

Group	equalization	Shoulders	Absolute	Percentage of	Total
	distribution	distribution	distribution	distribution	
experimental	10	50	10	50	20
Control	2	10	18	90	20

Variable	k_2	Df	Sig
Equalization of- top posterior hip rib	6.4	1	0.1

4. Discussion

Romano (2008) among the various programs including massage, hand exercises and active sports etc. concluded that people who actively participated in active sports , their body situation reduced in the Size of kb angle but they are getting towards recovery in this regard. The results of the research is matched to ours; the corrective movements lead to recovery of body situation in the subjects participated in experimental group; one most common reasons may be the type of exercise Carrying out on the spine and bringing all shocking angles in an effective line which made influential results such as the positive effect on equalization surface of top posterior hip in the subjects participated in the experimental group. Negrini (2008) in his study concluded that exercise can prevent the progression of – idiopathic scoliosis disorder. Our results also represent the same results. The corrective movements have positive impact on the equalization surface of top posterior hip in the subject participated in the experiment group. Negrini (2008) in his study concluded that exercise can prevent the progression of idiopathic scoliosis disorder. Our results also represent the same results. The corrective movements have positive impact on the equalization surface of top posterior hip so that about 50% of people with this disorder were complete recovered and 50 % were left with the lack synergy. The reason of- this correction probably was in relation to the type of exercises Carrying out on the spine; also. The comparison of the result in terms of- top posterior surface equalization is followed by the corrective movements in both control and experimental groups indicating significant results and the recovery is governed in the experimental group. In control group, due to the lack of give corrective movement, it is not expected any synergy in the two –sided top posterior hip ; thus it can be said that the corrective movements have been effective in two sides of- spine muscles due to the increase of power recovering the balance in equalization of- two – sided top posterior hip. The results of the research on scoliotic patients showed that these corrective movements has a positive impact on the equalization of the shoulders surface and after their corrective movements, 60% of the patients were recovered of

the shoulder's synergy; but the result of the research was not significant in relation to the control and experimental groups followed by corrective movements relating to the duration of- these corrective movements. Lateral bending in the subjects of the research was non- sinergical and doing corrective movements did not show any significant results in the experimental group after and before corrective movements ; the reason can be related to the duration and type of corrective actions. According to this view that corrective actions in terms of lateral specialty on the arches could lead to negative effects, thus they were rejected but they are representing an increase in this regard. Lateral bending was not significant in control and experimental groups after corrective actions. The reason can be related to the duration and rejection of special corrective movements in rejection to lateral bending and stretching, leading to insignificance of the results, however, the experimental group was in positive direction. Katsoshi et al (2005) studied the bilateral flexibility in scoliotic patients and concluded that 58.9% of scoliotic patients have bilateral flexibility reduction in this regard. Our results is consistent with this research , because patients showed reduction be for lateral bending test and they were recovered by the corrective movements and stretching actions on shortened tissues and also the mobilitu of the spine bilaterally. In our research in the experimental group the same reduction of flexibility was observed which the3 right side 19.2 ± 3.9 and the left was 18.6 ± 3.2. The flexibility of surrounding tissues in the joint is delivering to Stretch and then relaxation. The flexibility is being changed due to some factors such as deformation and placement of the joint in a fixed status. The soft tissues may be changed in two forms influencing on the flexibility, The first one is the lowest shortening and amendable following the lowest movement limitation and the second is related to intense or severe shortening as a fixed type of shortening and it is not amendable as usual methods and surgical method is needed. The rate of muscular shortening in the scoliotic patients of our research is amendable type because the scoliosis is situation mood in this regard the completion of a periodical corrective actions leads to the recovery of- flexibility in the experimental individuals indicating the muscular reaction to the regular exercises recovering their flexibility ; in the other hand, because scoliotic patients, type situational (functional) were considered; this, the muscular Shortening is not fixed type and it seems that they respond better to corrective movements. Also, these corrective movements lead to the recovery of mobility in the spine influencing on the flexibility (Harlson and

Andreas, 1991). The comparison of flexibility in experimental group with control group was not significant. All these results represented the increase of flexibility in the experimental group. Little and Adam (2009) reviewed the characteristics of soft tissue on the spinal flexibility in scoliotic patients; he concluded that about 40% spinal flexibility of scoliotic people was increased. Our results are consistent with this research. In our research, the increase of spinal flexibility in the experimental group was seen after corrective movements. One periodical corrective actions in scoliotic patients, Situational type, was significant in the remedy of back opening muscles power; According to this view that extension (rightening) of the spinal Cords is one of the most vital corrective movements in the related patients, therefore, doing Corrective actions leads to the recovery of muscles power and strength, in which it can be effective in the remedy of deformation (Atmen et al., 2005).

The results of corrective movements on the back muscles in the experimental group was not significant in Compare to control group; the reason, can be related to the duration of Corrective movements as unlimited; If the duration gets longer the result will be significant, too. All these comparisons indicate the power of back muscles after corrective movements in the experimental group than control group. Pingat et al. (2007) concluded that the power of the leg and body muscles is reduced in scoliotic patients and even this may due to the scoliosis effects. Our results is Consistent with this research; because the power of the muscles gets reduced before Corrective movements but following these Corrective actions Cause to changes in the power of back muscles influencing directly on the chest expansion and leaving flexibility there. Atmen et al. (2005) studied the effect of Corrective movements on idiopathic scoliosis treatment and concluded that these corrective movements are effective in the remedy of – Scoliosis. Our results are consistent with this study. The selected individuals were Scoliosis type idiopathic and doing corrective movements led to increase in the power of back muscles. Bayar et al (2004). Studied the effect of short- term Corrective movement on scoliotic patients with artez including stretching and strength exercises ; they conclude that these corrective movements lead to decrease the negative effects of artez on respiration system. In our research, patients never used artez all these research results on the chest expansion representing the positive results of corrective movements on the respiratory system. Also, our research results showed that doing powerful exercises in the experimental group increased the power of back muscles. Mcintive et al. (2008) indicated that

doing circular power exercises has been effective in the reduction of spinal lateral deviation and spinal fixation in scoloiosis 20-40◦ after eight months. Therefore, these circular exercises of spinal cords are recommended for correcting scoliosis. Our result is consistent with this study.

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Application of static synchronous compensator in multi machine power systems

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Abstract: Multi machine electric power systems are complicate and interconnected. Studying the performance of electric components in large electric power systems is very suitable and practical. In this regard, static synchronous compensator (STATCOM) is investigated in this paper. STATCOM is used to control of voltage and improvement of voltage profile in multi machine power systems. An optimization technique is used to tune the proposed STATCOM controllers. The results are compared with the system without STATCOM. Simulation results visibly show the ability of STATCOM in voltage support.

1. Introduction

It has long been recognized that the steady-state transmittable power can be increased and the voltage profile along the line also can be controlled by appropriate reactive shunt compensation. The purpose of this reactive compensation is to change the natural electrical characteristics of the transmission line to make it more compatible with the prevailing load demand. Thus, shunt connected, fixed or mechanically switched reactors are applied to minimize line overvoltage under light load conditions, and shunt connected, fixed or mechanically switched capacitors are applied to maintain voltage levels under heavy load condition [1].

The ultimate objective of applying reactive shunt compensation such as STATCOM in a transmission system is to increase the transmittable power. This may be required to improve the steady-state transmission characteristics as well as the stability of the system. Var compensation is thus used for voltage regulation at the midpoint (or some intermediate) to segment the transmission line and at the end of the (radial) line to prevent voltage instability, as well as for dynamic voltage control to increase transient stability and damp power oscillations.

The static synchronous compensator (STATCOM) is one of the most important FACTS devices and it is based on the principle that a voltage-source inverter generates a controllable AC voltage source behind a transformer-leakage reactance so that the voltage difference across the reactance produces active and reactive power exchange between the STATCOM and the transmission network. The STATCOM can be used for dynamic compensation of power systems to provide voltage support [2, 3]. Also it can be used for transient stability improvement by damping low frequency power system oscillations [4-7].

The objective of this paper is to investigate the ability of STATCOM for voltage support. Simulated Annealing (SA) method as a meta-heuristic optimization method is considered for tuning the parameters of STATCOM. A multi-machine power system installed with STATCOM is considered as case study. Simulation results show the validity of STATCOM in voltage support at bulk electric power systems.

2. Test system

A multi machine power system installed with STATCOM is considered as case study. The proposed test system is depicted in Figure 1. The system data can be found in [8]. In this paper, turbine-governor system is also modeled to eliminate steady state error of responses.
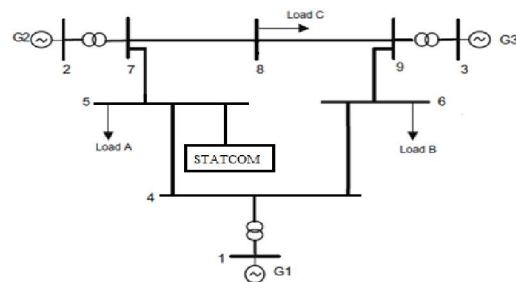

Figure 1. Multi-machine electric power system installed with STATCOM

2.1. Dynamic model of the system with STATCOM

The nonlinear dynamic model of the system installed with STATCOM is given as (1). The dynamic model of the system installed with STATCOM is completely presented in [1].

$$
\begin{cases}
\dot{\omega} = (P_m - P_e - D\omega)/M \\
\dot{\delta} = \omega_0(\omega - 1) \\
\dot{E}'_q = (-E_q + E_{fd})/T'_{do} \\
\dot{E}_{fd} = (-E_{fd} + K_a(V_{ref} - V_t))/T_a \\
\dot{V}_{dc} = (K_r(V_{ref} - V) - b_{STAT})/T_r
\end{cases}
\tag{1}
$$

Where, δ: Rotor angle; ω: Rotor speed (pu); Pm: Mechanical input power; Pe: Electrical output power (pu); M: System inertia (Mj/MVA); E′q: Internal voltage behind x′d (pu); Efd: Equivalent excitation voltage (pu); T′do: Time constant of excitation circuit (s); Ka: Regulator gain; Ta: Regulator time constant (s); Vref: Reference voltage (pu); Vt: Terminal voltage (pu).

By controlling m_E, the output voltage of the shunt converter is controlled. By controlling δ_E, exchanging active power between the STATCOM and the power system is controlled.

2.2. STATCOM controllers

In this paper two control strategies are considered for STATCOM:

i. DC-voltage regulator

ii. Bus-voltage regulator

STATCOM has two internal controllers which are bus voltage controller and DC voltage regulator. A DC capacitor is installed behind the STATCOM; this capacitor is used to provide the reference voltage for PWM performance. In order to maintaining the voltage of this capacitor, a DC-voltage regulator is incorporated. DC-voltage is regulated by modulating the phase angle of the shunt converter voltage. This controller is commonly a PI type controller. A bus voltage controller is also incorporated based on STATCOM. The bus voltage controller regulates the voltage of bus where the STATCOM is installed.

The most important subject is to tuning the STATCOM controller parameters. The system stability and suitable performance is guaranteed by appropriate adjustment of these parameters. Many different methods have been reported for tuning STATCOM parameters so far. In this paper, an optimization method named is considered for tuning STATCOM parameters. In the next section an introduction about the proposed optimization method is presented.

3. Simulated Annealing

In the early 1980s the method of simulated annealing (SA) was introduced in 1983 based on ideas formulated in the early 1950s. This method simulates the annealing process in which a substance is heated above its melting temperature and then gradually cooled to produce the crystalline lattice, which minimizes its energy probability distribution. This crystalline lattice, composed of millions of atoms perfectly aligned, is a beautiful example of nature finding an optimal structure. However, quickly cooling or quenching the liquid retards the crystal formation, and the substance becomes an amorphous mass with a higher than optimum energy state. The key to crystal formation is carefully controlling the rate of change of temperature.

The algorithmic analog to this process begins with a random guess of the cost function variable values. Heating means randomly modifying the variable values. Higher heat implies greater random fluctuations. The cost function returns the output, *f*, associated with a set of variables. If the output decreases, then the new variable set replaces the old variable set. If the output increases, then the output is accepted provided that:

$$
r \le e^{[f(P_{old}) - f(P_{new})]/T}
\tag{2}
$$

Where, *r* is a uniform random number and *T* is a variable analogous to temperature. Otherwise, the new variable set is rejected. Thus, even if a variable set leads to a worse cost, it can be accepted with a certain probability. The new variable set is found by taking a random step from the old variable Set as (3).

$$
P^{new} = dP^{old}
\tag{3}
$$

The variable *d* is either uniformly or normally distributed about p^{old}. This control variable sets the step size so that, at the beginning of the process, the algorithm is forced to make large changes in variable values. At times the changes move the algorithm away from the optimum, which forces the algorithm to explore new regions of variable space. After a certain number of iterations, the new variable sets no longer lead to lower costs. At this point the value of T and d decrease by a certain percent and the algorithm repeats. The algorithm stops when $T \simeq 0$. The decrease in *T* is known as the cooling schedule. Many different cooling schedules are possible. If the initial temperature is T_0 and the ending temperature is T_N, then the temperature at step *n* is given by (4).

$$
T_n = f(T_0, T_N, N, n)
\tag{4}
$$

Where, *f* decreases with time. Some potential cooling schedules are as follows:

Linearly decreasing: $T_n = T_0 - n(T_0 - T_n)/N$

Geometrically decreasing: $T_n = 0.99\, T_{n-1}$

Hayjek optimal: $T_n=c/log(1+n)$, where c is the smallest variation required to get out of any local minimum.

Many other variations are possible. The temperature is usually lowered slowly so that the algorithm has a chance to find the correct valley before trying to get to the lowest point in the valley. This algorithm has been applied successfully to a wide variety of problems [9].

4. STATCOM tuning based on SA

In this section the parameters of the STATCOM controllers are tuned by using SA. The optimum values of controllers which minimize different performance indices are accurately computed using SA. The performance index is considered as (5). In fact, the performance index is the Integral of the Time multiplied Absolute value of the Error (ITAE).

$$ITAE = \int_0^t t\sum_{i=1}^3 |\Delta\omega_i|\,dt + \int_0^t t\sum_{i=1}^9 |\Delta v_i|\,dt + \tag{5}$$

Where, $\Delta\omega$ shows the frequency deviations and Δv shows the voltage of buses. To compute the optimum parameter values, different faults are assumed in all buses and then the minimum solution is chosen as final solution. The results are listed in Table 1.

Table 1. Optimal parameters of STATCOM

	gain	value
PI controller of voltage	Proportional gain	1.2
	Integrator gain	0.4
PI controller of DC link	Proportional gain	23.6
	Integrator gain	0.35

5. Simulation results

The proposed STATCOM is evaluated on the test system given in section 2. The disturbance is provided by disconnection of line between bus 8 and bus 9. This disturbance shows a large signal disturbance in power systems. The simulation results are presented in Figures 2-6. Where, solid line indicates the system installed with STATCOM and dashed line shows the system without STATCOM.

The STATCOM is installed in bus 5 and it is expected that voltage of bus 5 be controlled. In this regard, the voltage of bus 5 and bus 1 are depicted in Figures 2-3. It is clearly seen that the STATCOM can successfully control the voltage of bus 5. It is also seen that STATCOM has a positive effect on the voltage of rest buses. Where, the voltage profile in bus 1 is better than the system without STATCOM.

The STATCOM is installed to control of voltage, bus is has an effect on the system dynamic performance. Figures 4-6 show the speed of

generators following disturbance. It is seen that the system with STATCOM is more stable than system without STATCOM. STATCOM affects the system damping and the oscillations are rapidly damped out with being of STATCOM.
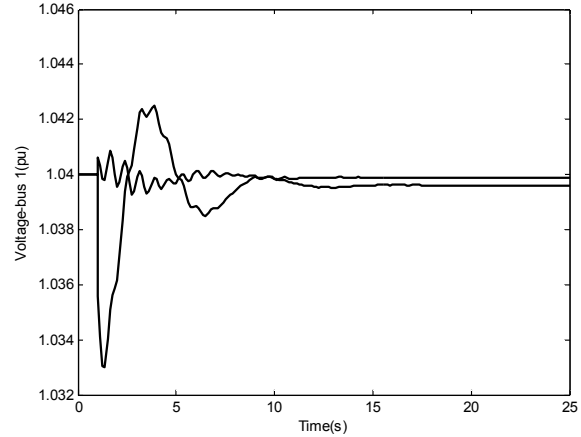

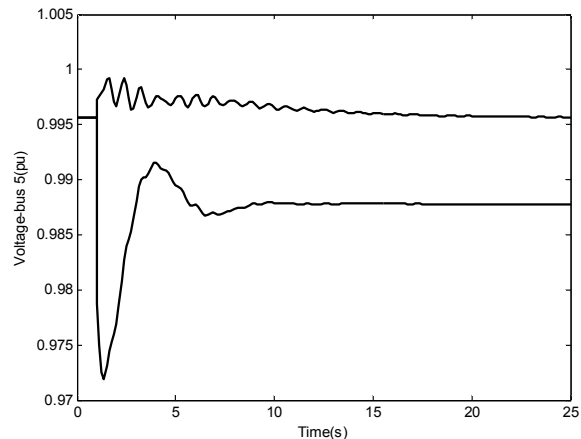Figure 2. Voltage bus 1 following disturbance

Figure 3. Voltage bus 5 following disturbance
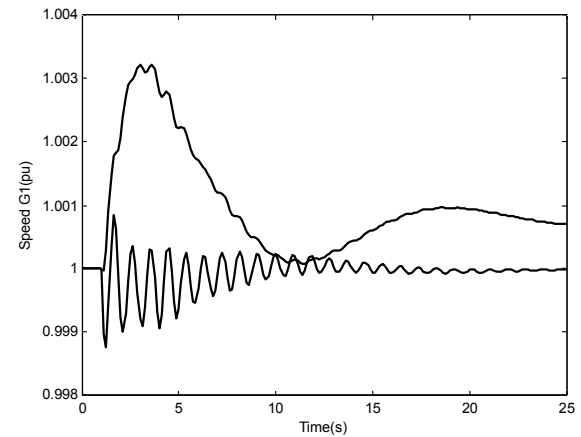
Figure 4. Speed G_1 following disturbance
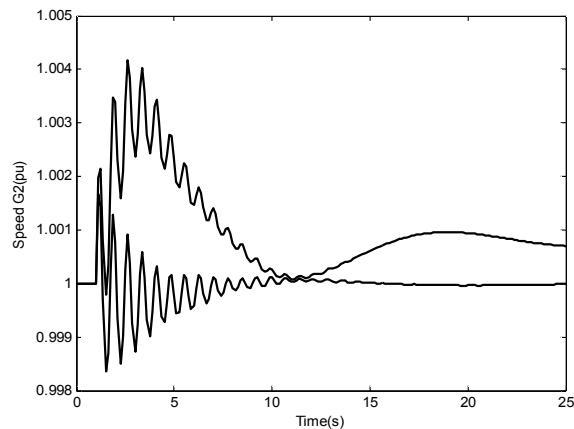
Figure 5. Speed G_2 following disturbance
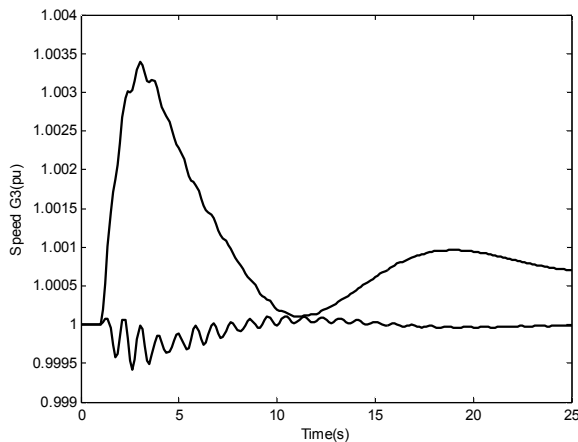
Figure 6. Speed G_3 following disturbance

6. Conclusions

The application of STATCOM in voltage support was investigated in this paper. A multi-machine electric power system installed with STATCOM was assumed to demonstrate the ability of STATCOM in voltage support. The parameters of the proposed STATCOM were tuned by using a Meta-heuristic optimization method. The proposed optimization procedure guaranteed the solution to reach a suitable and optimal response. Line disconnection was considered as disturbance, this is the worst case fault in power system which was assumed to evaluate the dynamic performance of system. Simulation results demonstrated that the designed STATCOM can guarantee the robust

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stability and robust performance under large signal disturbances.

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A Hybrid Fuzzy Wavelet Neural Network Combined with Shuffled Frog Leaping Algorithm for Identification of Dynamic Plant

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Abstract: This paper present a Fuzzy Wavelet Neural Network (FWNN) design based on Shuffled Frog Leaping (SFL) Algorithm to improve the function approximation accuracy and general capability of the FWNN. In presented FWNN, the fuzzy rules that contain wavelets are constructed. Each fuzzy rule corresponds to a sub-wavelet neural network (sub-WNN) consisting of wavelets with a specified dilation value. Orthogonal least square (OLS) algorithm is used to determine the number of fuzzy rules and to purify the wavelets for each rule and SFL algorithm is suggested for learning of FWNN parameters. The structure is tested for the identification of the dynamic plant. Simulation results demonstrate effectiveness and ability of proposed approach.
[Reza Sharifian Dastjerdi, Ramtin Sadeghi, Farshad Kabiri, Payam Ghaebi Panah. **A Hybrid Fuzzy Wavelet Neural Network Combined with Shuffled Frog Leaping Algorithm for Identification of Dynamic Plant.** *Life Sci J* 2012;9(4):4416-4420]. (ISSN: 1097-8135). http://www.lifesciencesite.com. 666

Keywords: Shuffled Frog Leaping Algorithm, fuzzy wavelet neural network, identification.

1. Introduction

In recent years, there has been a growing interest in algorithms inspired from the observation of natural phenomenon, such as fuzzy logic, neural network, and heuristic techniques in many scientific and engineering research areas by the researches around the world [1].

Fuzzy technology is an effective tool for dealing with complex, nonlinear processes characterizing with ill-defined and uncertainty factors. Fuzzy rules are based on expert knowledge. The constructing of knowledge base for some complicated processes is difficult. Thus, there are some methods for constructing of fuzzy rules [2]. On the other hand, some characteristics of neural networks such as learning ability, generalization, and nonlinear mapping are used to deal with signal processing, control system, decision making, and so on. However, the main problem of neural networks is that they require a large number of neurons to deal with the complex problems. Moreover, they also result in slow convergence and convergence to a local minimum. In order to overcome these disadvantages, wavelet technology is integrated into neural networks [3, 4].

Recently, based on the combination of feed-forward neural networks and wavelet decompositions, wavelet neural network (WNN) has received a lot of attention and has become a popular tool for function learning [3]. The main characteristic of WNN is that some kinds of wavelet function are used as the nonlinear transformation in the hidden layer of neural network, so time–frequency property of wavelet is incorporated into the learning ability of neural networks.

However, the main problem of WNN with fixed wavelet bases is the selection of wavelet frames because the dilation and translation parameters of wavelet basis are fixed and only the weights are adjustable. The appropriate wavelet transform will result in the accuracy of approximation. Therefore, there are several different methods proposed to solve the problems [5-7].

The complexity and uncertainty of the system can be also reduced and handled by the concepts of fuzzy logic. The local details of non stationary signals can be analyzed by wavelet transforms. The approximation accuracy of the plant can be improved by the self-learning capabilities of neural networks. Therefore, there are many papers that discuss the synthesis of a fuzzy wavelet neural inference system for signal processing, control problems, identification and pattern recognition [3, 8-12].

In this paper, a FWNN combined with SFL algorithm have been proposed to identification of dynamic plant from input-output observations, inspired by the theory of multi resolution analysis (MRA) of wavelet transforms and fuzzy concepts. FWNN consist of a set of fuzzy rules that each rule corresponding to a sub-WNN consists of single scaling wavelets. The difficulties of selecting wavelets are reduced and orthogonal least-square (OLS) algorithm is used to determine the number of fuzzy rules and to purify the wavelets for each rule. Furthermore, in order to improve the function approximation accuracy and general capability of the FWNN system, a self-tuning process that uses the SFL approach is proposed to adjust the parameters of translation, weights, and membership functions.

By minimizing a quadratic measure of the error derived from the output of the system, the design problem can be characterized by the proposed SFL formulation. The solution is directly obtained without any need for complicated computations. Moreover, the efficient method is expected to have good performance without requiring any derivatives or other auxiliary knowledge.

The paper is organized as follows: to make a proper background, the basic concept of the SFL algorithm is briefly explained in Section II. In Section III, the concepts of FWNN and optimization problem are explained. The results of the proposed FWNN-SFL in a simulation example are given in Section IV and conclusion is drawn in Section V.

2. overview of SFL

The SFL algorithm is a memetic meta-heuristic method that mimics the memetic evolution of group of frogs when seeking for the location that has the maximum amount of available food. The SFL is derived from a virtual population of frogs in which individual frogs represent a set of possible solution. Each frog is distributed to a different subset of the whole population referred to as memeplex. The different memeplexes are considered as different culture of frogs that are located at different places in the solution space (i.e. global search). Each culture of frogs performs simultaneously an independent deep local search using a particle swarm optimization like method. Within each memeplex, the individual frogs hold ideas, that can be influenced by the ideas of other frogs within their memeplex, and evolve through a process of change of information among frogs from different memeplexes.

To ensure global exploration, after a defined number of memeplex evolution steps (i.e. local search iterations), information is passed between memeplexes in a shuffling process. Shuffling improves frog ideas quality after being infected by the frogs from different memeplexes, ensure that the cultural evolution towards any particular interest is free from bias. In addition, to improved information, random virtual frogs are generated and substituted in the population if the local search cannot find better solutions, After this, local search and shuffling processes (global relocation) continue until defined convergence criteria are satisfied. The flowchart of the SFL is illustrated in Fig. 1.

The SFL begins with an initial population of "N" frogs P={ X_1, X_2,…, X_N }created randomly within the feasible space Ω. For S-dimensional problems (S variables), the position of the "ith" frog is represented as X_i =(x_{i1}, x_{i2},…, x_{iD}). A fitness function is defined to evaluate the frog's position.
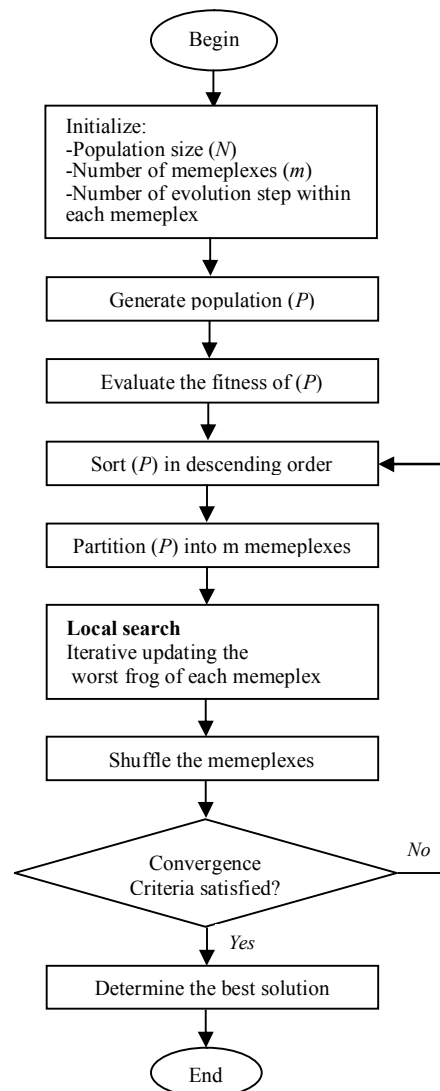
Figure 1. General principle of the SFLA.

Afterward the performance of each frog is computed based on its position. The frogs are sorted in a descending order according to their fitness. Then, the entire population is divided into m memeplexes, each of which consisting of n frogs (i.e. $N = n \times m$). In this process, the first frog goes to the first memeplex, the second frog goes to the second memeplex, frog m goes to the mth memeplex, and frog m + 1 back to the first memeplex, and so on.

Within each memeplex, the position of frog ith (D_i) is adjusted according to the different between the frog with the worst fitness (X_w) and the frog with the best fitness (X_b) as shown in (1), where rand () is a random number in the rang [0, 1]. During memeplex evolution, the worst frog X_w leaps toward the best frog X_b. According to the original frog

leaping rule, the position of the worst frog is updated as follow:

$$\text{Position change}(D_i) = rand() \times (X_b - X_w) \qquad (1)$$

$$X_w(new) = X_w + D, (\|D\| < D_{\max}) \qquad (2)$$

where $D_{\max}$ is the maximum allowed change of frog's position in one jump. If this repositioning process produces a frog with better fitness, it replaces the worst frog, otherwise, the calculation in (1) and (2) are repeated with respect to the global best frog (X_g), (i.e. X_g replaces X_b). If no improvement becomes possible in this case, then a new frog is randomly generated to replace the worst frog. The evolution process is continued for a specific number of iterations ([13, 14]).

3. FWNN and problem formulation
3.1. Fuzzy wavelet neural networks overview

A typical fuzzy wavelet neural network for approximating function y can be described by a set of fuzzy rules such as follow [3]:

R_i : If x_1 is A_1^i and x_2 is A_2^i and ... and x_q is A_q^i, then

$$\hat{y}_i = \sum_{k=1}^{T_i} w_{M_i,t^k} \Psi_{M_i,t^k}^{(k)}(\underline{x}), M_i \in z, t^k \in R^q, w_{M_i}^{t^k} \in R^q, x \in R^q \quad (3)$$

where R_i is the ith rule, c is the number of fuzzy rules. x_j and $\hat{y}_i$ are jth input variable of $\underline{x}$ and output of the local model for rule R_i, respectively. Also M_i is dilation parameter and T_i is the total number of wavelets for the ith rule. $t^k = [t_1^k, t_2^k, ..., t_q^k]$, wher t_j^k denotes the translation value of corresponding wavelet k. Finally, A_i^j is the fuzzy set characterized by the following Gaussian-type membership function.

$$A_j^i(x_j) = e^{-((\frac{x_j - p_{j1}^i}{p_{j2}^i})^2)^{p_{j3}^i/2}} \qquad (4)$$

p_{j1}^i, $p_{j2}^i \in R$ and $p_{j3}^i = 2$, where p_{j1}^i represents the center of membership function, p_{j2}^i and p_{j3}^i determine the width and the shape of membership function, respectively. Wavelets $\psi_{M_i,t^k}^{(k)}(\underline{x})$ are expressed by the tensor product of 1-D wavelet functions:

$$\psi_{M_i,t}^{(k)}(\underline{x}) = 2^{\frac{M_i}{2}} \psi^{(k)}(2^{M_i}\underline{x} - \underline{t}^k) = \prod_{j=1}^{q} 2^{\frac{M_i}{2}} \psi^{(k)}(2^{M_i}x_j - t_j^k) \quad (5)$$

By applying fuzzy inference mechanism and let $\hat{y}_i$ be the output of each sub-WNN, the output of FWN for function $y(\underline{x})$ is as follow:

$$\hat{y}_{FWN}(\underline{x}) = \sum_{i=1}^{c} \hat{\mu}_i(\underline{x})\hat{y}_i \qquad (6)$$

where $\hat{\mu}_i(\underline{x}) = \mu_i(x) / \sum_{i=1}^{c} \mu_i(x)$, $\hat{\mu}_i(x) = \prod_{j=1}^{q} A_j^i(x_j)$ and for current input $\underline{x}$ and each function, satisfies $0 \le \hat{\mu}_i \le 1$ and $\sum_{i=1}^{c} \hat{\mu}_i = 1$. Also $\hat{\mu}_i(x)$ determines the contribution degree of the output of the wavelet based model with resolution level M_i. In this paper the applied structure of FWNN is the same as the structure used in [12]. Also orthogonal least-square (OLS) algorithm is used to select important wavelets and to determine the number of fuzzy rules. Details of this OLS algorithm can be found in [15].

3.2. Tuning parameters of FWNN

Assume that there are H input–output pairs, $(x(l), y(l))$, $l = 1, . . . , H$. Our task is to design the fuzzy basis function expansion such that the error between $\hat{y}_{FWN_k}(x(l))$ and $y(l)$ is minimized. Therefore SFL is applied for tuning parameters of FWNN by optimizing the following objective or cost function.

$$E = \sum_{l=1}^{H} \left| \hat{y}_{FWN_k}(x(l)) - y(l) \right|^2 \qquad (7)$$

and, the Nth frog is represented as

$$F_N = [p_{j1}^{iN} p_{j2}^{iN} \underline{t}^{kN} w_{M_i}^N] \qquad (8)$$

which are all free design parameters that to be updated by SFL algorithm in our FWNN model. Summarized the whole proposed approach is illustrated in Fig. 2.
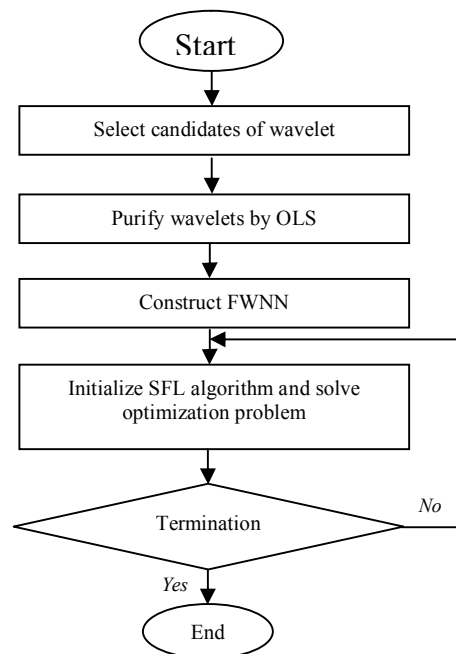
Figure 2. The algorithm of constructing FWNN

4. Design example

The identification problem involves finding the relation between the input and the output of the system. In order to evaluate the effectiveness and efficiency of the proposed approach, we repeat a simulation example from [15], where a FWNN-SFL employed to identify a nonlinear component in a control system. The plant under consideration is governed by the following difference equation:

$$y(k+1) = 0.3y(k) + 0.6y(k-1) + f(u(k)) \qquad (9)$$

Where $y(k)$ and $u(k)$ are the output and input, respectively, at time step k. The unknown function $f(.)$ has the form

$$f(u) = 0.6\sin(\pi u) + 0.3\sin(3\pi u) + 0.1\sin(5\pi u) \qquad (10)$$

In order to identify the plant, a series-parallel model governed by the difference equation as follow:

$$\hat{y}(k+1) = 0.3\hat{y}(k) + 0.6\hat{y}(k-1) + F(u(k)) \qquad (11)$$

Was used, where $F(.)$ is the function implemented by FWNN-SFL and its parameters are updated at each time step. In the learning process, the input to the plant and the model is considered as a sinusoid $u(k) = \sin(2\pi k/250)$ in interval $k=1$ until $k=250$ and $u(k)$ is changed to $0.5\sin(2k\pi/250) + 0.5\sin(2k\pi/25)$ at $k=250$ until $k=500$.

Three fuzzy rules with 4 selected wavelets are represented by OLS algorithm for constructing FWNN. The first step to implement the SFL is generating the initial population where N is considered to be 300. Each population is a solution to the problem which determines the parameters of FWNN, i.e. F_N vector. In this paper, the number of iteration is set to be 1000.

The output and control signal are shown in Fig. 3. As shown in Fig. 3, the output of the model follows the output of the plant almost immediately, even after the adaptation was stopped at $k=250$ and $u(k)$ was change to $0.5\sin(2k\pi/250) + 0.5\sin(2k\pi/25)$.

To compare the obtained result by SFL, a simple Genetic Algorithm (GA) is applied. The number of chromosomes in the population is set to be 200. Also, the number of iterations is considered to be 1000, which is the stopping criteria used in SFL. The approximation of piecewise function obtained by suggested method is presented in Fig. 4.

For the designed parameters, the average best-so-far of each run are recorded and averaged over 10 independent runs. To have a better clarity, the convergence characteristics in finding the best values of update parameters are given in Fig.5. Where shows SFLA performs better than GA at early iterations.

Figure 3. Results of identification, where solid line denotes the output of the plant, dashed line denotes the FWNN-SFL output.

Figure 4. Results of identification, where solid line denotes the output of the plant, dashed line denotes the FWNN-GA output.
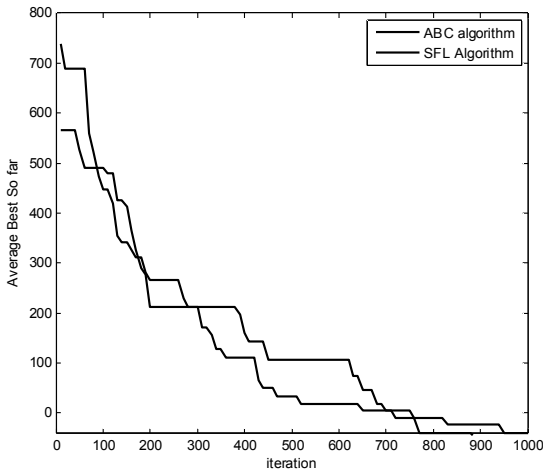
Figure 5. Convergence characteristics of SFLA and GA.

5. Conclusion

In this paper, a new memetic meta-heuristic method called Shuffled Frog Leaping Algorithm (SFLA), combined with FWNN for function learning is proposed. Proposed approach integrates the advantages of fuzzy concepts with the 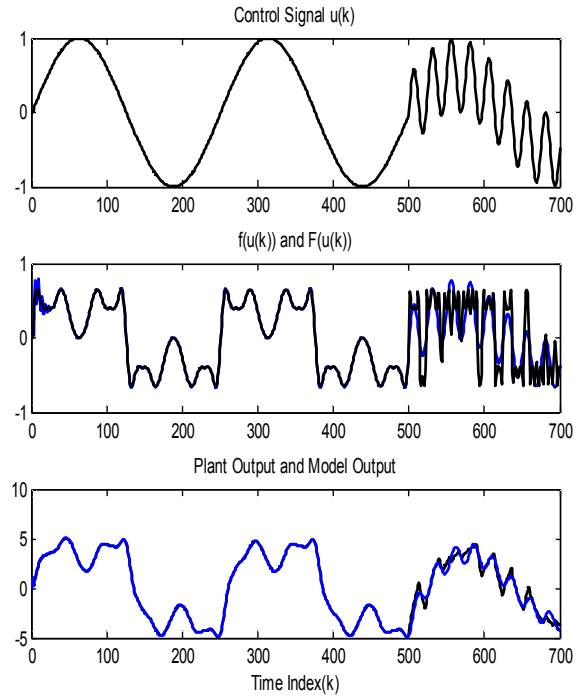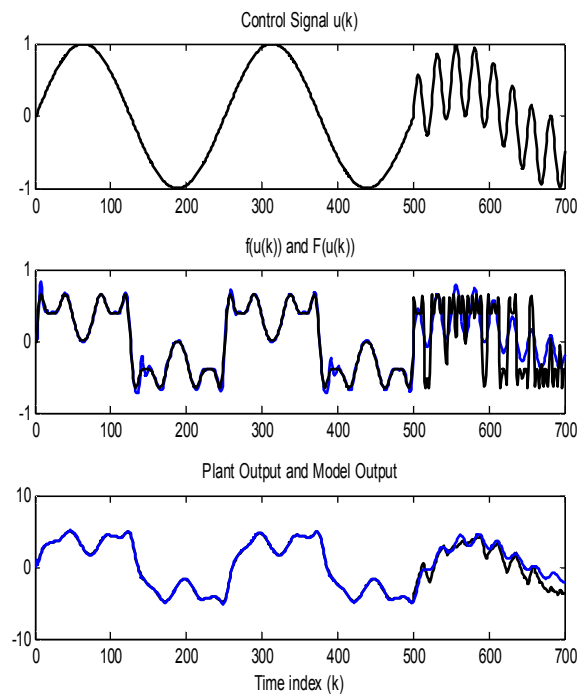WNNs and evolutionary algorithms. In the presented FWNN, OLS algorithm is used for determining the number of fuzzy rules and to purify the wavelets for each rule and a real version of SFL algorithm is used for tuning parameters of FWNN. The simulation results are presented show the efficiency and effectiveness of the proposed approach. Also, the GA is adopted from literature and applied for comparison. The obtained results demonstrate that SFL has faster convergence and better performance than GA.

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Investigation the correlation between the elements of HSEMS in Arvandan Gas and Oil Company

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Abstract: Nowadays considering undeniable role of human in improving safety, the HSE culture concept has been found to be very important. So, many strategies are being considered by organizations to improve HSE culture, which not only are used to improve but also to evaluate current state of organizations in terms of HSE culture. On this basis, this evaluation first recognizes problems and needs of this culture then analyzes the ways of improvement. Oil industry as the key industry of Iran economically and in the terms of complexity and risks, needs a procedure powerful enough to recognize, evaluate and control risks and value human resources as the main capital in this industry. For this end this study analyzes the correlation between the elements of HSEMS in Arvandan Gas and Oil Company. We will show that there is a meaningful correlation between seven dimensions of HSEMS.
[Hedayat Allah Kalantari, RamazanMirzaei, Abdolvahab Baghbanian, Sadegh Moghimi Monfared. **Investigation the correlation between the elements of HSEMS in Arvandan Gas and Oil Company.** *Life Sci J* 2012;9(4):4421-4432]. (ISSN: 1097-8135). http://www.lifesciencesite.com. 667

Keywords: HSE (Health, Safety and Environment), HSEMS (Health, Safety and Environmental Management System), management, Culture, HSE culture

1. Introduction

18th century was a really unbelievable era in the face of industry so that it got the nickname of industrial revolution era. In this time production was gotten out of small houses and workshops to big factories and risks began to emerge and took victims. In 1912, with the first meeting of engineers and experts of metallization organization in America, safety was introduced as a scientific phenomenon and starting in 1940, safety concepts in America were used[1]. Safety of a system is the process of using managerial skills to recognize and control risks during a project, plan or specific act[2]. So, system's safety could be considered as a regular plan which recognizes the risks before they happen and controls them. But this was only done to improve engineering skills and structures and accentuating safety of the equipment, and there was no sign of any attention to human resources as one the most important parts of any accident. Therefore, it seems that developing a suitable HSE culture is a good step toward risk reduction. Obviously, extending HSE culture firstly corrects individual behaviors and finally results in decreasing individual's errors and dangers. However, a number of factors can affect developing an HSE culture. Results of this study show that management is the most important component in this matter. Actually results of the values, motives and behavior patterns that determine commitment to an organization's plans, form HSE culture.

Studying HSE culture was first introduced in 1980 and the importance of the term was realized after the Chernobyl disaster in 1986[3]. Studies on big accidents such as Chernobyl and Piper alpha showed that in spite of using all engineering and protection factors there is always a potential for accidents to happen in high-risk industries [3]. The considerable point is that errors don't happen as a result of individual mistakes but as a result of a behavioral culture. Although a number of factor play roles in forming an HSE culture, results show that values, motives and behavioral patterns that show commitment to the organization's plans will determine powerfulness of HSE culture in an organization.[4]

Expressing the problem and the importance of study

Basically for HSE management different systems are used such as OHSAS18001:2007،HSE-MS, ISO14001:2005, etc. leadership of HSEMS in HSE culture is an important factor due to consistency of HSEMS elements with those of HSE culture improvement for reducing risks. In the oil industry HSEMS is a necessity which is seeking some goals.[5]

HSE management's goals:

1 acceptable level of wariness 2 reducing mortality 3 preventing unexpected stops 4 continuous growth 5 thrift 6 revenue stability 7 survival 8 profitability 9 social responsibility 10 satisfactory [6]

Therefore it's necessary to know how important HSEMS to improvement of HSE culture is. Management systems in the world have grown considerably through the last 50 years and many experts believe they have undergone basic changes. All these changes were because of natural resources constraints and the high costs of human resources in today's world. They all happened to increase exploitation in this competitive world of today to meet the needs of customers. Considering human resources as an inseparable part, to develop, repair and maintenance of machines protective actions must be done to prevent accidents. If so, changing management vision and attending systematic thoughts could help removing risks and dangers to improve exploitation.

2. Research Literature

Quality management system

International Standard Organization (ISO) 9001 is developed under supervision of technical committee (ISO/TC 176), quality management and quality assurance and SC2 committee. Later edition of ISO 9001 canceled last editions and made more consistency with 14001; 2004. Applying a quality management system must happen with a strategic decision making vision. Designing and pitching quality management system is affected by the following factors:

- The environment and the variations of risks in that environment
- Variable needs
- Specific goals
- Production
- Available procedures and those that are used
- The size and the structure of organization[7]

ISO 9001; 2008 in the development and pitching processes and also in effectiveness improvement of the quality management system phase encourages the organization to choose a strategy which can meet needs of customers and bring satisfactory.

Safety management system and job hygiene

All types of organizations are interested in achieving safety and job hygiene through risk control and in accordance with their policies.

They do this through regulations which get more and more strict, developing economic policies and other actions which favor safety and job hygiene and also growing worries from beneficiaries about safety and job hygiene. OHSAS standards which cover safety and job hygiene are develop to meet this need and in this direction are integrated with other requirements of an organization. Last edition of OHSAS happened in 2007 which is more consistent with ISO9001, ISO14001, ILO-OSH and other safety and job hygiene standards. Also this standard is based on PDCA cycle.[8]
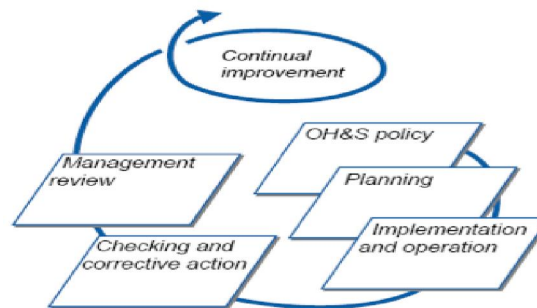
Figure 1: Model of Safety management system and job hygiene

Environment management system

Growing attention to preservation of the environment through national/regional/ and international regulations and also growing knowledge, expectation and necessities of beneficiaries toward lasting development has caused stimulation and motivation in environment management systems development[9]. Also standardization in international level resulted in consistency and integration in the vision toward environment. ISO 14000 series were devoted to different subjects and made a good ground for organizations to understand the environment concepts to use methods for planning, performing and controlling organizational processes with respect to environment. International standards which entitle environment management are developed to provide the elements of an environmental management system (EMS) to an organization in order to help organizations to achieve economic and environmental goals through integration of them with other managerial necessities. This standard addresses necessities of an EMS for organizations to develop and install their major goals and policies which express the attention to regulations and related information to environment. ISO 14001 first developed by technical committee of ISO/TC 207 and SC1 branch in 1996, and the last edition was in 2004. Also this method is based on PDCA cycle[10].

HSEMS (Health, Safety and Environmental Management System)

In each system the thoughts determine the intervals after which a system will achieve the objectives. International companies found their experiences and background in HSE as the main factor in controlling dangers in the industries[20,18]. HSE is a part of management system in any organization which like any other system consists of planning, execution, controlling and correction[11]. There are inputs like equipment, material, money,

time, labor and facilities… processes like strategic planning, guiding and leading, managing, recognition and determining, analyzing and assessing, improving the behaviors… and they all lead to some outputs. But the output could be damage or danger if the system is not designed properly.

In 1974, OGP was established by companies cooperating in oil production and their members were introduced in the UN and EU[16].Adding EMS to OHS and SMS, these two which only covered safety and health were completed and covered HSE.[12]

OGP guidelines introduced some elements for HSE to implant and maintain this system. HSEMS consists of 7 elements[15]. Table (1) is shown in end of article.
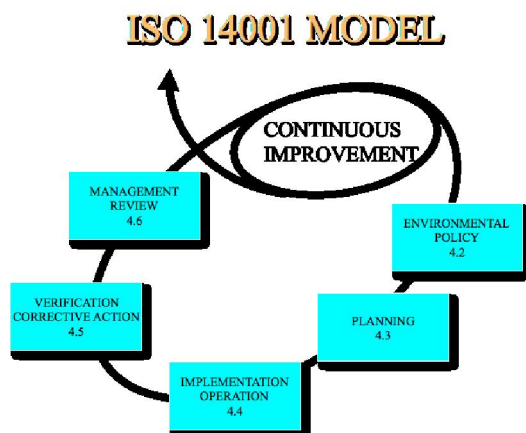
Figure 2: Model of Environment management system

1- Leadership and commitment

Senior management makes sure that the objectives are achieved through providing the resources needed for HSEMS. Management should make sure the necessity of HSE in understood for everybody and the actions are supported.

HSEMS must be supported according to the items below:

- Believing that the company wants to improve HSE
- Motivating the staff to improve their HSE actions
- Responsibility towards HSE
- All levels are involved in developing HSEMS
- Committing to an effective system in HSEMS[13]

2- Policy and strategic objectives

Management must define and document the objectives and policies. And make the followings happen:

- Consistency with the main company
- Consistency with productions and their effects on services and goods

- Consistency with other policies
- Having the same value as other objectives and policies
- Committing to rules and regulations
- If there no standard, setting a rational standard and applying it
- Committing to lower the risk involving in HSE to a minimum
- Committing to efforts that improve HSE performance[14]

3- Organization, resources and documentation

This item contains the followings:

3-1-organizational structure and responsibilities:

Execution and performing a successful HSE program is amongst the responsibilities of organizations and all levels of management and leadership must get involved in it. This must be considered while designing the structure and allocation of the resources. To successfully implant HSE plans, organizational chart must contain all responsibilities, tasks, authorities, and communications including:

- Providing labor and resources needed for HSEMS
- Making sure that every plan is consistent with HSE policy before even starting the plan'
- Gathering information about HSE topics and interpreting them
- Recognizing and recording corrective steps and improvement opportunities[14]

3-2- resources

Senior management must make sure that there are adequate resources in order to achieve HSEMS goals. Resource allocation needs to be revised periodically.[16]

3-3 documents

Following documents have got to be provided and controlled by the company:

- Policy, objectives and plan for HSE
- Determining and recording the responsibilities
- Explaining the HSEMS's elements and their interactions
- Connecting and explaining other documents related to the HSEMS
- Recording the results of risk and HSE assessment
- Developing ground rules related to HSE
- Procedures must be developed for special key actions
- Explaining reaction plans and responses in the cases of potential danger[13]

4- Risk management and assessment

There is some risk in any human action. This section is devoted to: Recognizing HSE risks and assessing them for every action, service or production and also developing risk lowering steps. Company must have practical methods to systematically identify risks and their effects and equipment needed in risks. Identification range must cover all actions from the beginning. Danger recognition must include the followings:

- In designing, building and developing stages (capital, activity improvement)
- In the normal and abnormal situations which involve emergency stops, repairing, and maintenance
- Potential incidents and situations which follow the following:
- Sabotaging the monitoring system
- Human factors including: destruction in HSEMS
- Potential risks and effects of theirs[14]

5- Planning and operation control
- This section is devoted to posture of planning the activities related to risk lowering (through assessment and management of risks). This part consists of programming for the new and current activities and managing the changes and developments needed to confront new situations. Company should embody HSE objectives in long-term programs. These programs include:
- Clarifying the objectives
- Clarifying the responsibilities in order to achieve the objectives in every level
- Incentive plans and motivating the staff to learn about HSE culture
- Processes in order to recognize good individual and group activities related to HSE
- Assessment and pursuit mechanisms[8]

6- Execution and perpetuity
This section explains about how the activities should be executed and continued. Tasks and activities must be clear before planning step. These activities in every level are as following

- Improving guideline objectives and planning senior section's activities ni accordance with HSE policies
- Providing and constituting procedures must be done by management and leadership

Management must be responsible for developing and approving tasks in accordance with procedures. Also management must make sure that controlling limitations aren't violated. Stabilizing the processes,

management must guarantee the adequacy of HSE actions

7- Verification and revision
1-7 Verification
First the areas in need of verification should be recognized. Verification must include HSEMS and its range of action and its accordance with other executive actions. Verification must become a part of normal monitoring, so organization must consider the followings:

- Labor necessities and the properties of a verification team
- Monitors mustn't be involved in monitored actions in order to have a fair judgment
- The documentation and monitoring methods which could include using questionnaires, check lists, interviews or direct observance
- Accordance or non-accordance of HSEMS elements with necessities defined
- HSEMS's effectiveness in achieving executive norms

2-7 Revision
Senior management must revise the HSEMS regularly in order to make sure that its plans are still effective. Revision must include the following but shouldn't be limited to these:

- Probable needs to change in policy and objectives and situations and permanent commitment to them
- Allocation of resources in order to implant and maintain HSEMS
- Places and sites according to risk assessment to confront emergencies[14]

According to the ILO's (international labor organization) report researches show emerging risks in safety and job hygiene in the world which is caused by new technologies. For instance, socio-psychological problems like job stress and other mental malformations, exposure to non-ionized rays and age-related diseases in labor which is a new challenge for the labor in developed countries.
Non-official jobs, highly dangerous jobs, temporary contracts and immigrant labors are also a challenge for ILO. However, child labor was addressed in some countries.

Recent challenges in labor department in the world are explosion in oil station in Mexico, survival of 33 miners in san hose in Chile which was caused by tunnel slump and imprisoned workers for 69 days and also unsuccessful efforts to save miners in New Zealand, Peru and China….

Fokoshima's disaster of explosion in nuclear plant in Japan which was caused by earthquake and Tsunami in March 24th this year caused 3.3 to 5.2 of the GDP in Japan to go away.[18]

According to the last studies conducted by ISSA investments in prevention in safety and job hygiene area in all economic institutes shows that the minimum rate of the benefits gained by this kind of investment equals 2.2 units for each unit of investment. It means that for each Rial invested in safety and job hygiene 2.2 Rials of capital will return. This study shows that in some cases this rate will exceed 5 units and also positively affects labor motivation, face and situation of the institute and also while decreasing problems increases the quality of the final production. These studies also show that investing on safety instructions by average gives away an amount of 4.48 units per each unit of investments and investing on PPE (personal protection equipment) will return 3.37 per 1 which is significant.

Non-official economy includes a major part of labors in developing countries. Unfortunately safety and job hygiene regulations are not met in these institutes or there is no enforcement for effective control of them.

Immigrant labors play a key role in economic growth in countries; nevertheless they are one of the challenges facing safety and job hygiene. These people are usually deployed in non-official jobs and in sub-optimal threesome conditions of dirty, dangerous and demeaning (3D). Unofficial statistic shows a high rate of job diseases and accidents in these labors comparing with local labor. For example 15 % of Hispanic workers work in construction in the US while 23.5% of mortal accidents happen to them which are 1.84 times bigger than this rate for non-Hispanic workers.[19]

One of the other challenges in this committee is age-related risks for the labor which in practice plays a key role in risk factors among labors. Due to the increase in labor and other parties' age, this problem must be addressed more carefully. The last statistic published by ILO shows that 13% of young labor are unemployed and some of them inevitably start non-official and 3D jobs which brings more risks for them. To control the risk in aged labor, governments must consider basic strategies for them. Challenges for female labor are the other problem addressed by the committee. Skeletal and muscular diseases due to carrying load by women in poor countries was addressed and governments were required to pay more attention to this problem especially in non-official jobs. Risks due to entering chemicals and new technologies are a new big worry for the labor. New pesticides, diesel fumes, chemical mixtures, new solvents etc. for instance makes it important for the governments to study this field. In the new technologies it has been estimated that by 2020 around 20% of all productions in the world would be produced by Nano technology (Nano equals 1000000000^{-1} meter or 80000^{-1} the width of human hair). Due to lack of knowledge about the risks related to Nano technologies the evaluation of these effects is impossible and needs extended research which ILO required governments to conduct. Another challenge addressed by ILO is the effects of green jobs in some countries. Workers involved in working above 80 meters of height in wind plants are exposed to the risk and according to the reports made by European risk control center by 2020 due to expansion of these jobs these risks will grow so that they need more and more monitoring and control.

Of matters mentioned in the congress we could name developing safety and job hygiene standards in the members of ILO which was expressed by their publications. For instance while only 13 countries accepted convention of 155 after a decade, in the second decade this amount reached to 34 countries and in the next decade it grew to 57 countries which is a good growth. Also accepting the convention of 187 was accentuated so that it was said that improving the frameworks of the safety and job hygiene systematically could be easily achieved by planning and strategic leadership. For this end, countries are now able to use consulting and technical services for these kinds of plans. Also according to the convention of 187, safety and job hygiene systems must be installed by the members of ILO through cooperation to improve safety and job hygiene culture. Some countries like Russia and Qazaqestan have used these systems through their own standards and with the help of ILO and others did this by the help of regional ILO offices. In Russia some safety and job hygiene systems are monitored by ILO for as much as 5 years which is interesting.

According to the ILO's report 98 % of the accidents are preventable. Statistics show 20 % and 62 % decrease in accidents in the last 20 years for Japan and Finland respectively. Major factor in this decrease is the change in workplace conditions for dangerous to safe.

The main purpose of HSEMS in HSE culture is to improve effectiveness and profitability. Aside from these goals followings could be considered as other goals:

1. To gain some information about organizations' status and to find deviations in their safety and job hygiene policies.
2. To recognize and evaluate the risks and effectively lower them.
3. To establish commitment through different organizational levels and necessitate the establishment of HSE culture to success
4. to lower direct and indirect losses due to accidents.

5. To respect human rights

6. To maintain and improve the health level in the society

7. to lower cost and increase effectiveness

8. To protect the environment and move toward stable development

The main purpose of this study is to develop a method for improvement of HSE culture through evaluating the elements of HSEMS in HSE culture in order to improve effectiveness in Arvandan Gas and Oil Company.

3.   Background of the study in Iran

First official start in safety and job hygiene regulations in Iran was started 1325 by the time of which labor and social affairs ministry started to work. In 1328 these regulations approved as laws according to which Auditing Department was in charge of monitoring safety and job hygiene. This situation went on until 1362 after various meetings by experts and taking the agreement from labor and social affairs ministry the monitoring task was charged by health ministry in order to prevent parallelization and higher quality of services. For this task first professional health office was developed then it changed to professional health department. Professional health department at that time was in charge of improving the health of labor in different professions. After approving a law in Aban 1369 and according to the 85th article of this law health, cure and medical educations ministry was put in charge of monitoring health problems of the labor and the workplace. Currently this task is being executed by "workplace health center" of health, cure and medical educations ministry and safety and health research and instruction center in labor ministry is a reference for instructions and consultation.

Researches, conducted on behavioral sciences use T test for determining the desirability level which in methodology uses Likert's 5 scale questionnaires to measure agreement level in individuals. Using single sample T test, and setting the average on 3, recognition, understanding and satisfaction is measured in individuals.

Ali Asghar khani et al did a study to set an index for customer satisfactory in Iran. To measure understanding and the idea of examinees a 5-scale Likert questionnaire was used and to analyze that data and to test statistical hypothesis descriptive statistic like mean and deductive statistic like single sample T tests were use. The average of the answers is related to the satisfaction of the customers which approves or rejects the hypothesis with a reliability of 95% and the sig.

4.   The background of the study in abroad

The first regulations related to recompense due to physical injuries were established in middle centuries and the middle ages. Around 1834 English foreign sailing and log office was developed and established safety and risk analysis concepts. In 1877 in Massachusetts laws were established related to machine maintenance and also some laws for employer's responsibility. At the end of the 19th century boilers' explosion made American mechanical engineers committee to develop regulation for safety of the boilers' containers. At the beginning of the 1911 in the US safety group and in 1913 national safety association were developed. In 1920 private section started to think about safety plans. In the first years of 1930s in the US prevention plans were designed. At the end of this decade national standards' institute of America published hundreds of booklets for industrial instructions. However, the main core of the safety plans form between 1950 and 1960 with the military nuclear plans[8]. In 1912 with the first meeting of metallization experts' institution, safety was addressed as a scientific phenomenon for the first time and after 1940 safety concepts were used in America. System safety is the process of using managerial and technical skills to recognize and control risks systematically during a project, plan or activity. So, safety could be addressed to as a systematic plan which recognizes and controls risks before they happen. But this was only for improving engineering skills and had nothing to do with equipment safety or human resources safety which is one of the most important factors in any accident. Therefore, in the process of decreasing risks managerial systems were born amongst which HSEMS tries to improve safety, health and environment culture through emphasizing on leadership and commitment, strategic policies and goals, documentation and organization of resources (organizational structure and responsibilities, financial resources, qualification and instruction, contractors, communications, documentation), risk assessment and management, planning (integration of the assets), performing and continuum, auditing and revision. Studying HSE culture first was conducted in 1980 and after Chernobyl disaster in 1986 it began to establish. Studies on big accidents like Chernobyl and Piper alpha showed that despite using all engineering factors and high level of protection, in big industries there is still a potential for dangers. The interesting part is that these dangers don't happen as a result of an individual mistake but a malformed behavioral culture. Although a number of factors are important in developing an HSE culture but results of the studies show that management is the most important part in HSE culture. Actually results of values, motives and behavioral patterns which show and determine commitment to HSE,

form HSE culture. Generally HSE culture is an important factor for the industries and organizations. For example safety culture and behaviors in industries like chemical, construction, and shipping is of a great importance. HSE culture is an anticipator of injuries and job accidents in gas and oil companies. Results show that although HSE culture is not the only factor in safety, it plays a key role in motivating the workers to show safe behaviors. Studies on the reasons of accidents show that 85% of accidents are due to an unsafe behavior and for each accident 331 unsafe behaviors have happened. For a better understanding of HSE culture, understanding organizational concepts is necessary.[11]

In 2000 Copper named HSE in relation with organizational culture and said that safety culture is a subset of the organizational culture. Also HSE culture is a general subset of organizations which is highly affected by internal events and these effects are interactive so that safety affects internal events too. Emergence of social organizations and their incremental growth is one of the obvious characteristics of the civilizations so that considering timely and location problems, special needs and traits causes social organization to grow daily. Clearly every organization needs a kind of management in accordance with its needs to achieve its goals. Dangerous behaviors happen in relation with views, behaviors and cultures.[14]

5-Methodology

Form objective aspect this study can be categorized as: historical, descriptive and experimental. Also by its very nature it is: fundamental, theoretical and practical. As current study tries to improve practical knowledge in a certain area (organizational performance and happiness), in other words it's practical, this study is a practical type, and it's a descriptive type considering data gathering method and in descriptive type it can be categorized as padding because the main objective is to understand the best work situation in order to gain competitive advantages.

5-1-Hypotheses:
1) Between commitment and leadership and other Elements of HSE-Ms there is a significant relationship.
2) Between Policy and strategic objectives and other Elements of HSE-Ms there is a significant relationship.
3) Between Resource allocation and documentation and other Elements of HSE-Ms there is a significant relationship.
4) Between Risk management and risk assessment and other Elements of HSE-Ms there is a significant relationship.
5) Between Planning and other Elements of HSE-Ms there is a significant relationship.
6) Between Execution and perpetuity and other Elements of HSE-Ms there is a significant relationship.
7) Between Verification and revision and other Elements of HSE-Ms there is a significant relationship.

6-Population and sampling

Topic territory: since the HSE matter is important both in private and governmental section, this study could be used in all organizations. All the organizations that share a property are a population. The population is all the staff in Arvandan Oil and Gas Company. The locality: this study was a case study in Arvandan Oil and Gas Company. The time territory: this study was conducted in 90-91. 175 people were chosen out of 320 according to the Morgan's table so that their staff number and names were taken and 175 people were chosen randomly. Questionnaires were distributed and 160 were completed properly by staff with different college degrees. The questions were about automation system governing the organization.

7-Reliability

One of the most important properties of measurement tools is reliability. Reliability shows the stability and consistency of the concept in question and helps users to judge the measurements. Reliability implies the extent to which the measurement tool results the same in the same situation. Cronbach's alpha is the most commonly used tool to assess the reliability.

Cronbach's alpha is weak below 0.6, acceptable on 0.7 and good above 0.8. The more it's closer to 1 the better it is (Danaeefard 1383, p489-490). Cronbach's alpha for a questionnaire is calculated by SPSS software.

According to the table below the Cronbach's alpha is 0.971 which is above 0.7 so it's acceptable.

Table1: Reliability Statistics

Cronbach's Alpha	N of Items
.871	63

8- Analysis of the data form questionnaire

To analyze the hypotheses, H0 and H1 hypotheses are used which are stated as below:

H0: Between commitment and leadership and other Elements of HSE-Ms there is a significant relationship.

H1: Between commitment and leadership and other Elements of HSE-Ms there is not a significant relationship.

Analyzing hypothesis no.1

This study is done by Pearson Correlation test. If sig is below 0.05 between commitment and leadership and other Elements of HSE-Ms there is a significant relationship. . If sig is above 0.05 between commitment and leadership and other Elements of HSE-Ms there is not a significant relationship. In the table (2) in end of article the Pearson Correlation for HSEMS elements are calculated by SPSS software. See table2.

The correlation between commitment and leadership with other factors is shown in the table below. Sig test for all the elements is zero or below 0.05 which shows that there is meaningful correlation between this dimension and others and Hypothesis is confirmed. See table3.

Analyzing hypothesis no.2

The correlation between policy and strategic objectives with other factors is shown in the table below. Sig test for all the elements is zero or below 0.05 which shows that there is meaningful correlation between this dimension and others and Hypothesis is confirmed. See table4.

Analyzing hypothesis no.3

The correlation between Organization, resources and documentation with other factors is shown in the table below. Sig test for all the elements is zero or below 0.05 which shows that there is meaningful correlation between this dimension and other and Hypothesis is confirmed. See table5.

Analyzing hypothesis no.4

The correlation between sources and risk management with other factors is shown in the table below. Sig test for all the elements is zero or below 0.05 which shows that there is meaningful correlation between this dimension and others and Hypothesis is confirmed. See table6.

Analyzing hypothesis no.5

The correlation between planning with other factors is shown in the table below. Sig test for all the elements is zero or below 0.05 which shows that there is meaningful correlation between this dimension and others and Hypothesis is confirmed. See table 7.

Analyzing hypothesis no.6

The correlation between implementation and monitoring with other factors is shown in the table below. Sig test for all the elements is zero or below 0.05 which shows that there is meaningful correlation between this dimension and others and Hypothesis is confirmed. See table8.

Analyzing hypothesis no.7

The correlation between evaluation and review with other factors is shown in the table below. Sig test for all the elements is zero or below 0.05 which shows that there is meaningful correlation

between this dimension and others and Hypothesis is confirmed. See table9.

Results

Oil industry as a key industry in the country. The industry needs a strong military and the identification, assessment and control of hazards. The oil companies need to put some strategies in the form of SWOT Matrix. Organizations can use this strategy to try to gain competitive advantage and You can use the strengths to exploit opportunities.You should Destroyed weaknesses by opportunities and Use strengths to avoid threats as well. We can minimize weaknesses and can be avoided from threats. See table 10.

HSE professionals need to understand that a cumbersome overprotective procedure is as bad, if not worse, than a procedure that falls short of providing the necessary level of protection.

Inaccuracy or inadequacies of procedures commonly result from lack of knowledge of HSE industry and regulatory standards. For example, when developing an environmental impact assessment procedure, it is critical to be aware of EPA requirements. Similarly, it would be useful to learn of OSHA Standard 1904 when preparing a procedure on Incident Reporting and Investigation.

Invalid procedures are impractical. They tend to have provisions or requirements that are difficult to implement by responsible parties. For example, a permit to work procedure that requires an operator to do preparatory activities for radiography work or conduct gas testing may not be realistic, in light of the operator's current level of competency.

There are several reasons for selecting these standards as models for the Company:

   The standards ensure that performance of the HSEMS improves over time – continual improvement.

   The ISO 14001 Standard for Environmental Management Systems is an accepted international Standard for Environment Management Systems.

   The OHSAS 18002:2000 Occupational Health and Safety Management Systems is an accepted international standard for Occupational Health and Safety Management Systems.

   The OGP Management System model is a standard for International Oil and Gas Exploration companies.

   The API (American Petroleum Institute) Model HSEMS is a voluntary tool for companies interested in developing an HSEMS or enhancing an existing one and is widely used within the Petroleum industry.

   The standards are consistent with the key elements found in most management system models.

Table2: Pearson Correlation between Elements of HSE-Ms

HSE	evaluation and review	implementation and monitoring	planning	sources and risk management	resources & documentation	policy and strategic objectives	Commitment and leadership		
0/827**	0/673**	0/473**	0/517**	0/642**	0/769**	0/677**	1	Pearson Correlation	Commitment and leadership
0	0	0	0	0	0	0	0	Sig	
159	160	160	160	159	160	160	160	N	
0/757**	0/638**	0/503**	0/430**	0/515**	0/697**	1	0/677**	Pearson Correlation	policy and strategic objectives
0	0	0	0	0	0	0	0	Sig دو دامنه	
159	160	160	160	159	160	160	160	N	
0/928**	0/783**	0/641**	0/731**	0/781**	1	0/697**	0/769**	Pearson Correlation	resources & documentation
0	0	0	0	0	0	0	0	Sig	
159	160	160	160	159	160	160	160	N	
0/855**	0/698**	0/539**	0/738**	1	0/781**	0/515**	0/642**	Pearson Correlation	sources and risk management
0	0	0	0	0	0	0	0	Sig	
159	159	159	159	159	159	159	159	N	
0/809**	0/656**	0/610**	1	/738**	0/731**	0/430**	0/517**	Pearson Correlation	planning
0	0	0	0	0	0	0	0	Sig	
159	160	160	160	159	160	160	160	N	
0/756**	0/706**	1	0/610**	0/539**	0/641**	0/503**	0/473**	Pearson Correlation	implementation and monitoring
0	0	0	0	0	0	0	0	Sig	
159	160	160	160	159	160	160	160	N	
0/881**	1	0/706**	0/656**	0/698**	0/783**	0/638**	0/673**	Pearson Correlation	evaluation and review
0	0	0	0	0	0	0	0	Sig	
159	160	160	160	159	160	160	160	N	
1	0/881**	0/756**	0/809**	0/855**	0/928**	0/757**	0/827**	Pearson Correlation	**HSE**
0	0	0	0	0	0	0	0	Sig	
159	159	159	159	159	159	159	159	N	

Table 3: Pearson Correlation between commitment and leadership and other Elements of HSE-Ms

HSE	evaluation and review	implementation and monitoring	planning	sources and risk management	Organization, resources and documentation	policy and strategic objectives	Commitment and leadership		
0/827**	0/673**	0/473**	0/517**	0/642**	0/769**	0/677**	1	Pearson Correlation	commitment and leadership
0	0	0	0	0	0	0	0	Sig	
159	160	160	160	159	160	160	160	n	

Table 4: Pearson Correlation between policy and strategic objectives and other Elements of HSE-Ms

HSE	evaluation and review	implementation and monitoring	planning	sources and risk management	Organization, resources and documentation	policy and strategic objectives	Commitment and leadership		
0/757**	0/638**	0/503**	0/430**	0/515**	0/697**	1	0/677**	Pearson Correlation	policy and strategic objectives
0	0	0	0	0	0	0	0	Sig	
159	160	160	160	159	160	160	160	n	

Table 5: Pearson Correlation between Organization, resources and documentation and other Elements of HSE-Ms

HSE	evaluation and review	implementation and monitoring	planning	sources and risk management	Organization, resources and documentation	policy and strategic objectives	Commitment and leadership		
0/928**	0/783**	0/641**	0/731**	0/781**	1	0/697**	0/769**	Pearson Correlation	Organization, resources and documentation
0	0	0	0	0	0	0	0	Sig	
159	160	160	160	159	160	160	160	n	

Table 6: Pearson Correlation between sources and risk management and other Elements of HSE-Ms

HSE	evaluation and review	implementation and monitoring	planning	sources and risk management	Organization, resources and documentation	policy and strategic objectives	Commitment and leadership		
0/855**	0/698**	0/539**	0/738**	1	0/781**	0/515**	0/642**	Pearson Correlation	sources and risk management
0	0	0	0	0	0	0	0	Sig	
159	160	160	160	159	160	160	160	n	

Table 7: Pearson Correlation between planning and other Elements of HSE-Ms

HSE	evaluation and review	implementation and monitoring	planning	sources and risk management	Organization, resources and documentation	policy and strategic objectives	Commitment and leadership		
0/809**	0/656**	0/610**	1	0/738**	0/731**	0/430**	0/517**	Pearson Correlation	planning
0	0	0	0	0	0	0	0	Sig	
159	160	160	160	159	160	160	160	n	

Table 8: Pearson Correlation between implementation and monitoring and other Elements of HSE-Ms

HSE	evaluation and review	implementation and monitoring	planning	sources and risk management	Organization, resources and documentation	policy and strategic objectives	Commitment and leadership		
0/756**	0/706**	1	0/610**	0/539**	0/641**	0/503**	0/473**	Pearson Correlation	implementation and monitoring
0	0	0	0	0	0	0	0	Sig	
159	160	160	160	159	160	160	160	n	

Table 9: Pearson Correlation between evaluation and review and other Elements of HSE-Ms

HSE	evaluation and review	implementation and monitoring	planning	sources and risk management	Organization, resources and documentation	policy and strategic objectives	Commitment and leadership		
0/881**	1	0/706**	0/656**	0/698**	0/783**	0/638**	0/673**	Pearson Correlation	evaluation and review
0	0	0	0	0	0	0	0	Sig	
159	160	160	160	159	160	160	160	n	

Table 10: SWOT Matrix for HSE

Weaknesses	Strengths	HSE strategies
Paper and recorded in order to attract domestic and foreign academic circles about the importance of research and innovation management	National Conference on HSE	Opportunity
Creating change management committee on foreign models	Held annually in the Internal Audit	
-----------	HSE personnel deployed for specialized training by foreign companies	
Create a program for managing corporate meetings attended by all staff	Perform maneuvers during a period of disaster preparedness	Threat
Using local knowledge and national companies to supply goods and parts required	Periodic meetings with government and military environment for interaction and exchange of information	
-----------	Legal capacity to deal with complaints from stakeholders	

Suggestions

Regarding the fact that stuff with the education level of bachelor or higher are young and also the newest technology in designing discovery, exploitation and production in Arvandan Gas and Oil Company we suggest that:

1. Start a research center in different fields including HSE
2. Throw monthly meetings with stuff and managers
3. Set strategies to instruct the stuff who are replaced or promoted
4. Teach and announce HSE instructions to mayors through in-place instruction and in media in the cities in the vicinity of installations to ensure that nobody violates the limits of those installations
5. Centralizing the stuff or
6. Increase the quality of accommodations for the stuff's families
7. Senior managers should pay attention to HSE
8. Allocate financial resources for HSE
9. Support commands and critiques system for HSE
10. Develop goals related to HSE and update them
11. Clarify the tasks in emergencies
12. Management must pay attention to safety health and environment matters
13. Initial education for the stuff
14. Developing and executing safety instructions

15. A suitable hiring and choosing process must be chosen for the stuff
16. Recognize and assess the risk
17. Effective monitoring for HSE performances for contractors
18. Analyze and find the causes of the accidents
19. Control and lower the risks
20. Apply HSE to purchase, installation and development phase
21. A good change management
22. Do maneuvers and analyses of them
23. Auditing and assessing HSE
24. Showing interest in improvement without accidents by the management
25. Use qualified stuff in HSE system
26. Measure and check contaminators
27. Record and pursue adjustments
28. Prevention through HSE in actions

Regarding the results, there is a significant correlation between HSEMS and HSE culture. Also there is an interactional correlation between ORD and revision and review which shows the importance of resource allocation and organization HSE and reviewing the system in order to improve the Resourcesstem continuously.

Resources

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A Modified Gauss – Seidel Method for M - Matrices

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Abstract : in 1991، A. D. Gunawardena et al. proposed the modified Gauss-Seidel (MGS) method for solving the linear system with the preconditioned $= I + S$. The preconditioning Effect is not observed on the nth row. In the present paper, we suggest a new precondition. We get the convergence and comparison theorems for the proposed method. Numerical examples also given.

1- Introduction:

We consider the following preconditioned linear system.

$$PAX = Pb,$$
(1.1)

where $A = (ai, j)_{n \times n \in R^{n \times n}}$ is a known non singular M-matrix, $P \in R^{n \times n}$, called the preconditioned, is non singular, $b \in R(A)$ is known and $X \in R^{n \times 1}$ is unknown, (A) is the range of A. throughout this paper, without loss of generality, we always assume that the coefficient matrix A has a splitting of the form $A = I - L - U$, where is the identity matrix, -L and -U are strictly lower triangular and strictly upper triangular parts of A, respectively.

To effectively solve the preconditioned linear system (1.1), a variety of preconditioners have been proposed by several authors, see $[1 - 6]$ and the references there in. Since some preconditioned are constructed only from a part of upper triangular part of A, the preconditioning effect is not observed on the last row of matrix A. For example, the preconditioned $P_s = I + S$ presented in [1] and $P_{s_{max}} = I + S_{max}$ in [7] are formed respectively by

$$S = (s_{i,j}) = \begin{cases} -a_{i,i+1} & i = 1,2,\dots,n-1; \\ o, & Other\ wise \end{cases}$$

and

$$S_{max} = (S_{i,j}^m) = \begin{cases} -a_i, k_i, & i = 1,\dots,n-1, j > i; \\ o, & Other\ wise, \end{cases}$$

$$K_i = min\{j| \begin{matrix} max \\ j \end{matrix} |a_{i,j}|, i < n\}$$

Motivated by their results, in this paper, we propose the following preconditioned:

$$P_m = I + S + R_{max}$$
(1.2)

where

$$(R_{max})_{i,j} = \begin{cases} -a_n, k_n, & i = n, j = K_n, \\ 0, & Other\ Wise \end{cases}$$

With $K_n = min\{j| |a_{n,j}| = max\{|a_{n,l}|, l = 1,\dots,n-1\}\}$

For the preconditioned (1.2), the preconditioned matrix

$$A_m = (I + S + R_{max})A$$

Can be split as

$$A_m = M_m - N_m$$

$$= (I - D - L - E + R_{max} - \acute{D} - \acute{E}) -$$
$$(U - S + SU),$$

where D and E are respectively the diagonal, strictly lower triangular parts of SL, while $\acute{D}$ and $\acute{E}$ are the diagonal, strictly lower triangular, the MGS iterative matrix is $T_m = M_m^{-1} N_m$.

2. Preliminaries

For the convenience of the readers, we first give some of the notations, definitions and lemmas which will be used in what follows.

For $A = (a_{i,j}), B = (b_{i,j}) \in R^{n \times n}$, we write $A \geq B$ if $a_{i,j} \geq b_{i,j}$ holds for all $i, j = 1, 2, \ldots, n$. $A \geq O$, called nonnegative, if $a_{i,j} \geq O$ for all $i, j = 1, 2, \ldots, n$, where O is a $n \times n$ zero matrix. For the vectors $a, b \in R^{n \times 1}, a \geq b$ and $a \geq o$ can be defined in the similar manner.

Definition 2.1([9]). A matrix A is a L-matrix if $a_{i,i} > 0, i = 1, \ldots, n$ and $a_{i,j} \leq 0$ for all $i, j = 1, \ldots, n. i \neq j$. A nonsingular L-matrix A is a nonsingular M-matrix if $A^{-1} \geq 0$.

Lemma 2.1 ([10]). Let A be a nonnegative nonzero matrix. Then

(a)$\rho(A)$, the spectral radius of A, is an eigen value;

(b)A has a nonnegative eigenvector corresponding to $\rho(A)$;

(c) $\rho(A)$ is a simple eigen value of A;

(d) $\rho(A)$ increases when any entry of A increases.

Definition 2.2. Let A be a real matrix. Then, $A = M - N$ is called a splitting of A if M is a nonsingular matrix. The splitting is called

(a)regular if $M^{-1} \geq 0$ and $N \geq 0$[10];

(b)weak regular if $M^{-1} \geq 0$ and $M^{-1}N \geq 0$[11];

(c)nonnegative if $M^{-1}N \geq 0$[12].

(d)M-splitting if M is a nonsingular M-,matrix and $N \geq 0$[13].

Definition 2.3 ([8]).We call $A = M - N$ the Gauss-Seidel splitting of A, if $M = (I - L)$ is nonsingular and $N = V$. In addition, the splitting is called

(a)Gauss-Seidel convergent if $\rho(M^{-1}N) < 1$;

(b)Gauss-Seidel regular if $M^{-1} = (I - L)^{-1} \geq 0$ and $N = U \geq 0$.

*Lemma*2.2([14]).Let $A = M - N$ Be an M-Splitting Of A. Then $\rho(M^{-1}N) < 1$ if and if A is a nonsingular M-matrix.

*Lemma*2.3([15]).Let A and B be $n \times n$ matrices. Then AB and BA have the same eigenvalues, counting multiplicity.

*Lemma*2.4([16]).Let A be a nonsingular M-matrix, and let $A = M_1 - N_1 = M_2 - N_2$ be two convergent splitting, the first one weak regular and the second one regular. If $M_1^{-1} \geq M_2^{-1}$, then $\rho(M_1^{-1}N_1 \leq \rho(M_2^{-1}N_2) < 1$.

3. Convergence And Comparison Theorems

We begin this section with a lemma given in [7].

For the preconditioned $P_S = I + S$, the Preconditioned Matrix $A_S = (I + S)A$ can be written as

$$A_S = M_S - N_S = (I - D - L - E) - (U - S + SU).$$

In which D and E are defined as in section1. If $a_{i,i+1} a_{i+1,i} \neq 1 (i = 1, 2, \ldots, n - 1)$, then the MGS iterative matrix T_s for A_s can be defined by $T_s = M_S^{-1}N_S = (I - D - L - E)^{-1}(U - S + SU)$ as $(I - D - L - E)^{-1}$ exists. In this case there is the following result:

Lemma 3.1 ([7]). Let $A = I - L - U$ be a nonsingular M-matrix. Assume that $O \leq a_{i,i+1} a_{i+1,i} < 1, 1 \leq i \leq n - 1$, then $A_S = M_S - N_S$ is regular and Gauss-Seidel convergent.

Theorem 3.2. Let A be a nonsingular M-matrix. Assume that $O \leq a_{i,i+1} a_{i+1,i} < 1, 1 \leq i \leq n - 1$ and $O \leq a_{n,k_j} a_{k_j,n} < 1, k_j = 1, \ldots, n - 1$, then

$A_m = M_m - N_m$ regular and Gauss-Seidel convergent splitting.

Proof. We observe that when $O \leq a_{i,i+1} a_{i+1,i} < 1, 1 \leq i \leq n-1$ and $O \leq a_{n,k_j} a_{k_j,n} < 1, k_j = 1, \ldots, n-1$, the diagonal elements of A_m are positive and M_m^{-1} exists. It is known that (see [11]) an L-matrix A is a non singular M-matrix if and only if there exists a positive vector y such that $> o$. By taking such, the fact that $I + S + R_{max} \geq 0$ implies $A_m y = (I + S + R_{max}) A_y > 0$. Consequently, the L-matrix A_m is a nonsingular M-matrix, which means $A_m^{-1} \geq 0$.

We note that $L - R_{max} + E + \acute{E} \geq 0$ since $L \geq R_{max} \geq 0$.

When $0 \leq a_{i,i+1} a_{i+1,i} < 1, 1 \leq i \leq n-1$ and $0 \leq a_{n,k_j} a_{k_j,n} < 1, k_j = 1, \ldots, n-1$, we have $D + \acute{D} < I$, so that $(I - D - \acute{D}) \geq 0$. Hence,

$M_m^{-1} = [(I - D - \acute{D}) - (L - R_{max} + E + \acute{E})]$

$= [I - (I - D - \acute{D})^{-1} (L - R_{max} + E + \acute{E})]^{-1} (I - D - \acute{D})^{-1}$

$= [I + (I - D - \acute{D})^{-1} (L - R_{max} + E + \acute{E}) + [(I - D - \acute{D})^{-1} (L - R_{max} + E + \acute{E})]^2 + \cdots$

$+ [(I - D - \acute{D})^{-1} (L - R_{max} + E + \acute{E})^{n-1}] (I - D - \acute{D})^{-1}$

≥ 0

On the other hand, it is to see that $N_m = U - S + SU \geq O$ since $U \geq S$ and $SU \geq 0$. Therefore, $A_m = M_m - N_m$ is a regular and Gauss-Seidel convergent splitting by definition 2.3 and lemma2.2.

For the splitting $A = I - L - U$ of matrix A, the iteration matrix of the classical Gauss-Seidel method for A is $T = (I - L)^{-1} U$. Comparing $\rho(T)$ with $\rho(T_m)$, the spectral radius of the MGS with the preconditioned $P_m = I + S + R_{max}$, we have the following comparison theorem:

Theorem 3.3. Let A be a nonsingular M-matrix. Then under the assumptions of theorem3.2, we have $\rho(T_m) \leq \rho(T) < 1$.

Proof. For $M_m = I - D - L - E + R_{max} - \acute{D} - \acute{E}$ and $N_m = U - S + SU$, by theorem 3.2, we know that $A_m = P_m A = M_m - N_m$ is a Gauss-Seidel convergent splitting. Since A is a nonsingular, the classic Gauss-Seidel splitting $A = (I - L) - U$ of A is clearly regular and convergent.

To compare $\rho(T_m)$ with $\rho(T)$, we consider the following splitting of A:

$A = (I + S + R_{max})^{-1} M_m - (I + S + R_{max})^{-1} N_m$

If we take $M_1 = (I + S + R_{max})^{-1} M_m$ and $N_1 = (I + S + R_{max})^{-1} N_m$, then $\rho(M_1^{-1} N_1) < 1$ since $M_1^{-1} N_m = M_1^{-1} N_1$.

Also note that

$M_1^{-1} = (I - D - L - E + R_{max} - \acute{D} - \acute{E})^{-1} (I + S + R_{max})$

$\geq (I - D - L - E + R_{max} - \acute{D} - \acute{E})^{-1}$

$= [I - (I - D - \acute{D})^{-1} (L - R_{max} + E + \acute{E})]^{-1} (I - D - \acute{D})^{-1}$

$\geq [I - (I - D - \acute{D})^{-1} (L - R_{max} + E + \acute{E})]^{-1}$

$\geq (I - L)^{-1},$

It follows from lemma 2.4 that $\rho(M_1^{-1} N_1) \leq \rho(M^{-1} N) < 1$.

Hence $\rho(M_m^{-1} N_m) \leq \rho(M^{-1} N) < 1, i.e., \rho(T_m) \leq \rho(T) < 1$.

Next, we give a comparison theorem between the MGS methods with the preconditioners P_m and P_s respectively.

Theorem 3.4. Let A be a nonsingular M-matrix. Then under the assumptions of theorem 3.2 and $a_{k_n} j \leq a_{k_n}, n \, a_n, j, 1 \leq n-1$, we have $\rho(T_m) \leq \rho(T_s) < 1$.

Proof. For the matrices M_s, M_m, N_s and N_m in the splitting of matrices $P_s A = M_s - N_s$ and $P_m A = M_m - N_m$, they can be expressed in the partitioned forms as follows:

$M_s = I - D - L - E = \left(\begin{array}{c|c} \widehat{M} & 0 \\ \hline U^T & 1 \end{array} \right),$

$M_m = I - D - L - E + R_{max} - \acute{D} - \acute{E},$

$$M_m = M_s + R_{max} \times A = \left(\begin{array}{c|c} \widehat{M} & 0 \\ \hline V^T & U_n \end{array}\right),$$

$$N_m = N_s = \left(\begin{array}{c|c} \widehat{N} & W \\ \hline 0 & 0 \end{array}\right),$$

where

$$\widehat{M} = (\widehat{m}_{i,j}), \widehat{m}_{i,j} =$$
$$\begin{cases} 0, 1 \leq i \leq j \leq n-1 \\ 1 - a_{i,i+1}a_{i+1,i}, i = j, \\ a_{i,j} - a_{i,i+1}a_{i+1,j}, j < i \leq n-1, \end{cases}$$

$$U^T = (a_{n,1}, \dots, a_{n,n-1}),$$

$$V^T = (V_1, \dots, V_{n-1}), V_j = a_{n,j} - a_{n,kn}a_{kn,j} (1 \leq j \leq n-1),$$

$$V_n = 1 - a_{n,kn}a_{kn,n},$$

$$W = (W_1, \dots, W_{n-1})^T, W_i = -a_{i,n} + a_{i,i+1}a_{i+1,n} (1 \leq I \leq n-1),$$

and $\widehat{N} \geq 0$ is an $(n-1) \times (n-1)$ strictly upper triangular matrix.

Direct computation yields

$$M_s^{-1} = \left(\begin{array}{c|c} \widehat{M}^{-1} & 0 \\ \hline U^T\widehat{M}^{-1} & 1 \end{array}\right) \qquad \text{and}$$
$$M_m^{-1} = \left(\begin{array}{c|c} \widehat{M}^{-1} & 0 \\ \hline -V_n^{-1}V^T\widehat{M}^{-1} & V_n^{-1} \end{array}\right).$$

Therefore,

$$N_s M_s^{-1} = \left(\begin{array}{c|c} \widehat{T}_s & W \\ \hline 0 & 0 \end{array}\right) \geq 0$$

and

$$N_m M_m^{-1} = \left(\begin{array}{c|c} \overline{T}_m & U_n^{-1}W \\ \hline 0 & 0 \end{array}\right) \geq 0$$

where $\widehat{T}_s = \widehat{N}\widehat{M}^{-1} - Wu^T\widehat{M}^{-1}$ and $\overline{T}_m = \widehat{N}\widehat{M}^{-1} - WV_n^{-1}V^T\widehat{M}^{-1}$.

Obviously, $\rho(N_s M_s^{-1}) = \rho(\widehat{T}_s)$ and $\rho(N_m M_m^{-1}) = \rho(\overline{T}_m)$.

By simple computation, we know $\overline{T}_m \leq \widehat{T}_s$ that under the assumption $a_{kn,j} \leq a_{kn,n}a_{n,j}, 1 \leq j \leq n-1$. Hence by lemma 2.1, we have

$$\rho(N_m M_m^{-1}) = \rho(\overline{T}_m) \leq \rho(\widehat{T}_s) = \rho(N_s M_s^{-1})$$

Therefore, by lemma 2.3, we immediately know that which means that $\rho(T_m) \leq \rho(T_s)$.

4. Numerical Examples

In this part, we give some examples to illustrate the theory in section3.

Example 4.1. Let us consider the matrix A of (1.1), given by

$$A = \begin{pmatrix} 1 & -0.2 & -0.3 & -0.1 & -0.2 \\ -0.1 & 1 & -0.1 & -0.3 & -0.1 \\ -0.2 & -0.1 & 1 & -0.1 & -0.2 \\ -0.2 & -0.1 & -0.1 & 1 & -0.3 \\ -0.1 & -0.2 & -0.2 & -0.1 & 1 \end{pmatrix}.$$

We have $\rho(T_m) = 0.3114$ and $\rho(T_s) = 0.3384$. Clearly, $\rho(T_m) < \rho(T_s)$ holds.

Example 4.2. Let the coefficient matrix A of (1.1) be given by

$$A = \begin{pmatrix} 1 & -0.5 & -0.5 \\ -0.3 & 1 & -0.6 \\ -0.3 & -0.3 & 1 \end{pmatrix}.$$

We have $\rho(T_m) = 0.29167 < \rho(T_s) = 0.44763$

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How to Influence Students' Risk-Taking Behaviour in Order to Enhance their Creative and Critical Thinking Processes

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Abstract: This study explores the relationship between the art classroom environment and students' creative and critical thinking in girls' intermediate schools (students aged 12–15 years old) in Jeddah, Saudi Arabia. It addresses the following research question: By manipulating the art classroom environment, is it possible to positively influence students' risk-taking behaviour in order to enhance their creative and critical thinking processes? In this paper, I will focus on one part of my research: how art classroom wall displays can affect students' risk-taking behaviour and enhance their creative and critical thinking.

1. Introduction

Art education plays an important role in forming an individual's personality. **Alhilah (2002)** and **Shawqi (2007)** state that together with other subjects, art helps an individual build character and develop a complete personality. In art, children, adolescents and adults can find an outlet for their emotions, a means of expressing hopes, wishes and ideas, and of forming their future personalities (**Alhilah, 2002; Shawqi, 2007**). Art education aims to explore an individual's creative abilities and provide an atmosphere conducive to the learning, allowing learners to relax, set aside their worries and practise their activities freely **(Jody, 1997; Alhilah, 2002)**.

The independent variable in this study is the wall display, while the dependent variables are risk taking, creative thinking and critical thinking. The link between the dependent variables is 'ideas': creative thinking is about the expansion of ideas, critical thinking is about the evaluation of ideas, and risk taking is about testing and practising ideas and having the courage to share and defend ones ideas in the face of potential criticism.

Before describing the systemic context of the supposed influences of the wall displays, I will first define some key terms.

Learning environment: here this includes any element of the art classroom environment that may affect student behaviour. **Hiemstra (1991:8)** defines the learning environment as 'all of the physical surroundings, psychological or emotional conditions, and social or cultural influences affecting the growth and development of [a person] engaged in an educational enterprise'.

Risk-taking behaviour: this may be defined as taking a chance or doing something although the outcome may be uncertain (**Neihart, 1999**). This research considers positive risk-taking behaviour as students having the confidence to try new things during art sessions, which will enhance creative and critical thinking.

Creative thinking: Creativity can be defined in many ways, but the one most suited to this research is 'the ability to think about something in novel and unusual ways and come up with unique solutions to problems' (**Santrock, 2004**).

Critical thinking: this is 'the intellectually disciplined process of actively and skilfully conceptualising, applying, analysing, synthesising, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action' **(Scriven & Paul, 2007)**.

A carefully planned physical environment provides students with additional opportunities to explore and experiment, and can support them in managing their own behaviour (**McLeod *et al.,* 2003**). As part of the physical surroundings, decoration plays a significant role in ensuring a comfortable classroom environment (**Sommer and Olsen, 1980**). In order to create a positive learning environment, the area should be softened through small enhancements, like cushioned chairs, book cabinets, adjustable lighting, colourful carpets, live plants, pictures and a bulletin board; these elements can make the room more appealing to students, and increase the level of student satisfaction and interaction in the classroom (**Sommer and Olsen, 1980**).

Learning is a sensory experience, therefore the visual displays in a classroom are powerful learning tools (**McLeod *et al.,* 2003**). Human eyes 'contain nearly 70 per cent of the body's sensory receptors and

send millions of signals every second along the optic nerves to the visual processing centres of the brain' (**Wolfe, 2001**). It is therefore not surprising that students remember visually presented information longer than they remember that which is presented verbally (**Wolfe, 2001**). **McLeod *et al.* (2003)** state as important elements of a visual display the various ways of presenting and updating information, and its relation to the subject curriculum.

The display of students' work can improve the classroom atmosphere as it motivates student and encourages them to take pride in their work; it is important to display a representative range of students' work and not only the highest achievers (**Muijs & Reynolds, 2005**). A balance of stimulation and organisation in the art classroom environment is required for students to work well, and a brightly coloured classroom with abundant stimuli, including the artwork of artists and students, serves to broaden the students' minds. An aesthetically pleasing workspace will encourage students to take pride in their personal work area, whereas an overcrowded art classroom may negatively influence students' thinking and limit the development of their ideas (**Ruscoe, 2008**).

2. Material and Methods

To explore alterations in art classrooms that might encourage risk-taking behaviour among students and help in the development of their creative and critical thinking processes, I investigated a number of girls' intermediate Manuscript schools in Saudi Arabia using a qualitative and quantitative approach to explore the environment and identify relevant factors. The study sample was selected from both state and private schools in the city of Jeddah, one of the largest educational areas in Saudi Arabia in terms of the numbers of students and schools (Ministry of Education, 2010), where state school classes have thirty students and private school classes have fifteen. To better determine the influence exerted by each manipulation, the selected students were of the same academic level, and were completing the same tasks.

The primary research comprised of two main stages. The first stage involved the examination of the art classroom environment by observing students, teachers and student-teacher interaction in the classroom, as well as interviewing the art teachers and some students. A Likert-type questionnaire was then distributed to all students. I observed and analysed the effects of existing art classroom layouts on student practices and explored ways in which the art classroom environment might affect students' risk-taking behaviour and thereby the development of creative and critical thinking.

In the second stage I identified the important variable factors, including the wall displays, in the art classroom environment, and the observations and questionnaires were repeated after implementing changes in the wall displays. Initially the art classrooms in the sample tended to be either relatively bare, with very few or no creative wall displays, or cluttered and disorganised, presenting both new and old student artwork. To try and effect a positive change in the learning environment, attractive wall displays of current student artwork were created in all cases.

Using the data collected from the pre- and post-implementation questionnaires, two sets of aggregate scores were recorded. Statistical analysis was then conducted using the Statistical Package for the Social Sciences (SPSS) software. The data were subjected to a non-parametric Wilcoxon signed ranks statistical test with a significance level of five percent and a critical region of ± 1.96 for a two-tailed test. The technique of behaviour mapping was also applied to the classroom observations before and after the changes were implemented. Marks achieved by the students before and after change implementation conditions were subjected to a paired samples *t*-test for comparison and this enabled evaluation of the influence of the changes on the marks. The washout period the pre- and post-implementation datasets was three weeks.

3. Results and Discussion
Questionnaire

A Likert-type questionnaire related to wall displays was distributed to the students before and after the changes were implemented. The students were asked to rate their level of agreement with three questions, whereby their attitude towards the art classroom was determined:

1. I prefer to take art sessions in our art classroom.
2. The work display in our classroom inspires me to be more creative.
3. Generally, I find the art classroom supportive of trying new things in art tasks.

Table 1 presents students' responses to the three questions before and after implementation of the wall display changes. Their responses are also illustrated in Figures 1–3.

Table 2 presents the output of the ranks data for each question. Table 3 shows the test statistics based on negative ranks. The Z-values for questions one, two and three were −2.041, −4.269 and −2.850, respectively, and their *P*-values were 0.041, 0.000 and 0.004. Thus, the difference in students' responses to the questions before and after changes were made to the wall displays was statistically significant.

The pre- and post-experiment aggregate scores of all the test questions were recorded, and the

Wilcoxon signed ranks statistical test was applied to them. The output ranks are presented in Table 4, and test statistics based on negative ranks are shown in Table 5. The Z-values and *P*-values (−5.426 and 0.000, respectively) prove that the responses obtained after the wall display changes were implemented test are significantly different from those compiled before the implementation.

Table 1: Responses Pre- and Post-Implementation

Students' Responses	Strongly Agree		Agree		Neither Agree nor Disagree		Disagree		Strongly Disagree		Total	
	Score	(%)	Score	(%)	Score	(%)	Score	(%)	Score	(%)	Score	(%)
Q1 (Pre)	53	70.7	12	16.0	5	6.7	2	2.7	3	4.0	75	100
Q1 (Post)	55	73.3	14	18.7	3	4.0	2	2.7	1	1.3	75	100
Q2 (Pre)	19	25.3	9	12	11	14.7	10	13.3	26	34.7	75	100
Q2 (Post)	34	45.3	17	22.7	8	10.7	6	8	10	13.3	75	100
Q3 (Pre)	32	42.7	16	21.3	12	16.0	10	13.3	5	6.7	75	100
Q3 (Post)	37	49.3	19	25.3	10	13.3	6	8.0	3	4.0	75	100

Table 2: Comparative Descriptive Ranks Output Data for Each Test Question

		n	Mean Rank	Sum of Ranks
Q1 (Pre) – Q1 (Post)	Negative ranks	0	0.00	0.00
	Positive ranks	5	3.00	15.00
	Ties	70		
	Total	75		
Q2 (Pre) – Q2 (Post)	Negative ranks	0	0.00	0.00
	Positive ranks	23	12.00	276.00
	Ties	52		
	Total	75		
Q3 (Pre) – Q3 (Post)	Negative ranks	0	0.00	0.00
	Positive ranks	10	5.50	55.00
	Ties	65		
	Total	75		

Table 3: Comparative Test Statistics Based on Negative Ranks for Each Test Question

	Q1 (Pre) – Q1 (Post)	Q2 (Pre) – Q2 (Post)	Q3 (Pre) – Q3 (Post)
Z	−2.041	−4.269	−2.850
Asymp. sig. (two-tailed)	0.041	0.000	0.004

Table 4: Comparative Ranks Output Data for All Test Questions

		n	Mean Rank	Sum of Ranks
Total (Pre) – Total (Post)	Negative ranks	0	0.00	0.00
	Positive Ranks	38	19.50	741.00
	Ties	187		
	Total	225		

Table 5: Test Statistics Based on Negative Ranks for All Questions

	Total Pre– Total Post
Z	−5.426
Asymp. sig. (two-tailed)	0.000
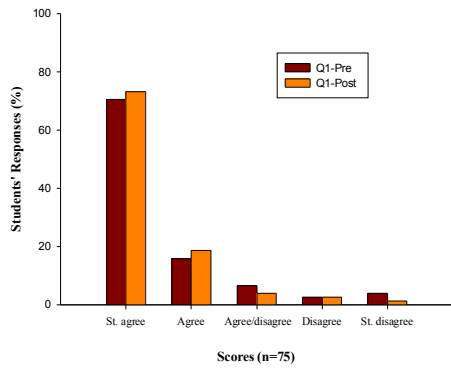
Figure 1: Students' Preferences for Using the Art Classroom Pre- and Post-Implementation of Changes (Question One)

Figure 2: Students' Assessment of the Work Display in Their Art Classrooms Pre- and Post-Implementation of Changes (Question Two)

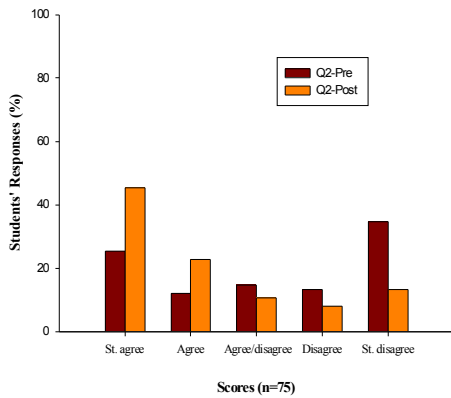**Figure 3:** Students' Assessment of Whether Their Art Classrooms Encourage Them to Try New Things Pre- and Post-Implementation of Changes (Question Three)

Students' Marks

Comparison of marks obtained by the students before and after the changes were implemented showed that more students engaged in the assigned task after the changes were implemented. The levels of completed work before and after the changes were implemented were compared, and the results showed an improvement.

Table 6 summarises the marks obtained before and after the changes were implemented. Tables 7 and 8 show paired samples t-test descriptive output data and statistics respectively. The P-value was 0.000, indicating a very statistically significant difference in the marks before and after the implementation of changes.

Table 6: Students' Art Marks (Pre- and Post-Implementation of Changes)

Marks	7	8	9	10	11	12	Mean Students' Marks
	Frequency						
Pre-Implementation	2	6	6	22	14	25	10.53
Post-Implementation	1	1	8	14	19	32	10.93

Table 7: Paired Samples *t*-test Descriptive Output Data Statistics for

		Mean	n	Std. Deviation	Std. Error Mean
Pair 1	Pre	10.5333	75	1.37873	0.15920
	Post	10.9333	75	1.17787	0.13601

Table 8: Paired Samples *t*-test Statistics

		Paired Differences			
		Mean	Std. Deviation	Std. Error of Mean	95% Confidence Interval Difference
					Lower
Pair 1	Pre − Post	−0.4000	0.49320	0.05695	−0.5135

Pre- and post-implementation observations

Across the sample of art classrooms I initially found a variety of problems. Some of the art classrooms and schools appeared bare, with very few or no displayed materials, and students' work kept in lockers, placed at the side of the room or sometimes returned to them after evaluation; the lack of recognition and reward led to an unmotivated group. The first classroom, which was shared between the intermediate and secondary school students, was relatively bare; the secondary students' artwork, which was naturally of a higher standard, tended to dominate the displays, with very few pieces of work related to the lower grade. While this could have encouraged some students to take risks and try new things, others were visibly disheartened and expressed their disappointment not to be represented in the displays; these negative emotions served as a barrier to their creative ability. In the second classroom the display was limited to written information, in very small print. The third classroom was a disorganised combination of both old and new student artwork, where some displays overlapped each other and older work was gathering dust; as a result students tended to reproduce previous work rather than pushing their own creative boundaries. I noticed that overcrowded displays either overload students with information, or make them feel that their work not valued. Furthermore, when the displays are not regularly changed, students become desensitised to them.

Each display has a different function and influence on both students and the teacher. The display of information and materials related to the art subject can save time during lessons by reducing the number of questions related to basic information, allowing the teacher to concentrate on more important points. Information can be presented and updated in various ways; for example, one school provided extra information related to the curriculum, including topics and tool use, for example. The students from this school were more confident, as they had a clear understanding of the topics to be covered and had few questions about basic information.

After the re-organisation and addition of different types of wall displays to the classrooms, I gathered data on students impressions of the changes; positive comments included 'I like my classroom more' and a reference to 'our beautiful class'. I interpret their positive attitude to the change to be a result of displaying their creations and provoking pride in their work. When respect was shown towards the students' artwork, there was a noticeable increase in their positive risk-taking behaviour and creativity. A regularly changing display of students' boosted confidence, offered inspiration and motivated them to take risks in order to achieve more in future tasks.

Through the display, the teacher was able to encourage students to develop critical and creative thinking, which agrees with findings of Muijs and Reynolds (2001). Bruner (1977) concurs that lack of confidence may make students unwilling to take risks. Students' artwork gives the classroom its identity, and conveys a message to students that the room is a space for trying new things.

Re-designing the disorganised display in one classroom led to a demonstrably more effective environment, helping students to do their work, stimulating them to be more accurate, feeding their imagination, and generating new ideas which are required for creative and critical thinking. These findings were in agreement with LaGreca (1980), Fisher (2005) and Ruscoe (2008).

In the post-implementation stage the art classroom became a colourful and fun learning environment. I found that variety in the substance and format of the materials displayed in the art classroom was very important, as it could then appeal to a range of tastes, to attract and visually stimulate as many students as possible. This finding regarding the influence of different methods of display in the classroom is in agreement with the findings of previous studies (Sommer & Olsen, 1980; Loughlin & Suina, 1982; O'Hare, 1998; Wheeler, 2000; McLeod et al., 2003; Ruscoe, 2008).

This research found that displaying artwork on walls and bulletin boards resulted in a softer classroom environment for students and increased the students' satisfaction level with their art classroom. These findings are in agreement with those of Sommer and Olsen (1980), Muijs and Reynolds (2005) and Ruscoe (2008).

Changes made in the art classrooms also increased students' interaction with their environment, and the rich and attractive environment developed their ability to discuss and analyse. In addition, the well-decorated classroom also enhanced teacher performance. This finding is in agreement with Wollin and Montagne (1981).

4. Conclusion

To ensure equal student participation the teacher should take care to display a range of students' artwork representing all abilities. Variation is important, and while some displays relate to unchanging, basic information, for example colour wheels or how to use materials, a teacher can make efforts to engage his or her class by redesigning or rearranging the display to give the same information in a different manner. Art classroom displays should not only be for information, instructions material, they should also include students' artwork. In conclusion, display materials should encourage

students and challenge them to take risks and be more creative and critical thinkers. The proper setup of an art classroom display is important for stimulating students by encouraging imagination, exploration, analysis, information gathering and new experiences, all of which can enhance their risk-taking ability and develop their critical and creative thinking skills.

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Social Media Marketing

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ABSTRACT: During different time era's different methods of communications has developed and changed the day by day life. Social media has become the method of statement in the 21't century, enabling us to express our belief, ideas and manner in a absolute new way. This way of message have also have a huge impact on corporation, where they have realize that without a correct plan and social media strategy they have no chance to stand out in the rapidly changing digital freedom. To guarantee a successful attendance on social media the companies need to take different marketing theories into consideration so that they can boost their brand in different aspect. If this can be collective with original ways of consumer interaction the companies have a good chance to take the lead in social media marketing'. The meteoric growth of community websites, such as Twitter, Facebook and Linkedln, have usher the world into a new era of social media. The global reach is nothing short of marvelous, so much so that if Facebook were a country, it would be third largest, next to China and India. Some even say that this is the biggest shift since the industrial revolution, which means that the world has a brand new playing meadow At its center, social media is any kind of online media that stimulates participation, openness' conversation, Connecters and sense of community. The social media phenomenon has a profound impact. Social media has transformed research methods. This allows brands to communicate better with their consumers, and intensify their association with them. The advertising world has not been spared from social media influence. Companies are now more careful with advertising; chiefly in anticipate consumer response and avoiding unanticipated blunders to prevent a viral consumer backlash in networking sites. Social media plays a hybrid role in the promotion mix. It allows companies to talk to their clientele and, at the same time, it allows regulars to talk to one another. Shaping customers' discussions to ensure they are aligned to the organization's goals is the firm's best importance. Companies have started provided that their consumers with networking platforms, and have occupied them during blogs and other social media tools. Social media is seen by Marketers today as a great opportunity to boost market share figures. Marketers are only too happy to view the social web as a new set of channels through which to market their goods or services. Social media marketing is a hot topic for companies. It allows companies to establish a communication channel with its customers, market their products, build brand equity, and boost clientele faithfulness.However, as it is a two-way channel, it requires effort and care to manage this communication. Dissatisfied customers can protest out loud, attainment many other customers easily and damaging the brand's image. In order to avoid the risk of damaging the brand's image rather than improving it, the company should align their social media marketing with the global marketing strategy of the company. In order to do this, the business should choose the profile of people that matches its target segment and communicate with them accordingly.
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Keywords: Social; Media; Marketing

1.0 INTRODUCTION

Marketing is a well-developed methodological science and is constantly changing its rules according to the needs and developments taking place in and around it. To establish itself in the new eta, it has begun adapting the new methods of virtues to come to terms with the new paradigms of business. The role of marketing in the development of business is intact but the way it was executed is radically changing due to contributions made by satellite communication and extensively developed scientific devices. Social Media is best defined in the context of the previous industrial media paradigm. Traditional media such as television, news papers, radio and magazines are in one direction static show technologies. New web technology have made it simple for anyone to create and most highly, issue their own content. A blog position, tweet or youtube video can be twisted and viewed by millions almost for free. Advertisers don't have to reimburse publishers or distributors huge sums of money to embed their messages and they can make their own interesting content that viewers will flock to. Social media comes in many forms and the eight most

popular are: Blogs, Microblogs, Social Networks, Media-Sharing Sites, Social Bookmarking and selection Sites, analysis Sites, forum and effective Worlds.

2.0 TECHNOLOGY AND ITS IMPACT ON BUSINESS

Over the past 40 years, there has been a radical shift in how business is conducted and how people cooperate. The preface of private computers, the Internet, and e-commerce have had a great impact on how businesses function and promote. The preface of social media technology is accelerating and it can expect it to have a similar impact on businesses now and into the prospect. As new technologies become existing, business that learn to use innovative technologies increase great reimbursement. Some of the best-known examples include technology-driven companies such as Microsoft, eBay, Amazon and Google. Finally' the explosive growth of the smart phone market and mobile computing is affecting the strategy, as social media connectivity is becoming easier and is helping social media glow even faster.

3.0 BIG BRANDS AND SOCIAL MEDIA

Social media is being widely used by almost all and even the companies, in spite of their size have started using social media to advertise and promote themselves. Big brands make use of the social media to convey their strong existence and friendly customer relationship. Big brands like IBM, Dell and Burger King have made use of the social media to a greater extent. IBM owns more than 100 different blogs, a dozen islands in the virtual world, several official Twitter accounts, and a accepted forum called DeveloperWorks. It publishes a machine series on youTube, and several employees upload presentations to the media-sharing-site SlideShare.

Dell has tapped the power of social media with its hugely popular IdeaStorm website, where users add thoughts for new creation lines and enhancement, choose them up or down, and comment on submission. Because of the site, Dell has ongoing to ship computers with Linux install, and has added community carry. Starbucks has also started to use this representation to some success with its MyStarbucks Idea Site. Burger King has made headline time and time again with its innovative and viral social marketing campaigns. The burger chain offered Facebook users a free Whopper coupon if they would "unfriend" 10 of their social network connections.

4.0 THE SOCIAL CONSUMER DECISION JOURNEY

Companies have quickly learned that social media works: 39 percent of companies surveyed by McKinsey Quarterly use social-media services as their primary digital tool to reach customers, and that proportion is probable to increase to 47 percent within the next four years. fuel this growth is a growing list of success stories from majority companies:

Creating buzz: Eighteen months before Ford re-entered the US subcompact-car market with its Fiesta model, it began a broad promotion movement called the Fiesta Movement. A major part involved giving 100 social-media influencers a European model of the car, having them whole "missions,,, and ask them to paper their practice on a selection of social channels. Videos related to the Fiesta campaign generated 6.5 million views on YouTube, and Ford received 50,000 requests for information about the vehicle, mostly from non-Ford drivers. When it finally became available to the public, in late 2010, some 10,000 cars sold in the first six days.

Learning from customers: PepsiCo has used social networks to collect customer insight via its DEW McCray promotions, which have led to the making of new variety of its Mountain Dew brand. Since 2008, the company has sold more than 36 million cases of them.

Targeting customers: Levi Strauss has used social media to offer location-specific deals. In one instance, direct interactions with just 400 consumers led 1,600 people to turn up at the company's stores- an example of social media's word-of-mouth effect.

The number of companies with Facebook pages, Twitter feeds, or online communities continue to grow. Marketing primary objective is to reach consumers at the moments, or touch points, that influence their purchasing behavior. Social media is a exclusive component of the consumer decision journey: it's the only form of marketing that can finger consumers at each and every stage, from when they're pondering brands and products right through the period after a purchase, as their experience influences the brands they prefer and their potential advocacy influences others.

5.0 THE PILLARS OF SOCIAL MEDIA MARKETING (Table 1)

Table 1. Commonly Used Social Media Marketing Tools		
Facebook 92%	Twitter 84%	LinkedIn 71%
Blogs 68%	Youtube 56%	Forums 24%
Foursquare 17%	MySpace 6%	Social BookMarking 26%

5.1 Blogging

A blog is a type of content management system that makes it easy for anyone to publish short articles called posts. Blog software provides a variety of social features, including comments, blog rolls,

trackbacks and subscriptions that make it perfect for marketing purposes. Blogs make great hubs for other social media marketing efforts, as they can be integrated with nearly every tool and platform. Every company with a website should have a blog that speaks to its current and potential customers as real people. Blogs are not the right place for corporate-speak press releases; blogs should be conversational in tone.

Mashable is one of the five most popular blogs on the web, according to Technocratic, and is the leader in the social media niche. Blogs influence roughly one in five readers at important purchase-decision stages, according to Buzz Logic and Jupiter Research's "Harnessing the Power of Blogs" report. Specifically, blogs help consumers discover products and services, refine choices, get support and answers, and decide on a specific product or service. From a direct marketing perspective, these findings make sense because blogs aggregate customers who have similar demographic, psychographic, and behavioral traits. According to the research, readers trust blog content more than social media sites for shopping. This makes sense, since shoppers look for detailed information to help them make a decision rather than engage with random posters who may have opinions about products.

While no longer the latest, preferred form of online communications, blogs can be highly effective and cost-efficient in driving sales. But they aren't a quick marketing fix. They're a form of online media that requires a long-term investment to help and engage the customers and create more interest in the product offering. By their nature, blogs also aid search optimization and reduce the burden of post-purchase support and customer service.

5.2 Twitter and Micro Blogging

Micro blogging is a form of blogging that limits the size of each post; for instance, Twitter updates can contain only 140 characters. Twitter started to take off in terms of popularity in the first half of 2009 as a result of high-profile celebrity members and a mention on Oprah, and now it has become more main stream than other social media tools. Most companies should be on Twitter; it's easy, requires very little investment of time, and can quickly prove worthwhile in increased buzz, sales and consumer insight. Twitter can also be used to announce offers or events, promote new blog posts, or keep the readers in the know with links to important news stories. Twitter can be one way of staying on top what the competitor is doing. The company can also show support for their Twitter-loving customers by subscribing to their tweets. Briefly, Twitter for businesses is a fast, easy (and free) way to:

- Stay on top of what the competitor is doing;
- Keep in touch with the own clients (subscribe to their Tweets and see what they are doing);
- Offer private discounts and sales announcements;
- Provide internal updates to team members and employees;
- Get leads on business opportunities, trends, and a jump on late-breaking news.

6.0 SOCIAL NETWORKS

As the World Wide Web grew in popularity, social networking moved to web-based applications. The first wave was built for specific functions or audiences. In 1995, Classmates.com and Match.com were created; both remained fairly popular sites in their niche. In 1999, more targeted networks were launched. The modern era of social networks began in2002, when Jonathan Abrams launched Friendster. In 2003, Intermix Media developed the social network, MySpace. It duplicated the core functionality of Friendster. Initially powered by Intermix Media's large mailing lists, MySpace quickly became a leader among social networking sites. In October 2003, Mark Zuckerberg went on to create the Facebook, a social network that began as an exclusive site for Harvard Students. Finally, in 2006, anyone with an e-mail id can sign up. Sometime between 2008 and 2009, Facebook overtook MySpace.

Facebook would be a natural fit for internet marketing. How would a marketer take advantage? Some ways may include:

- Establishing and enhancing the brand image
- Establishing and enhancing the company's authority in the market , a thought leader
- Using the network for market research (opinions and viewpoints, good for surveys)
- Creating a Facebook group of people of similar interest. Great for networking.
- Targeted Advertising

According to the wall Street Journal, Facebook is working on a system to allow targeted advertising to specific networks of people with similar interest. Social-networking Web site Facebook Inc. is quietly working on a new advertising system that would let marketers target users with ads based on the massive amounts of information people reveal on the site about themselves. Eventually, it hopes to refine the system to allow it to predict what products and services users might be interested in even before they have specifically mentioned an area.

EBay's Group Gifts service, employs Facebook platform technology. To use Group Gifts, users log in with their Facebook credentials, which loads up the

list of their Facebook friends? The user can then choose the friend for whom she wants to get a gift and then proceed to look for an appropriate item. The site can offer generic gifts, but a savvy user can ask the application to look at the gift recipient's list of Likes on Facebook and recommend a set of items that match the recipient's interests. Once the gift is chosen, the user can decide how much to contribute herself and how much to leave for others to chip in. Then, she can automatically post a status update on Facebook that alerts others that they can contribute to that gift. When these friends see the update, they can click on it to go to the Group Gifts site and add their contributions. Once the sum of all contributions equals the purchase price of the gift, the transaction is executed and the recipient receives the gift, a list of all the friends who contributed to it, and brief notes from them.

It is truly social. It overcomes some real off-line difficulties related to group gift giving - like having to solicit people directly and risking embarrassment when you ask someone to contribute who does not want to do so. The online application simply puts it out there for people to contribute if they wish. Also, it seeks to strengthen relationships between friends. It also has real strategic benefits for eBay. The company can sell a greater volume of more expensive items. And since individuals are, in essence, advertising the service to their friends, it lowers eBay's cost of acquiring customers. In other words, this kind of social strategy produces a win-win for Facebook users and a company.

7.0 USING FACEBOOK TO CAPTURE CUSTOMERS

A central tenet of retailing is to put stores near customers. Now that 600 million potential customers are on Facebook, retailers are flocking to the site and aggressively experimenting with new communication strategies. Here are five ways they're connecting with customers on Facebook.

7.1 Promotions

For retailers, the key is to treat "fans" differently than other customers by providing special access to offers and information. Using Facebook as a one-way communications channel is a baby step, but broadcasting deals already found in other channels isn't a particularly effective engagement model. A smarter approach is to reward fans by, for instance, providing Facebook-only discounts and sneak peeks at upcoming products.

Participatory promotions are particularly effective as they add excitement to online purchasing and an incentive for customers to invite other friends. For example, Lowes ran a Black Friday campaign on Facebook in which it offered a limited number of items at ridiculously low prices for fans only. Most discounts were in the range of 90% and were limited to the first 100 people to check out with the item at lowes.com. Not only did this engage existing customers, but it drove new customers to "like" Lowes' Facebook page, allowing Lowes to post future deals-on their newsfeeds.

7.2 Crowd sourcing

Wal-Mart and Gap have used crowdsourcing tactics on Facebook, inviting large groups to participate in shaping an offer or strategy. The Wal-Mart Crowd Savers program, for example, offers a potential deal to Facebook fans that is only activated if enough fans "like" the promotion - in effect, joining together to reach a goal - much like Groupon's model. Similarly, last year Gap asked its Facebook fans to comment on its new logo design. After a barrage of negative feedback from fans, Gap invited them to submit their own designs. Responding to customers' outcry, the retailer ultimately restored its original logo.

7.3 Check-ins

Mobile-device check-ins is a popular way to electronically announce the arrival at a location. This has enormous potential value for retailers who, if they identify customers at all, typically don't do it until checkout, at which point it's too late to influence a purchase. Facebook Deals enables retailers to provide electronic coupons and loyalty points when customers check in at arrival, increasing store traffic and sales, and giving retailers a clearer picture of their customers' behavior. Last year REI drove traffic to its stores by offering $1 donations to charity for every check-in, with a ceiling of $100,000. American Eagle has offered 20% discounts to customers who check into its stores.

7.4 Games

Games like Farmville and Mafia Wars hosted on Facebook are immensely successful, creating an ideal opportunity for retailers to do something they know well: marry entertainment and merchandising. Last summer 7-Eleven partnered with game-maker Zynga to extend social games into the physical world. Items such as slurpees and Big Gilps were branded with Farmville, Mafia Wars and YoVille designs that had redemption codes for in-game rewards. Meanwhile, teen-fashion retailer Wet Seal has been developing its own Facebook game, Chic Boutique. The retailer is hoping customers will compete with each other online to design outfits compiled from items in its catalog, increasing awareness of Wet Seal's offerings and driving sales.

7.5 Social Shopping

The most obvious use of Facebook is also the most elusive - to create more than just an e-

commerce store within a Facebook frame. Over the past two years several retailers have made it possible for customers to browse a subset of products on the company's Facebook page, but they usually rely on their e-commerce site to complete the transaction. This is a step in the right direction, but to take real advantage of Facebook, retailers must make it easier for people on the site to communicate with each other about products, promotions' and reviews, and seamlessly make purchases.

To that end JCPenney recently opened a storefront on Facebook containing its entire catalog of products. The UK retailer ASOS quickly followed suit. Facebook is testing a Buy-with-Friends program' currently limited to virtual goods, that publishes users' purchases on friends' newsfeeds and, by offering discounts, encourages those friends to make the same purchase. All companies, not just retailers, should be using social media like Facebook to listen to what customer are saying about their products and brand; attract them by using promotions, contests, and games; and involve them to keep them loyal and take advantage of the power of influential's. These are the early days, and while it's uncertain what will work best, it's likely that retailers that don't experiment with social commerce will find their customers defecting to those that do.

8.0 MEDIA SHARING SITES

Media sharing sites allow you to upload your photos, videos and audio to a website that can be accessed from anywhere in the world. Most services have additional social features such as profiles, commenting, etc. The most popular by far are youTube (videos) and Flickr (pictures). Whether it's Pinterest, Instagram, Flickr or one of the many photo sharing sites popping up online, image-driven social media networks and sites are a great resource for B2B companies. Online marketing doesn't just consist of Facebook, PPC efforts, and banners. Online marketing is about providing current and potential customers with interesting, informative content. This includes images. Because many photo sharing sites are free, a business's biggest investment is time. B2B companies can truly benefit from having corporate accounts on a number of these photo sharing sites.

9.0 SOCIAL BOOKMARKING AND VOTING SITES

Social bookmarking sites are a popular way to store, classify, share and search links through the practice of folksonomy (an Internet-based information retrieval methodology consisting of collaboratively generated, open-ended labels that categorize content such as Web pages, online photographs, and Web links) techniques on the

Internet. Social Bookmarking is a technique that is explained as organizing and maintaining resourceful bookmarks online. The method began in April 1996 when the website itList was launched giving users the capability of having public or private bookmarks. Over the next few years online bookmark services began to go head to head with each other and the industry became very competitive with venture-backed institutions such as Hotlinks, ClickMarks, Clip2, Blink and Backflip amongst others entering the marketplace.

In 2003, Delicious was formed and pioneered a term called 'tagging' which allowed users to search for bookmarked items by a keyword, Delicious also coined the phrase 'Social Bookmarking'. Social bookmarking is a very useful way to access a compiled list of bookmarks from a variety of computers, manage a large amount of bookmarks and share the bookmarks with contacts. Many bookmarking sites have implemented a voting system where users are encouraged to indicate bookmarks that they found to be interesting or of use. As a bookmark receives more votes its visibility increases on the website which in turn generates more and more votes.

10.0 REVIEW SITES

A review site is a website on which reviews can be posted about people, businesses, products, or services. These sites may use web 2.0 techniques to gather reviews from site users or may employ professional writers to author reviews on the topic of concern for the site. Early review sites included Epinions.com and Amazon.com. Review sites are generally supported by advertising. Some business review sites may also allow businesses to pay for enhanced listings, which do not affect the reviews and ratings. Product review sites may be supported by providing affiliate links to the websites that sell the reviewed items.

With the growing popularity of affiliate programs on the Internet, a new sort of review site has emerged - the affiliate product review site. This type of site is usually professionally designed and written to maximize conversions, and is used by e-commerce marketers. It's often based on a blog platform like Wordpress, has a privacy and contact page to help with SEO, and has commenting and interactivity turned off. It will also have an e-mail gathering device in the form of an opt-in, or drop-down list to help the aspiring e-commerce business person build an e-mail list to market to. These sites generally review e-books. Because of the specialized marketing thrust of this type of website, the reviews are not objective.

Studies by independent research groups like Forrester Research, comScore, The Kelsey Group, and the Word of Mouth Marketing Association show that rating and review sites influence consumer shopping behavior. In an academic study published in 2008, empirical results demonstrated that the number of online user reviews is a good indicator of the intensity of underlying word-of-mouth effect and increase awareness. In 2007 even large companies such as Best Buy and Walmart began to mention online reviews in television advertisements and on the back of receipts.

11.0 FORUMS

An Internet forum, or message board, is an online discussion site where people can hold conversations in the form of posted messages. They differ from chat rooms in that messages are at least temporarily archived. Also, depending on the access level of a user or the forum set-up, a posted message might need to be approved by a moderator before it become visible. Forums have a specific set of jargon associated with them; e.g. a single conversation is called a "thread". A discussion forum is hierarchical or tree-like in structure: a forum can contain a number of sub forums, each of which may have several topics. Within a forum's topic, each new discussion started is called a thread, and can be replied to by as many people as so wish. Depending on the forum's settings, users can be anonymous or have to register with the forum and then subsequently log in order to post messages. On most forums, users do not have to log in to read existing messages.

Forum marketing is great way to make your online business stand out from the crowd, forum users are generally net savvy and open to making online purchases. Many forum users are also respected experts and bloggers in the specific topics covered by the forum. Forum marketing is a high ROL strategy because making a good impression in front of this savvy and influential audience can help your marketing message spread far and wide.

12.0 VIRTUAL WORLD

A virtual world is an online community that takes the form of a computer-based simulated environment through which users can interact with one another and use and create objects. The term has become largely synonymous with interactive 3D virtual environments, where the users take the form of avatars visible to others. These avatars usually appear as textual, two-dimensional, or three-dimension representation a, although other forms are possible (auditory and touch sensations for example). In general, virtual worlds allow for multiple users.

The computer accesses a computer-simulated world and presents perceptual stimuli to the user, who in turn can manipulate elements of the modeled world and thus experience a degree of telepresence. Such modeled worlds and their rules may draw from the reality or fantasy worlds. Example rules are gravity, topography, locomotion, real-time actions, and communications. Communication between users can range from text, graphical icons, visual gesture, sound and rarely, forms using touch, voice command and balance senses.

In the virtual world, people can meet, collaborate, plan, visualize, train and learn together. They can use the same tools as in real life meetings such as whiteboards and PowerPoint as well as accessing media such as You Tube and Websites. Furthermore they can visualize information three dimensional. For example, instead of seeing a list of potential clients, they could walk onto a live Google map and touch a marker to bring up media relevant to the organization such as their website , news coverage , press release etc – all in one space – and share that experience with other team members (no matter where they are in the world).

13.0 SOCIAL MEDIA STATISTICS

Facebook:

1. There are now more than 800 million active Facebook users, with more than 200 million added in 2011 .

2. B2C Facebook results are 30% above average on Sundays. (Convince & Converts)

3. Nearly every charity and University in America is on Facebook. Less than 60% of the fortune 500 are. (Grow)

4. The average Facebook user has 130 friends and is connected to 80 pages, events and groups. (Social Media Examiner)

5. 95% of Facebook wall posts are not answered by brands (Facebook).

6. Auto-posting to Face-book decreases likes and comments by 70%.(inside Facebook)

7. When it comes to liking brands on facebook, the reasons are varied, but for the most part, respondents said they "Like" a brand on Facebook because they are a customer(58%) or because they went to receive discounts and promotions(57%).(Mashable)

8. 77% of consumers said they interact with brands on facebook primarily through reading posts and updates from the brands…(Mashabke)

9. 17% of respondents said they interact with brands by sharing experiences and news stories with others about the brand and only 13% of respondents said they post updates about brands that they like (Mashabke)

10. 56% of consumers said they are more likely to recommend a brand to a friend after becoming a fan on facebook (Mashable)

11. There are more than3.5 billion pieces of content(web links, news stories, blog posts, etc.) shared each week on Facebook. (Hubspot)

Figures on Social Media

12. Roughly two-third of social media users say that staying in touch with current friends and family members is a major reason they use these sites while half say that connecting with old friends they have lost touch with is a major reason behind their use o these technology.(PEW research)

13. One in three respondents (33%) said that they could prioritize social media freedom, device flexibility and work mobility over salary in accepting a job offeer (GIGAOM)

14. One in three textors would rather text than talk (NY TIMES: BITS)

15. 73% of people think employees over share on social media (marketing piligrim)

16. 43% of all online consumers are social media fans or followers (HUBSPOT)

17. 64% of AMERICAN stream mobile vedio at work (TUBE FILTER)

18. According to Threatmatrix survey of 722 active internet using consumers, 37% intend to make a purchase using their smartphone, nearly three times as many as those who plan to use their tablet. (Get Elastic).

General Social Media

19. Tablet owners tend to consume a greater variety and volume of news on their devices, and Tablets' visual , interactive features encourage in-depth exploration, according to a joiny study from Starcom Mediavest and the online division of the BBC. (Mashable)

20. More Smartphones and Tablet owners are researching products than purchasing them – 80.8% compared to 41.4%, according to BIGResearh – but attitudes vary quite a bit among different age groups.(eMarketer)

21. 40% of bloggers themselves are professionals.(MediaBistro/ State of the Blogosphere 2011)

22. A 2011 study by the National Restaurent Association conforms that consumers who use social media including apps, Twitter, Facebook, FourSquare, UrbanSpoon and more, not only dine out more, but are more likely to become return customers. (ReadWriteWeb)

23. Linked In : Linkedin has 64 million users in North America alone.(All Twitter)

24. John Hopkins, facebook's birth place Harvard, and Notre Dame are the top schools for social media.(Boston.com)

25. Facebook, Twitter and Youtube are now considered cornerstones of most social-media strategies in larger companies. 94% of respodents

said Facebook is one of their top three social media platform priorities. Twitter was second with 77% and Youtube trailed with 42%. (Scratch Engine Watch).

26. The Mobile marketing Association of Asia atated that ouyt of the 6 billionpeople on the planet, 4.8 billion have a mobile phone while only 4.2 billion own a toothbrush. (60 Second Marketer)

27. 61% in 2010 and 65% in 2011, Fully 65% of adult internet users now say they use a social-networking site like MySpace, Facebook or Linkedin, up from 61% one year ago. This marks the first time in Pew Internet surveys that 50% of all adults use social networking sites. (Wired PR Works)

28. IT professionals see serious risks assocaited with enterprise social network use – and only 29% say they have adequate protection. (InformationWeek : The BrainYard)

29. Social media is responsible for one-third the web traffic in Malaysia. (ReadWriteWeb)

30. 44% of companies track employees' social-media use in and out of the office (TheNextWeb)

31. 84% Among college students and young professionals, 24% experience three to five interruptions in a given hour, while 84% get interrupted at least once while trying to complete a project. (GigaOm)

32. The mean half life of a link on Twitter is 2.8 hours, on Facebook it's 3.2 hours and via "direct" sources(like email or IM clients) it's 3.4 hours. So you can expect, on average, an extra 24 minutes of attention if you post on Facebook than if you post on Twitter. (bitly blog)

33. 20% of searches on Google each day have never been searched for before. (HubSpot).

34. SEO : Still dominates for marketers, with both B2B (57%) and B2C (41%) businesses stating it makes the biggest impact on their lead generation goals. (AllTwitter).

35. A^A : Overall. 57% of comments about U.S. airlines on social media in the past year where negative. But American Airlines- The world's 4th largest airlines stood out with only 12% of social media opinions about the airlines being positive. (The RealTime Report)

36. 56% of college students said that if they encountered a company that banned access to social media they would either not accept a job offer or would join and find a way to circumvent corporate policy. (GigaOm)

37. Only 15% have the average local business's fans are in the city where the business is located. (WSJ)

38. According to a new studt published by Neilsen those two categories eat up 23% of internet usage overall. This is double online gaming, which comes in at number two and after that, it takes 75 different

categories to account for the remaining 35% of time spent (Marketing Pilgrim)

39. There are 245 million internet users in the U.S, according to internet world statistics. Nielsen estimates that social sites and blocks reach 80% of all active U.S internet users (PR Week)

40. 30% of B2B marketers are spending millions of dollars annually on social marketing programs, though nearly 30% are not traking impact of social media programs on lead generation and sales.

41. NETFLIX: Netflix's price hike caused 8,05,000 paid subscriber to jum ship in the most recent quarter.

Twitter

42. E-Marketer estimates there will be nearly 21 million twitter users in the U.S by the end of this year, and a sizable minority of those will use the service at least in part to follow brands

43. 34 % of marketers have generated leads using twitter and 20% have closed deals using twitter (AllTwitter)

44. 40% actually don't tweet but simply dip into their Timeliness to keep tabs on what people are saying

45. 55% of them access Twitter via mobile
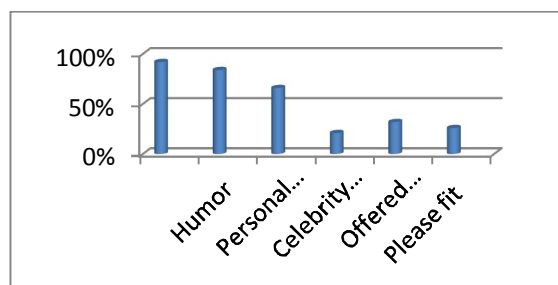
47. What makes people to tweet

(Figure 1)

Figure 1. Plot repsentation

14.0 CONCLUSION

Social media isn't about money or institutions. It isn't about stockholders making billions of dollars. It isn't about corporate ownership. Social media is about ordinary people taking control of the world around them and finding creative new ways to bring their collective voices together to get what they want. Social Media Marketing (SMM) is primarily internet-based but has similarities with non-internet-based, marketing methods like word-of-mouth marketing. SMM is the way of promoting a website, brand or business by interacting with or attracting the interest of current or prospective customers through the channels of social media. Facebook, Twitter and Youtube are the most popular social media that are widely used by the companies and the celebrities in promoting themselves and their brands. With the number of users rising each day in Facebook and other social networking sites, it is bound to bring in more customers for the business and much more promotions and marketing thus making social media, the better platform for marketing.

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Urinary Tract Infection and Wound Infection in Obese Women Undergoing Cesarean Section at Women's Health Center

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Abstract: Background: Obesity is a serious and growing global health problem. There are approximately 300 million obese adults worldwide and increasing in developing countries more than developed countries. In Egypt 70% of adult women were overweight, added that the prevalence in 30.8% rural women and 49.1% urban women were obese. Pre pregnancy obesity is common and it adversely affects the maternal and perinatal outcomes. Maternal obesity has major impact on health service, especially on relation to the level of care required, the cost and resources implications related to increase complications and risk to the mothers and infant such as increased rates of caesarean section and post partum infections. **Aim of this study:** was to determine whether obese women are at increased risk of urinary tract and wound infection after cesarean section compared to women with a normal body mass index (BMI).**Methods and Materials***: It is a prospective study of 500 women (250 were obese and 250 non obese) after elective cesarean section from postpartum wards, Obstetrics Department, Women's Health Center, Assiut university Hospital.Special questionnaire for data collection was designed, urine culture was taken to detect (UTIs) and follow up continue after one week until one month after discharge to detect wound infection. **Results:** Women in the obese group were significantly with more complications during pregnancy and higher in post partum infection more than non obese women, Urinary tract infection was (22.8%) compared with (12.4%) in non obese women and wound infection was (12.4%) compared with (3.2%) in non obese women. **Conclusions:** Maternal obesity has major adverse effects on pregnancy outcome

1 . Introduction

Obesity is a chronic metabolic disorder caused by an imbalance between the intake of food and the expenditure of energy resulting in an excessive amount of adipose tissue. Obese women experience significantly more infections than women with a normal body mass index [1]

Obesity has become an epidemic health problem among pregnant women. In Egypt 70 percent of women are overweight or obese [2].The incidence of obesity among pregnant women in the United States of America (USA) ranges from 18.5% to 38.3% [3].

The world Health Organization (WHO) and (NHI) in America recommend that obesity is measured by the (BMI) and calculated by weight (kg)/height (m²). A (BMI) of 30-34.9 kg/ m² classified as class I (mild obesity), 35-39.9 kg/ m² as class II (moderate obesity) and greater than and equal to 40 kg/ m² as class III (severe or extreme obesity). Alternatively, (BMI) between 30-34.9 kg /m² is considered obese and 35 kg/m² or greater is considered morbidly obese [4].

A greater rate of infection associated with obese women undergoing Caesarean section (S.C) surgery has been reported. Surgical site infection (SSI) is the second most common infectious complication after

urinary tract infections (UTIs) following (S.C) delivery [5].

Wound infection after (S.C) occurs in 2%-16% of women depending on many factors such as diabetes, obesity, length of labour, number of vaginal examinations and antibiotics prophylaxis [6]. (SSIs) is an infection that develops within 30 days after an operation or within one year if an implant was placed and the infection appears to be related to the surgery. Post-operative (SSIs) is the most common healthcare-associated infection in surgical patients, occurring in up to 5 percent of surgical patients. Patients who develop an (SSIs) require significantly more medical care and the development of an (SSIs) increases the hospital length of stay by a median of two weeks. The risk continues after discharge. (SSIs) develop in almost 2 percent of patients after discharge [7].

UTIs are abroad term used to describe bacterial infection or inflammation of the bladder (Cystitis), urethra (urethritis), or renal pelvis and kidneys (pyelonephritis) and microbial colonization of the urine. Approximately 10% of women are diagnosed with UTIs in the (USA) yearly more than men because ascending infection from urethral opening and vagina to the perineal area. Infection in the pregnant women

should always be cultured. Colony count as low as 10,000/ml can cause symptomatic infections in women [8].

The frequency of menstrual disturbance in women with severe obesity is three times greater than for women of normal weight. High pre-pregnancy weight is associated with an increased risk of pregnancy hypertension, gestational diabetes, UTIs, C.S delivery and toxemia. Women with obesity are 13 times more likely to have overdue births, longer labors, induced labor and blood loss. Complications after childbirth, related to obesity, include an increased risk of wound, endometrial and UTIs infection [9].

Significance of the study

Obesity is a major public health problem. There are approximately 300 million obese adults worldwide; While in Egypt 70% of adult women were overweight in 1998, added that the prevalence in 30.8% rural women and 49.1% urban women were obese ([10].

Prevalence of obesity in women of reproductive age: In 2003, 19.6% of U.S. women of reproductive age (aged 18-44 years) were obese (BMI greater than or equal to 30)[11]. Obese women have a greater risk of developing complications during pregnancy, after labour and their babies are also more likely to be admitted to neonatal intensive care units [12].

Aim of this study

This study aimed to estimating the prevalence of urinary tract infection and wound infection in women undergoing cesarean section in obese women compared to non obese women and estimates the most common causative organisms of urinary and wound infection.

2. Subjects and Methods

1-Research design-

A prospective study was used in carrying out this study.

2- Setting

The Study was conducted in postpartum wards of Obstetrics Department in Women's Health Center at Assiut university hospital, which serves all cases from rural and urban areas.

3-Sample

This prospective study included 250 obese women and 250 non obese women who were delivered by elective cesarean section at Women's Health Center.

Sample criteria

Inclusion criteria:-

1- All obese women categories according to the classification of (WHO, 2010)
- Class I obesity 30.00 – 34.9 kg/ m²
- Class II obesity 35.00 - 39.9 kg/ m²

- Class III obesity ≥ 40.00 kg/ m², chosen at any age group at Women's Health Center.

2- All non obese women categories according to the classification of (WHO, 2010)
- Underweight less than 18.5 kg/ m²
- Normal weight 18.5 – 24.9 kg/ m²
- Overweight 25.0 – 29.9 kg/ m²

3- Elective cesarean section.

Exclusion criteria:-

1- Diabetic women

2- Premature rupture of membrane during pregnancy.

3- Ante partum hemorrhage

4 -Tools of the study

- **An interviewing questionnaire:-**

An interviewing questionnaire was designed for this study utilized by the researcher and was used to collect the relevant data from group of obese and non obese women admitted to postpartum department undergone C.S at Women's Health Center at Assiut university hospital.

 - The data collected which include the following parts:-

1- Personal data:

o women's and husband's name, age, educational level, socioeconomic level, address, telephone number, occupation, women's height, weight and body mass index (BMI).

2 - Maternal History:

o Menstrual history, E.g.(Age of menarche, Duration, Interval and Rhythm)

o Family planning history, E.g.(Method used, Duration and cause of termination)

o Family history for any disease ,E.g.(Diabetes, Hypertension, Multiple pregnancy, Congenital anomalies and Others hereditary conditions as obesity)

o Past history for any medical and surgical history, E.g.(Diabetes, Hypertension, Cardiovascular disease, Renal disease, Respiratory disease, Hepatic disease, ….etc)

o History for taking any drugs

3- Obstetric History:

o Gravidity, parity, No of abortions, stillbirths, neonatal deaths and No of living children.

4- Outcomes of previous deliveries:

o Number of normal vaginal deliveries, No of abnormal vaginal deliveries, No of cesarean sections and previous indications of cesarean section.

5- Current Antenatal Condition:

o Gestational age / Weeks.

o Current antenatal risk factors, e.g.(None, Previous Cesarean section, Ante- partum hemorrhage, Cardiovascular Disorders, etc).

6- Data related to current Cesarean Section:

o Date of operation.

- Indications of Cesarean section, e.g. (Ante partum hemorrhage, P.I.H, C.P.D, Failure of progress, Failure of induction, etc).
- Attendant of Cesarean section.
- Type of antibiotics.
- Type of anesthesia.
- Operative technique.
- Time of initiation of lactation.
- Status at discharge

7 - Neonatal condition:
- Neonatal Outcomes. (Normal or Still birth)
- Abnormal Neonatal Outcomes, e.g. (Neonatal jaundice, Respiratory distress syndrome, Malformation, Admission to .I.C.U, etc).
- Birth weight / GM
- Apgar score at1&5 minutes.
  - Sex of the newborn, E.g. (Male, Female, Twins females, Twins males, Mixed Twins and Triplet).

8- Intra operative complications:
  - None, bleeding, bladder injury, bowel injury, ureteric injury, rupture uterus & uterine repair (traumatic), anesthetic complications, etc).

9- Post operative (puerperal) complications:
  - None, urinary tract infections, wound infection, bleeding, fever, blood transfusion, chest infection, mastitis (engorgement), etc).

10- Admission to I.C.U:
  - Duration of hospitalization: days –Weeks - Month
  - Indications for admission

11 - Date of discharge.

12- State of previous wound (clean or septic).

13 - Data related to wound infection if present:
- Diagnosis of wound infection or day of rehospitalization.
- Date of secondary suture of wound if done.
- Diagnosis after discharge.
- Sample taken.
- Abdominal swab. (Done & Not done)
- If done, causative organism is (No Growth, Staphylococcus aureus, Escherichia coli, Klebsiella sporous, Anaerobes, etc).
- Blood culture. (Done & Not done)

14 - Urine culture, the causative organism is (No Growth, Gm-ve Bacilli, Lactose Fermenter (E-Coli), Klebsiella, Anaerobes, .etc).

- **Procedure**
- An official permission was obtained from the Council of Department of Obstetrics & Gynecology in Women's Health Center at Assiut University hospital and an ethical approval was also obtained from Ethical Committees of Faculties of Nursing and Medicine.

- Formal consent was took from every woman (written or verbal) before involved in the study after explanation of the nature of the study and that are no risk or cost in participation.
- The researcher interviewed the woman face to face for explain the purpose of the study, and then took complete history from the women and patient's record after obtain consent and agreement to participate and to fill the questionnaire.
- The researcher measured the women's weight and height to calculate the body mass index according to the equation of BMI.

$$BMI = \frac{Weight\ (Kg)}{Height\ (m^2)}$$

- The researcher provided health educations about wound care and proper perineal care to minimize wound infection and urinary tract infection.
- The researcher instructed the women how to collect the Clean-catch midstream urine sample and then took urine sample to the lab for culture.
- Follow up for women was scheduled after one week until one month through the outpatient clinic if the women returned for wound dressing and to ensure that the wound clean or through a telephone call to ensure that the wound was clean or became infected.
- If the wound became infected and re-hospitalized, was taken a swab from the infected wound for culture to detect the causative microorganisms.
- The researcher informed women about results of culture and future management.

Urine Culture Technique:

  Clean-catch midstream urine collection method:-
- This method helps to protect the urine sample from germs that are normally found on the vagina.
- Women were instructed to wash your hands before collecting the urine and removed carefully the lid of container and set it down with the inner surface up.
- Clean the area around your vagina.
- A woman was spread open the folds of skin around her vagina with one hand, and then used other hand to clean the area around vagina and urethra.
- Wiped the area from front to back to avoid spreading bacteria to the vagina that is normally found around the anus.
- Begun urinating into the toilet or urinal. Placed the collection container in the stream and collected midstream urine without stopping the

flow and finished urinating into the toilet or urinal.
o   Carefully replaced the lid on the container.
o   Washed your hands.
o   Returned the urine sample to the lab.

❖ **Supplies and Equipment:-**
▪   **Media**
o   Blood agar
o   MacConkey agar

❖ **Procedure of culture**

This procedure was performed on plates of 5% sheep blood agar, which detects growth of most organisms, and on a plate of MacConkey agar or other selective and differential medium for isolation of gram-negative organisms. The plates were incubated at 36°C for 18 to 24 hours and read for growth. The number of colonies is multiplied by the appropriate factor to give the colony count per mL urine. Plates which showed no growth at 24 hours were incubated another day and read again. Growth of more than three species indicated contamination, plates were held and a partial identification (e.g. gram-negative rod, lactose positive) was reported when there were less than 10,000 colony forming units (CFU) per mL. Each colony type giving 10,000 or more CFU/mL was identified and antibiotic susceptibility testing was performed.

3. Results
- Urine culture results were ready in 1 to 3 days. Some organisms took longer to grow in the culture; for this reason, results may not be available for several days.
o   Urine culture Normal (No grows): No bacteria or other organisms (such as fungi) grow in the culture. The culture result was negative.
o   Abnormal: Organisms (usually bacteria) grow in the culture. The culture result was positive. A count of 100,000 or more bacteria per milliliter (mL) of urine caused by an infection.
o   If test results were positive, sensitivity testing was done to help make decisions about treatment.

❖ **Wound swab culture Technique:**

The Swab was taken from the women after re-hospitalization with septic wound for culture to detect the causative organism. Wound Swab was taken from an area of viable tissue for culture. The health-care professional prepared the patient by cleansing the affected area with a sterile solution, such as saline and excessive debris was removed. Antiseptics such as ethyl alcohol were not recommended, because they kill bacteria and cause the culture results to be negative. A cotton-tipped transwab was rubbed lightly across the wound surface in zigzag manner and simultaneously rotating the swab over the entire surface.

❖ **Supplies and Equipment:-**
▪   **Media**
o   Blood agar
o   MacConkey agar
o   Chocolate agar
o   Mannitol salt agar
o   Eosin methylene blue agar

❖ **Procedure of swab culture**
▪   **Incubation of media**

The swab was placed in a sterile tube with a small amount of sterile saline. The swabs were platted on Blood, MacConkey and Chocolate agars then the Blood and MacConkey agars were incubated at 35-37c in an ambient air and Chocolate agar were incubated at 35-37c in a candle jar.

❖ **Direct smear**

Gram-stained smear was prepared. In addition to microorganisms, WBC, and aquamous epithelial cells suggestive of surface contamination were examined.

❖ **Culture examination**
1)   All Media were examined after overnight incubation.
2)   Completed identification and susceptibility testing were performed (if applicable) for up to 3 organisms, especially when any of the following are true:
    1] WBC's were seen on the direct smear
    2] Culture source is from a normally sterile site
    3] The sample had few if any epithelial cells
    4] The organism was seen on the direct smear
o   Blood agar for staphylococci, streptococci
o   Chocholat agar for group –ve bacilli
o   MacConkey agar for pneumocooci, Haemophilus influenzae
o   Mannitol Salt Agar for differentiate S. auruas from staph organism
o   Eosin methylene blue agar for differentiate group –ve bacilli and group +ve bacilli

Pilot study

It was conducted in 10% from sample size which was included in the study to modify the questionnaire and to test validity and reliability of the questionnaire.

Timing of enrollment

It was done after the women delivered by cesarean section and admitted to postpartum ward.

Statistical analysis

Data collected were coded and analyzed. Results were tabulated and statistically compared by computer program (SPSS) version16.0, expressed as Mean + S.D, number, percentage and using Chi square to determine significance between variables and T. test to determine significance between numerical variable. N.S $P > 0.05$ (No significance), $P < 0.05$ (significance).

3. Results

In table (1) the results of comparison between obese & non obese groups show that more than half of obese women (52.8%) were in the age group 20-29 years old with mean maternal age (24.26 ± 5.86) years compared to non obese, two third of women (70%) in the same age group with mean (25.81± 4.63) years. There was an increase in percentage of obese group (46%) with increase of age ≥30 years old in comparison with non obese group (24.4%) which was found to be of high statistical significance between both groups which means that the obesity increases with aging. As regarding of maternal educational level, about one third of women in obese group (38%) were illiterate and less than half of them (41.6%) were secondary school, in comparison with other group about less than half of women (42.8%) were illiterate and more than one fourth of them (29.6%) were secondary school with high statistical significance between both groups. As regarding to maternal occupation and residence, the highest percentages among both groups were housewife (90.8% & 92.8% respectively) and were living in rural areas (69.6% & 70% respectively) with no statistical significance between both groups.

In Table (2) the results show that the highest percentage in both group related to the surgeon who did the cesarean section, the resident is the most available person who did the operation (84.60% & 92.40% respectively) and also the highest percentage in both group in the type of anesthesia are spinal type (94.80% &95.60% respectively) with no statistical significance between both groups.

In Figure (1) the results show that the obese women had more post operative complications than non obese group as urinary tract infections (22.8% & 12.4% respectively) and wound infection (12.4% & 3.2% respectively) with high statistical significance in both types of infection , also from the important complication for obese women admission to intensive care unit for complicated eclampsia which represented (8%) than non obese group (4.4%) and found other types of infection

In figure(2) the results show the percentages for the causative organisms of urinary tract infection among both groups, the higher percentage of causative organisms cause urinary tract infections according to the obese group are Gm-ve Bacilli Lactose Fermenter (Klebsiella) which representing (8 %) and (6.4%) in non obese group, Gm-ve Bacilli Lactose Fermenter (E.Coli) which representing (6.8%) and (1.6%) in non obese group with statistical significance, Gm-ve Bacilli non Lactose Fermenter (6%) and (3.6%) in non obese group, Staphylococcus (Pathogenic)

representing (4.4%) and (2 %) in non obese group and lower organisms are Staphylococcus (Non Pathogenic) which representing (2.4%) and (1.6%) in non obese group .

In Table (3) the results show that the current antenatal risk factors according to the degrees of obesity the results show that very obese women with high significance compared with obese group as preeclampsia which represents (34.68%) while in obese women represent (21.43%) and concerning with indications of cesarean section also the very obese women with very high significance in increase indication for cesarean section related to multiplication risks for more than one (10.50%) while in obese women represent (0%) and with significance in macrosomic baby (9.67%) than obese women (3.97%) but obese women with very high significance in repeated cesarean section (33.33%) than very obese women (15.33%).

In Figure (3) the results of relationship between degree of obesity with post operative *complications show that very obese women with high significance in post operative* complications than obese women specifically urinary tract infection (26.61%) than obese women (19.04%) and wound infections (17.74%) than obese women (7.14%).

4. Discussion

Health problems of obesity are becoming serious in the present times. Obesity is more common in women than men and reports are showing increased risk of complications among pregnant women who are obese [13].

National surveys done during the past decade indicated that there is an increase in the prevalence of obesity and overweight from 51.8% in 1995 to 79.7% in 2005 among Egyptian women. Where it was more than double in the last ten years [20.5% in 1995 and reached 46.5 % in 2005 and Obesity among Egyptian women was higher with increasing age [14]

The association between excessive BMI and the need for CS is independent factor. Obese women not only undergo C.S more frequently than women of normal weight but also are at greater risk for intrapartum and postoperative complications such as longer operating time, increased blood loss, and endometritis [15].

Three cohort studies addressed the incidence of perinatal mortality according to the amount of pregravid weight excess. Even in moderate overweight women the incidence of perinatal mortality in the infant was 1.15% and 2.5 fold higher than that in normal weight women [16].

Table (1): Distribution of women according to sociodemographic characteristics among both groups

Sociodemographic characteristics	Obese group BMI >30.0 N = 250		Non obese group BMI < 30.0 N = 250		X2	P-Value
	Number	Percentage	Number	Percentage		
Age/Years (Mean ± SD)	24.26± 5.86		25.81 ± 4. 63			
<20	3	1.2%	14	5.6%		
20-29	132	52.8%	175	70%		
30-39	97	38.8%	60	24%		
≥ 40	18	7.2%	1	0.4%	37.071***	0.001
Total	250	100%	250	100%		
2- Education						
Illiterate	95	38.00%	107	42.80%		
Read & Write	8	3.20%	10	4.00%		
Primary school	5	2.00%	21	8.40%		
Preparatory school	18	7.20%	14	5.60%		
Secondary school	104	41.60%	74	29.60%	16.701**	0.005
University	20	8.00%	24	9.60%		
Total	250	100%	250	100%		
3- Residence						
Urban	76	30.40%	75	30.00%		
Rural	174	69.60%	175	70.00%	0.000	1.000
Total	250	100%	250	100%		
4- Occupation						
House wife	227	90.80%	232	92.80%		
Employee	23	9.20%	18	7.20%	0.425	0.514
Total	250	100%	250	100%		

Table (2): Distribution of women according to Cesarean section operationamong both groups

Cesarean section operation	Obese group BMI >30.0 N = 250		Non obese group BMI < 30.0 N = 250		X2	P-Value
	Number	Percentage	Number	Percentage		
1- Attendant at Cesarean section						
Resident	212	84.60%	231	92.40%		
Assistant Lecturer	36	14.60%	19	7.60%	8.069	0.018
Senior Staff	2	0.80%	0	0.00%		
Total	250	100%	250	100%		
2- Type of anesthesia						
General	13	5.20%	11	4.40%		
Spinal	237	94.80%	239	95.60%	3.688	0.275
Epidural	0	0.00%	0	0.00%		
Total	250	100%	250	100%		

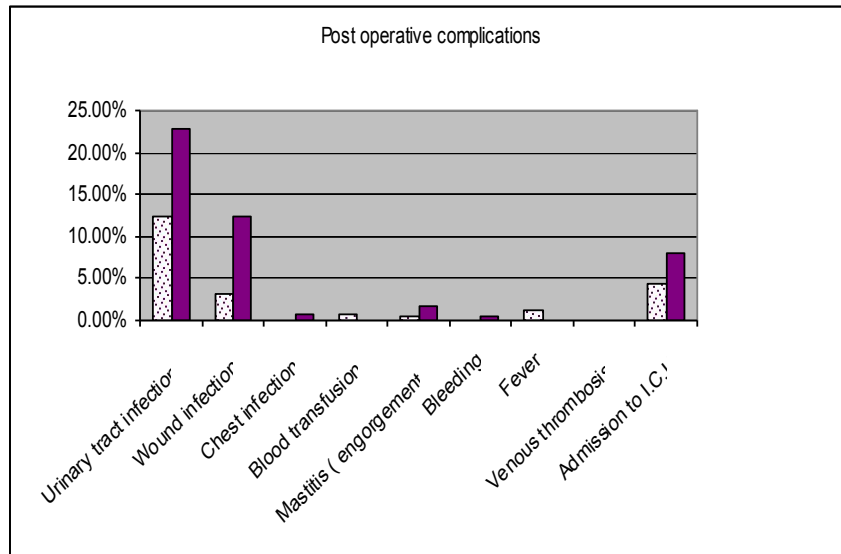
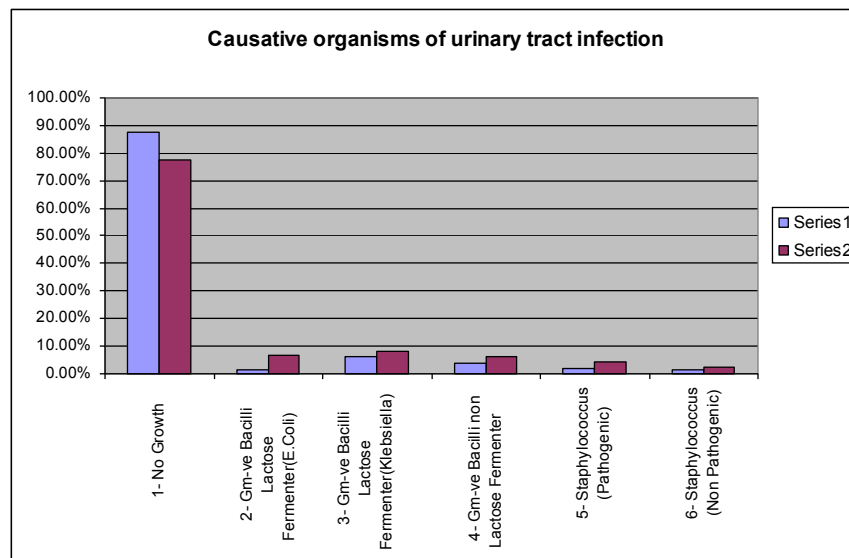Figure (1): Distribution of women according to post operative complications.

Figure (2): Distribution of women according to causative organisms

Table (3): Relationship between degrees of obesity with current antenatal Conditions

Current antenatal Conditions	Obese group BMI 30.0-34.9 N = 126		Very obese BMI ≥ 35.0 N = 124		X2	P-Value
	Number	Percentage	Number	Percentage		
2- Current antenatal risk factors						
None	51	40.47%	40	32.25%	1.350	0.088
Preeclampsia	27	21.43%	43	34.68%	2.471**	0.007
Contracted pelvis	12	9.53%	3	2.41%	2.365 **	0.009
Rhesus isoimmunization	2	1.58%	2	1.62%	0.016	0.494
I.U.F.D	1	0.80%	1	0.80%	0.011	0.495
I.U.G.R	1	0.80%	1	0.80%	0.011	0.495
Previous Cesarean section + Tender scare	10	7.94%	6	4.84%	1.001	0.158
Oligohydeoimnous	10	7.94%	10	8.06%	0.037	0.485
Polyhydrominous	2	1.58%	2	1.62%	0.016	0.494
Congenital anomalies	2	1.58%	2	1.62%	0.016	0.494
More than one risk factors	8	6.35%	14	11.30%	1.379	0.084
3- Indications of Cesarean section:						
More than one cause	0	0.00%	13	10.50%	3.733***	0.000
Macrosomic baby	5	3.97%	12	9.67%	1.793*	0.036
Repeated Cesarean section	42	33.33%	19	15.33%	3.315***	0.000
Breech presentation	4	3.17%	11	8.88%	1.896*	0.029
Marked oligohydrominous	1	0.80%	6	4.84%	1.938	0.026
SPET	17	13.50%	16	12.91%	0.138	0.445
I.U.F.D	0	0.00%	1	0.80%	1.010	0.156
I.U.G.R	1	0.80%	1	0.80%	0.011	0.495
Contracted pelvis	6	4.76%	3	2.41%	0.994	0.160
Non engaged head	7	5.55%	9	7.25%	0.550	0.291
Infertility	8	6.34%	9	7.25%	0.285	0.388
Congenital anomalies	3	2.39%	1	0.80%	0.992	0.161
Previous Cesarean section + Other cause	20	15.87%	13	10.50%	1.259	0.104
Transverse lie	12	9.52%	10	8.06%	0.407	0.342
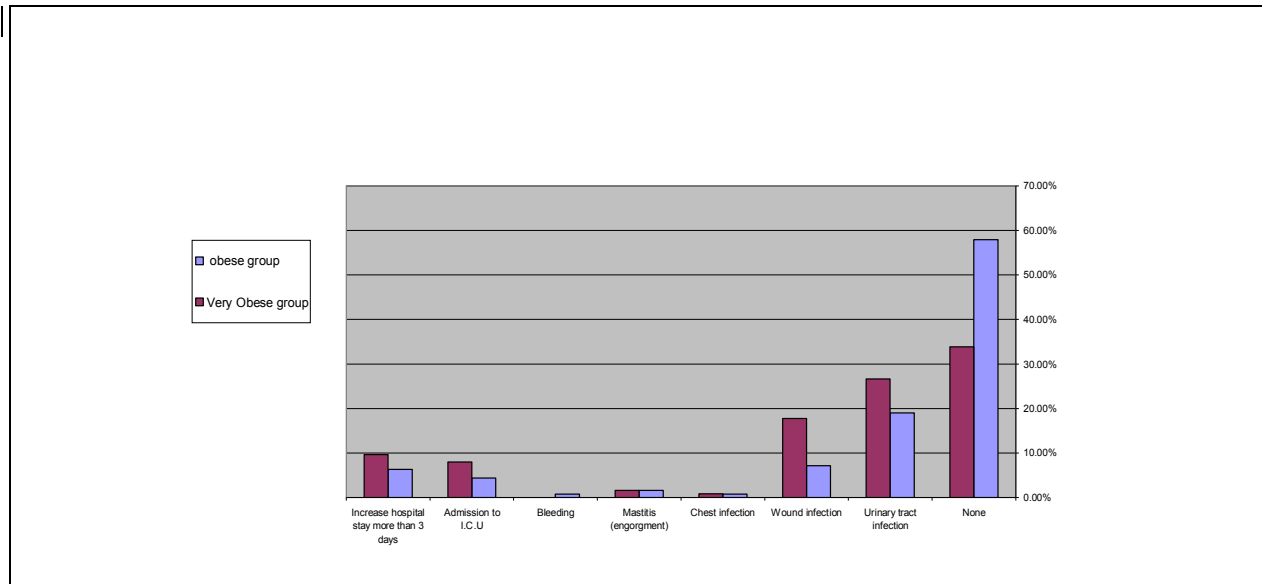
Figure (3): Illustrated the Post operative complications according to the degree of obesity

In a cohort study shows that post-partum infection is increase for concern with the growing cesarean rate. Post-partum infections are costly and time-consuming to treat, increase hospital re-admission and healthcare costs, and often lead to a difficult and frustrating start to motherhood[17]. The rate of C.S wound infections tends to be even higher in fat women. U.S primary cesarean delivery rate is approximately 14.6%, ranging from a low of 11.5% in Utah to a high of 24.3% in Mississippi [18].

Post pregnancy infections remain a significant source of maternal morbidity and mortality. Obstetric infection accounts for more than 12% of maternal deaths. Infection occurs most frequently in women who have cesarean births, and following spontaneous or elective termination of pregnancy. Infection is estimated to be the second highest cause of under-reported maternal death in the (U.S) [19]

Weiss[20] mentioned in his study according to (a population-based screening study) in New York that the obesity is an independent risk factor for adverse obstetric outcome and is significantly associated with an increased cesarean delivery rate. The cesarean delivery rate was 20.7% for non obese, 33.8% for obese and 47.4% for morbidly obese patients and Kaiser[21] showed that women with BMI more than 29 Kg/m2 was associated with 3-4 fold increased in C.S.

Increase C.S rate all are more with the obese pregnant than general population. Despite this significant clinical problem, not many studies have explored the underlying mechanism of pathogenesis for association between obesity and raised C.S rate but most clinician suspect that the rise in C.S rate associated with obesity is due to obstructed labour caused by increased deposition of soft tissue in the maternal pelvis and large babies. But recently a very promising study of Zhang et al[22] from Liverpool women's hospital and university concluded that myometrium of obese women contracted with less force and frequency and had less Ca2+ flux then that of normal. Most of C.S occurs due to delay in first stage. Maternal obesity and hypercholestromia are associated with poor uterine contractility. This contradicts the finding of Young, et al[23] study which showed that C.S is more in second stage of labour mostly because of increased soft tissue mass and obese women had 2-4 fold increased cesarean deliveries rates due to dystocia was increased 6 fold in obese nulliparas**.**

Urinary tract infections (UTIs) are more common in pregnant women than their non pregnant counterparts and the increase of BMI are related to increase patient's risk to develop UTIs [24]. Women who are overweight or obese have an increased risk of various infections, especially urinary and genital tract infections [25]

As regarding of maternal age, the present study revealed that the mean of maternal age was 25.81 ± 4.63 years in non obese group and was 24.26 ± 5.86 in obese group and increase percent of obese group (46%) with increase of age ≥30 years old in comparison with non obese group (24.4%) which mean that the obesity increases with aging. This finding is in agreement with Kabiru and Rayner[26] in Atlanta who showed that the mean age in non obese women was 24.4 ± 5.7 years and in obese women was 25.2 ± 5.9 years, Nasreen[27] who reported in their study that the mean age of women in normal weight was $29.3 + 5.8$ years and in obese women was

28.9+8.3 years, Aekplakorn , et al[28] in Thailand who reported in their study that the prevalence of overweight and obesity was greater among older compared to younger people and also supported by, **Tracee Cornforth**, [29] who reported that the obesity rates were lowest at ages 18 to 24 (12.1%) and peaked around 30% among 35- to 64-year-olds.

The present study revealed that one third of women in obese group (38%) were illiterate and less than half of them (41.6%) were secondary school, in comparison with other group about less than half of women (42.8%) were illiterate and more than one fourth of them (29.6%) were secondary school which consist with **Zhang,et al**[22] who reported that (39.9%) in obese women were secondary education and (55.5%) in non obese women were secondary education.

As regarding to maternal occupation, most of the highest percentages among both groups were housewife (90.8% & 92.8% respectively). These findings are supported by Abd El-Azez**,** [30] who mentions that the majority of women in both group (92.2%&96.2% respectively) were housewife, Musaiger,[31] who reported that 79% of women were unemployed in Saudi Arabia and supported by McMunn, [32] who reported in their study that evidently the severely obese cannot work because they are bed ridden and working mother have may experience high levels of stress sometimes so for about 38% of stay-at-home mothers were obese and for working mothers the percentage was 23% .

The present study revealed that the most of women in both groups were living in rural areas (69.6% & 70% respectively), agree with Abdel-Rahman[33] who reported that most of women were from rural areas . On the other hand, these findings are contradicted with Aekplakorn, et al[28] in Thailand who that most of women in both group live in residents of urban (34.8% and 9.9%) compared to rural areas (26.4% and 5.9%) .

Many findings suggest that low level of education and poverty among individuals in the lower socioeconomic status may have been responsible for the inverse relationship between socioeconomic status and each of overweight and obesity, these may have resulted from poor food habits, where quantity is valued above quality[34]

Concerning the rate of UTIs, in the present study finding show that the incidence of UTIs in obese women (22.8%) higher than non obese women (12.4%). These findings are supported by Zinnat[35] who revealed in his study that the UTIs in obese women was (24%) and in normal weight women was (6%) with the same number of subject in both groups with the present study.

In the same line Pitchard, et al[36] in their study which conducted in sidhu hospital in India reported that the incidence of UTIs in normal weight was (16.7%), in obese (29.0%) and in morbid obese women was (37.5%). Pract, et al[37] in their study reported that the incidence of UTIs in morbidly obese women was (6%) in 100 of women compared with (0%) in 209 normal weight women.

Mukherjee, [38] in London, their study found a significant increase in hypertension, diabetes, thrombophlebitis and UTIs in obese women than non obese women.

Concerning with previous abortion, the present study mention that the obese women higher in loss of the fetus more than non obese women (35.6% & 24.8% respectively) which supported by Sturdee, et al[39] who reported in their study that the risks of early miscarriage (at 6–12 weeks of gestational age) and recurrent early miscarriage were significantly higher among obese women.

Obesity was recognized as a risk factor in pregnancy more than 50 years ago, so numerous retrospective studies have demonstrated the association between maternal obesity and various pregnancy complications [40]. Many studies evaluated the correlation between BMI and the out come of pregnancy and found that massive obesity can contribute to many complications during pregnancy [41]. The pregravid overweight increases maternal and fetal morbidity [42]

Several studies have documented the increased risks of adverse outcome associated with obesity and pregnancy. Hypertensive disorders are more prevalent among pregnant women who are obese at the time of conception [43] and Obesity is also strongly associated with the development of preeclampsia [44]

The present study reflected there is increase risk of antenatal complication in obese women than non obese women, such as preeclampsia which developed in (11%) in non obese compared with (21.43%) in obese and (34.68%) in morbid obese women. This is supported with William, et al[45] in Edinburg who showed in their study that preeclampsia were (5%) in non obese, (14.7%) in obese and (28.2%) in morbid obese women . Cedergen elucidated that preeclampsia was five times more common in a morbidly obese population BMI>40Kg/m2 [46]

In the same line O'Toole et al[47] who found a strong association between increasing BMI and pregnancy induced hypertension and the risk of pre-eclampsia is doubled with each 5 to 7 Kg/m2 increase in pre-pregnancy BMI,   found a 3 times higher risk of pre-eclampsia in obese women and a 7 times higher risk in morbidly obese women . Baeten, et al[48] reported in their study that the proportion of women who developed preeclampsia or eclampsia

consistently increased with BMI, which found that the percentage of preeclampsia (13.5%) in obese women and (9.1%) normal weight women.

The present study showed high percentage of preterm baby between both groups (32.80% & 36.00% respectively) which supported by Abd El-Azez [30] reported in their study that the incidence of prematurity was (42.5%).

The present study showed significance difference to indication of C.S in obese group than non obese group as sever preeclampsia which reported in the previous paragraphs, and unengaged head related to masrosomic baby represent (23.2%) than non obese group (10%). This is supported by Rosenberg[49], Watkins, et al[50] and Zinnat[35] who reported in their studies that found a consistent association between women weight and macrosomia (30.9%) in obese versus (10.3%) in non obese women.

Nuthalapaty and Rouse[51] mentioned in their study that the infants born to obese women are significantly more likely to weigh more than 4000 g, obesity has been identified as an independent risk factor for macrosomia (even in non-diabetic women).

Fetal macrosomia is more common in the obese non-diabetic mother compared to the lean mother with gestational diabetes. Increased glucose concentrations in the diabetic mother led to fetal hyperglycemia and hyperinsulinaemia causing increased fetal growth. Obesity is associated with maternal insulin resistance and fetal hyperinsulinaemia even in the absence of maternal diabetes, the combination of an increased energy flux to the fetus and fetal hyperinsulinaemia may explain the increased frequency of large for gestational age infants seen in the obese non-diabetic women [52].

The present study has also shown a small but significant increase in fetal death or still birth related to a raised maternal BMI (5.2%) compared with (1.2%) in non obese women, supported with Abd El-Azez, [30] reported in her study that the stillbirth was (4.5%) in obese and (2.2%) in non obese women and also in the present study the percentages of previous stillbirth and neonatal death in obese women significantly higher than non obese women. This is supported by (ElZein [53] who reported in their study that previous stillbirth and neonatal death increase in obese than non obese women.

In the same line Tilton et al[52] have reported that the combination of rapid fetal growth induced by the endogenous hyperinsulinaemia in obese women and the functional limitations of the placenta to transfer sufficient oxygen to meet the requirements of the fetus, may lead to hypoxia and death in some cases. Infant's ability to adapt to postnatal life.

Almost 95% of cases of UTIs are caused by bacteria that typically multiply at the opening of the urethra and travel up to the bladder and bacteria spread to the kidney from the bloodstream [54].

In the present study mention the most common causative organisms in obese group are Gm-ve Bacilli Lactose Fermenter (Klebsiella) representing (8 %), Gm-ve Bacilli Lactose Fermenter (E.Coli) representing (6.8%), Gm-ve Bacilli non Lactose Fermenter (6%), Staphylococcus (Pathogenic) representing (4.4%) and lower organisms are Staphylococcus (Non Pathogenic) representing (2.4%).

This finding is consistent with Foster[55] who reported that the Klebsiella, Escherichia (E.) coli and Staphylococcus account the most of remaining bacterial organisms that cause UTIs in older women and Enterococci bacteria, proteus mirabilis ureaplasma urealyticum and Mycoplasma hominis account the rare bacterial causes of UTIs which are generally harmless organisms.

This finding is contradicted with Alper & Curry[56] who reported that the (E.coli) account for about 60% to 80% of all UTIs, as it usually found in the perineal and anal region and close to urethral opening and found other organisms include klebsiella, staphylococcus aureus, proteus, pseudomonas and heamophilus contributes to the development of UTIs.

In the same line Alikhan [57] in the northwest of Iran who reported in his study that the Escherichia coli was the most common etiological agent of UTI (74.6%), followed by Klebsiella spp (11.7%), Staphylococcus saprophyticus (6.4%), and Pseudomonas aeruginosa (2.2%).

Surgical site infection (SSI) is the second most common infectious complication after UTIs following C.S delivery [58]. Wound infection often requires a prolonged hospital stay and leading to increase costs[6]

Wound infections are also more common in obese women. This association remains significant even when the procedure is elective and prophylactic antibiotics are administered[59].

Concerning the rate of wound infection, the present study finding revealed that the incidence of post cesarean wound infection was higher in obese women (12.4%) compared with non obese women was (3.2%) which is supported by the report of Pelle, et al[60] who reported in their study that the most important risk suggested to contribute to (SSI) is (BMI). A greater rate of infection associated with obese women undergoing C.S surgery has been reported which in others studies as Johnson, et al [1] who mentioned in their study that SSI in obese

women was (19.7%) and (9.0%) in normal weight women.

In the same line Zinnat[35] in Bangladesh mentioned in their study that wound infection in obese women was 2% more than non obese women 0.4% with the same number of subject in both groups with the present study

In the present study according to classification of women's body weight and it relation with post partum wound infections, the finding revealed that the incidence of post cesarean wound infections in women who were non-obese was 3.2%, while 7.14% of the women who were obese and 17.74% of the women who were very or morbid obese which is supported by the report of Robinson, et al[61] who reported in their study that the risk of SSI is more common in women with an elevated BMI, compared maternal outcomes based on women weight. The incidence of cesarean wound infections in women who were non-obese was 0.8%, whereas 5.3% of the women who were morbid obese.

Conclusions

Obesity causes significant complications for the mother and fetus during pregnancy and morbid post partum infection. The present study described the outcomes of 250 obese women compared with 250 non obese women; the results concluded that, obese women were more likely to present several obstetric complications, delivered by Caesarean section more than non obese women, increase admission to ICU and increase length of hospital stay. The incidences of urinary tract infections are significantly higher in obese women (22.8%) rather than non obese women (12.4%), and the most common causative organism is Klebsiella then Escherichia Coli and also the incidences of surgical site infections are significantly higher in obese women (12.4%) compared to non obese women (3.2%).

Recommendations

On the basis of the most important findings of the study, the following recommendations are suggested:-

- Obesity is epidemic health problems, the antenatal healthcare systems, obstetricians and midwives will be forced to deal with the problems and risks related to obesity (obesity precautions).
- The obesity intervention programs for pregnant women were based on a number of extra visits with a specially trained midwife. The cornerstone in the programs was a motivational interview/talk in early Pregnancy, 20 with the aim of motivating the obese pregnant woman to change her behaviors and to obtain information relevant to her needs.

- Maternal and fetal surveillance may need to be heightened during pregnancy; a multidisciplinary approach is useful. Women need to be informed about both maternal and fetal complications and about the measures that are necessary to optimize outcomes.
- Prompt recognition and treatment of post pregnancy infection is required to prevent the onset of systemic infection. The majority of postpartum infections are detected following hospital discharge as wound infection.
- Enhancing or reducing women postpartum infection through direct education about ideal wound care and perineal care at home by specialist and trained health care provider.
- Directed patient education regarding risk factors and symptoms of postpartum infection must be included as part of comprehensive, quality follow-up care of women postpartum.
- Evaluating women for any signs of fever or other signs and symptoms of infection has been suggested as one means to improve care in special place in hospital for follow-up of all women after delivery and with planned schedule for visits.
- Consistent documentation and reporting of women characteristics as weight and height to identified body mass index for all women to concerning care in obese women tor reduce risk and post pregnancy infections are needed to improve epidemiologic evaluation of the true magnitude of this problem for women.
- Implementation of such a standard of care and infection control strategies in preoperative, intraoperative and mainly post operative periods would serve to improve prevention and identification of post pregnancy infections in women and reduce the associated burden of morbidity and mortality on the lives of women and their families
- Nurses must be encouraged to attend specific meetings as workshops, seminars and continuing educational programmes held to prevention of post partum complications especially infection which increasing length of hospital stay and costs.

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Trigonometric based time domain constellation shaping technique for peak-to-average power ratio reduction in OFDM systems

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Abstract: In this paper, a modified technique based on constellation shaping is proposed to reduce the peak-to-average power ratio (PAPR) in orthogonal frequency division multiplexing (OFDM) systems. To accomplish significant reduction in PAPR, the energy compaction property of trigonometric transforms such as discrete cosine transform (DCT) is utilized in combination with the time domain constellation shaping technique. The application of trigonometric transforms results in OFDM signal with few energy components, which is then transformed by constellation shaping in time domain. This combined technique with extremely low computational complexity does not involve transmission of side information and is independent of OFDM input. Closed form expression for the complementary cumulative distribution function (CCDF) of PAPR of the proposed technique is derived and confirmed by simulation results. Performance of the proposed algorithm is evaluated and compared for even information bits in case of square QAM, and for odd information bits in case of cross QAM and rectangular QAM. Comparative analysis with the time domain constellation shaping and trigonometric based transform OFDM techniques shows better performance of the proposed scheme with no increase in terms of average power.
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Keywords: Orthogonal Frequency Division Multiplexing (OFDM), Peak-to-Average Power Ratio (PAPR), Constellation Shaping, Trigonometric Transforms.

1. Introduction

OFDM has been exploited for various high speed wireless communication and broadcasting systems. OFDM is a multi-carrier modulation scheme that allows the transmission of high bit rate data by using many subcarriers for parallel transmission. The main implementation disadvantage of OFDM signals is high peak-to-average power ratio, which tends to increase the implementation complexity of the Analog-to-Digital and the Digital-to-Analog converters, and reduce the power efficiency of high power amplifier. Large peaks in transmitted OFDM signal are clipped by the power amplifier creating non-linear distortions which degrades BER performance.

Several techniques have been proposed in the literature to mitigate the PAPR problem. Clipping reduces PAPR by limiting the peak amplitudes in the signal to desired threshold level, at the cost of nonlinear distortions and spectral spreading which can be reduced to some extent by filtering with reduced implementation complexity (Wang et al., 2005). Clipping and filtering combined with precoding method can give better results in PAPR reduction (Namitha et al., 2010). Multiple signal representation techniques such as Selective Mapping (SLM) (Han et al., 2004)

and Partial Transmit Sequence (PTS) (Jiang et al., 2007) require the transmission of side information and experience an increase in the computational complexity. Several techniques have been introduced to overcome the issue of computational complexity (Lim et al., 2005; Lim et al., 2006). SLM and PTS techniques combined with error correction codes can eliminate the need for side information but causes reduction in transmission rate (Yang et al., 2003; Chen et al., 2007). The loss of data rate and transmission of side information can be avoided by employing constellation shaping techniques which reduce the PAPR by modifying the transmitted data symbols. Constellation shaping technique based on symbol predistortion extends the outer constellation points using decision metric without affecting the minimum distance and degrading performance (Sezginer et al., 2007). The main drawback is an increase in average power and dependence on the modulation format. Time domain constellation shaping technique uses a simple transformation to reduce PAPR (Dalakas et al., 2009) . This technique is independent of OFDM input and avoids the power increase by power normalization but it influences the BER performance. Recently, new techniques based on trigonometric transforms such as

discrete cosine transform (DCT) have been developed to solve the PAPR problem in OFDM making use of their energy compaction property with a slight increase in complexity (Shanlin et al., 2008; Ahmad et al., 2007) . These techniques can accomplish significant PAPR reduction, but there is a need for much reduction in the PAPR of transmitted OFDM signals along with reduced implementation complexity.

In this paper a modified scheme based on constellation shaping is presented and analyzed. This new technique combines the energy compaction of trigonometric transforms with low computational complexity of time domain constellation shaping proposed in (Dalakas et al., 2009) and attains considerable PAPR reduction. The character of DCT concentrates the input data of IFFT in a few components. The application of time domain constellation shaping after IFFT further reduces the PAPR and makes this technique independent of modulation scheme. Power normalization is utilized to keep the average power of the signal unchanged.

Analytical closed form expression for the PAPR distribution of the proposed technique is derived and verified by simulations. Performance of the proposed technique is compared for square, cross and rectangular QAM for different number of bits per symbol. The effect of varying the constellation parameters like, minimum distance between constellation points and constellation energy is also explored. CCDF and bit error rate (BER) performance of the proposed technique is compared with time domain constellation shaping and trigonometric based OFDM.

2. System model and PAPR definition

OFDM is a digital multicarrier technique which divides the available bandwidth or spectrum into multiple parallel subcarriers and each is modulated with low rate data streams. An OFDM system with N subcarriers can be implemented by taking the N-point inverse discrete Fourier transform (IDFT) of a block of information data symbols followed by digital-to-analog converter. The information bits are mapped to a block of N complex data samples $\{x_n, n = 1, \ldots, N\}$, taken from an appropriate signal constellation such as quadrature amplitude modulation (QAM) or phase shift keying (PSK). The IFFT of the data block gives the discrete time domain samples $\{X_k, k = 1, \ldots, N\}$ of the OFDM given by

$$x_n = \frac{1}{\sqrt{N}} \sum_{k=0}^{N-1} X_k \exp\left(j2\pi \frac{kn}{N}\right) \qquad (1)$$

Superposition of a large number of independently modulated subcarriers with same phase in OFDM signal can give large peaks. These peaks in the signal degrade the performance of OFDM system due to amplitude limiting caused by nonlinear components in transmission path. A measure of signal degradation is

peak-to-average power ratio defined as

$$PAPR = \frac{\max |x_n|^2}{E\left[|x_n|^2\right]/N} \qquad (2)$$

where $E[.]$ denotes expectation. Reducing $\max|x_n|$ is the main goal of PAPR reduction schemes. The continuous-time PAPR is obtained by taking LN point IDFT of the zero-padded input data sequence of length LN, where L is the oversampling factor (Sezginer et al., 2007). In this paper, evaluations are done for the case $L = 1$.

Complementary cumulative distribution function is a measure of PAPR efficiency of an OFDM system and is expressed as:

$$CCDF = 1 - [1 - \exp(-x^2)]^N \qquad (3)$$

3. Time domain constellation shaping

To reduce PAPR, time domain OFDM symbol $\mathbf{x}$ obtained after IFFT operation is translated into another symbol $\mathbf{y}$ by adding a peak cancelling vector which involves the multiplication of a positive real constant with phase information of OFDM symbol (Dalakas et al., 2009).

$$\mathbf{y} = \mathbf{x} + \alpha \mathbf{u} \qquad (4)$$

where α is a positive real constant and $\mathbf{u}$ is the phase information vector of OFDM symbol $\mathbf{x}$. The nth element of $\mathbf{u}$ is defined as:

$$u_n = \exp(j\theta_n), \quad 0 \le n \le N-1 \qquad (5)$$

where θ_n is the phase of x_n in radians.

PAPR due to the addition of cancelling vector should be less than the PAPR of the original OFDM symbol $\mathbf{x}$ in order to have reduced PAPR of resulting symbol y (Dalakas et al., 2009). The OFDM symbol $\mathbf{y}$ obtained after the transformation process results in reduced PAPR with an increase in the total average power. This increase in power can be avoided by normalization, keeping the PAPR reduction unchanged (Dalakas et al., 2009).

$$\mathbf{x}_{norm} = \lambda \mathbf{y} \qquad (6)$$

where λ is the normalizing factor given by

$$\lambda = \frac{P_{avg}^{x_{norm}}}{P_{av}^{y_n}} = \frac{1}{1 + \alpha^2 + \alpha\sqrt{\pi}} \qquad (7)$$

Normalization restores the total average power but it results in minimum distance reduction which degrades the BER performance. The simple transformation makes the implementation complexity of this algorithm quite low and easily reversible at the receiver.

3.1 Performance Analysis of time domain constellation shaping

The analytical expression for the PAPR of the proposed technique in terms of CCDF is expressed in

(Dalakas et al., 2009). Consider the time domain OFDM samples x_n obtained by the IFFT operation. For large value of subcarriers, both real and imaginary parts of x_n follow Gaussian distribution with mean of zero and variance of 0.5. The amplitude of x_n normalized by average power is given by

$$s_n = \frac{|x_n|}{\sqrt{P_{avg}^x}} \qquad (8)$$

The magnitude of x_n is Rayleigh distributed with CDF as follows

$$F_{s_n}(s) = 1 - \exp(-s^2) \qquad (9)$$

The CCDF distribution of PAPR is expressed (Dalakas et al., 2009) as follows

$$CCDF(s) = 1 - \left[1 - \exp\left(-\left(\frac{s-t}{r}\right)^2\right)\right]^N \quad (10)$$

where $r = \dfrac{\sqrt{P_{avg}^{x_n}}}{\sqrt{P_{avg}^{y_n}}}$ and $t = \dfrac{\alpha}{\sqrt{P_{avg}^{y_n}}}$

4. Trigonometric transforms based OFDM system

The energy packing capability of trigonometric transforms, like discrete cosine transform (DCT) can be utilized in OFDM systems for providing high PAPR reduction with low implementation cost. DCT transform of a sequence of N real data points is defined as:

$$X_k = \sum_{n=0}^{N-1} x_n \cos\left[\frac{\pi}{N}\left(n+\frac{1}{2}\right)k\right], \; 0 \le k \le N-1 \quad (11)$$

Discrete sinusoidal transforms are applied in the frequency domain of OFDM to focus the energy of the signal in few samples corresponding to low special frequencies by redistributing the signal power on every subcarrier. As a result of this redistribution some subcarriers become concentrated with signal energy while others remain close to zero, keeping the signal energy after transformation unaffected (Shanlin et al., 2008; Wang et al., 2010). This decrease in signal components is the main cause of PAPR reduction in Sinusoidal transforms based OFDM system. To reduce PAPR, DCT is applied to constellation symbols. The transformed OFDM signal is then modulated by IFFT for transmission. At the receiver, inverse DCT is applied to the received symbols after FFT.

4.1 CCDF of trigonometric transforms

The complex envelope of DCT is given as

$$x_c = x_{ci} + jx_{cq} \qquad (12)$$

DCT signals converge to Gaussian distributed variable for large number of subcarriers. Central chi-squared distribution with one degree of freedom is followed by power distribution (Ahmad et al., 2007). The amplitudes follow the Rayleigh distribution. CDF

of DCT signal is given as

$$F_{s_c}(s) = 1 - \exp(-\frac{s^2}{2}) \qquad (13)$$

CCDF for DCT signal is

$$CCDF^{(c)} = \left[1 - \exp(-\frac{s^2}{2})\right]^N \qquad (14)$$

5. The novel PAPR reduction technique

The proposed technique is an efficient PAPR reducing scheme with low implementation cost and requires no transmission of side information to the receiver. The main aim of the proposed scheme is to obtain high level PAPR reduction by combining the time domain constellation shaping with the energy focusing trigonometric transforms, as illustrated in Figure 1.
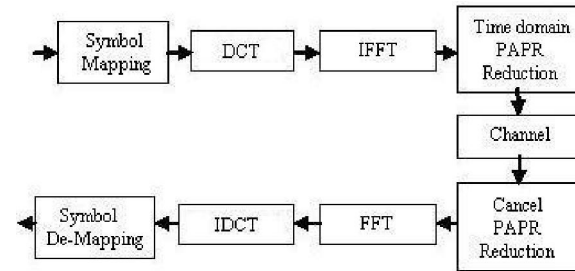

Figure 1: Block Diagram of the proposed PAPR Reduction Scheme

In the proposed technique, OFDM signal is first transformed by the sinusoidal transforms in frequency domain. DCT is a scalar transformation so in order to obtain the transformed OFDM signal DCT is applied on both the real and imaginary components of mapping symbols separately. The rearrangement of energy results in most of the subcarriers equal to zero. The application of trigonometric transforms does not influence the orthogonality of OFDM (Shanlin et al., 2008). The transformed OFDM signal is then modulated by IFFT operation to get the time domain signal. Due to the less energy components obtained by DCT operation, PAPR of the modulated OFDM signal is minimized. The time domain constellation shaping is then applied on the modulated OFDM to further reduce the PAPR.

The proposed algorithm is summarized as follows,
1. Obtain DCT transform of the input data block using (11).
2. Compute IFFT of the transformed signal using (1).
3. Choose value for α according to PAPR reduction required.
4. Compute phase vector using (5)
5. Transform the time domain OFDM signal using (4).
6. Calculate λ using (7).
7. Perform normalization using (6) to obtain the

transmitted signal.

6. Performance analysis of proposed technique

The analytical expression for the PAPR of the proposed technique in terms of CCDF is derived and confirmed by simulations. Central limit theorem is used to approximate the input data block by Gaussian distribution for large number of subcarriers.

6.1 CCDF of proposed technique

The proposed algorithm is the combination of sinusoidal transform and time domain constellation shaping. Since time domain constellation shaping takes place after modulating the transformed DCT signal, CCDF of PAPR for the proposed technique can be obtained by combining the CCDF for constellation shaping from (10) and CCDF for DCT signal from (14).

$$CCDF = 1 - \left[1 - \exp\left(-\left(\left(\frac{s-t}{r} \right) + \left(\frac{s}{2} \right) \right)^2 \right) \right]^N \quad (15)$$

where $r = \frac{\sqrt{P_{avg}^{x_n}}}{\sqrt{P_{avg}^{y_n}}}$ and $t = \frac{\alpha}{\sqrt{P_{avg}^{y_n}}}$

Closed form expression for the CCDF of PAPR of the proposed technique derived in (15) is confirmed by simulation results for varying values of α. Figure 2 shows the CCDF performance of the proposed scheme with DCT transform for 16-QAM with α varying from 0 to 1.5 with step 0.5. Results verified the analytical expression derived for proposed technique since the theoretical and simulated results overlap to great extend. Simulation results also show reduction in PAPR with the increase in the value of α.
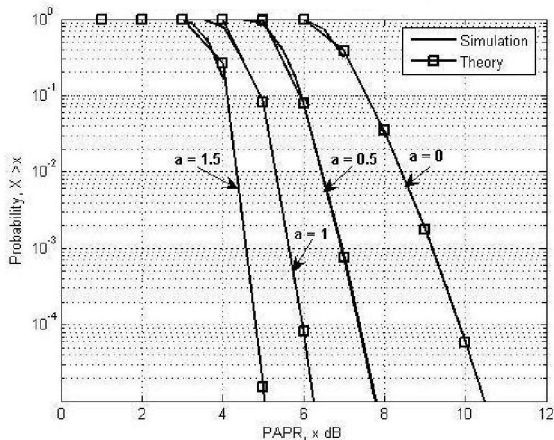
Figure 2: CCDF of DCT-Time Domain Constellation Shaping

7 Performance evaluation of proposed technique

In this section numerical results for the proposed technique are presented for even and odd number of bits per symbol. Simulations are carried out for different number of bits per symbol and comparative analysis is performed for same minimum distance and same energy. The main parameters that comprise any constellation are:

a) Number of bits per symbol to be transmitted.
b) Minimum distance between constellation points.
c) Constellation energy.

Results have been developed for the proposed technique by taking into account the effect of varying the above mentioned parameters. Comparison of the proposed scheme with time domain constellation shaping and trigonometric based OFDM is performed.

7.1 Performance evaluation for different QAM schemes

Square QAM is utilized for transmitting even number of bits per symbol while in case of odd number of bits two constellation formats namely cross QAM and rectangular QAM are used. The main difference between the two is that rectangular QAM requires more energy to transmit symbols as compared to the cross QAM. CCDF performance of DCT based proposed technique for different modulation schemes (8-QAM, 16-QAM, 32-QAM, 64-QAM, 256-QAM) with N=256 and α=1 is shown in Figure 3. The results show that PAPR of the proposed technique increases with the increase in signal constellation points.
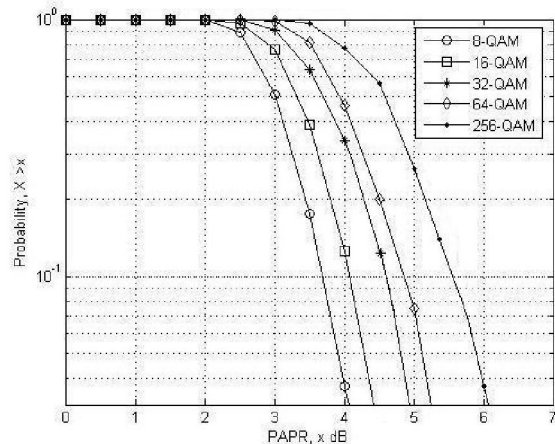

Figure 3: CCDF of the PAPR for Various QAM Constellations

7.2 Performance evaluation for varying constellation parameters

As mentioned earlier, for transmitting odd number of bits either cross QAM or rectangular QAM can be employed. Cross QAM is a preferred QAM signal constellation when the number of bits is odd since both the peak and average power can be reduced by using a cross QAM constellation compared to the rectangular QAM.

Rectangular QAM offers more constellation energy compared to cross QAM, keeping the minimum distance between the constellation points same for both the odd constellation formats (cross QAM and rectangular QAM). Comparison of cross and rectangular QAM for odd number of bits (32-QAM, 128-QAM, and 512-QAM) in terms of same minimum distance between constellation points for DCT based proposed technique is presented in Figure 4. It is observed that PAPR reduction in case of cross QAM is more as compared to the rectangular QAM due to high initial energy of rectangular QAM.
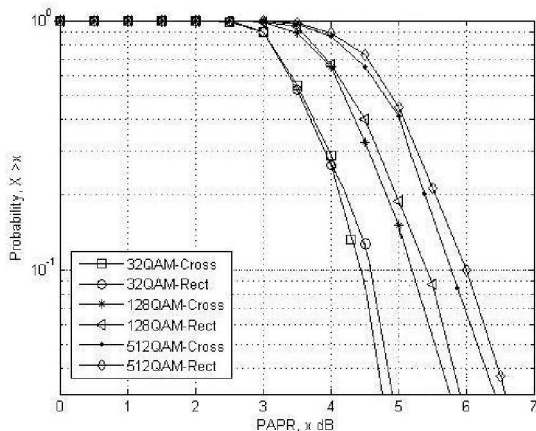
Figure 4: CCDF of the PAPR for Cross & Rectangular QAM Constellations

Results of proposed technique can be evaluated for cross and rectangular QAMs by making constellation energy of rectangular QAM equal to that offered by corresponding cross QAM. This is done by reducing the minimum distance of rectangular QAM to make its energy equal to the corresponding cross QAM. Figure 5 shows the comparison of cross and rectangular QAMs (32-QAM, 128-QAM, and 512-QAM) for same energy with DCT based proposed technique. For same energy, both cross and rectangular QAMs show almost equal reduction in PAPR by the application of proposed scheme.

7.3 Performance comparison with competitive techniques

Comparative analysis of the proposed scheme (New Technique) with time domain constellation shaping (TDCS) and trigonometric based OFDM (DCT OFDM) is performed for 16 QAM with N=256 and α=1. Figure 6 presents the comparison of DCT based systems for 16-QAM. OFDM signal performance without PAPR reduction is also shown as a reference. The results show the better performance of the proposed new scheme in PAPR reduction compared with other recent schemes. It is observed that for the proposed technique improvement is on the order of
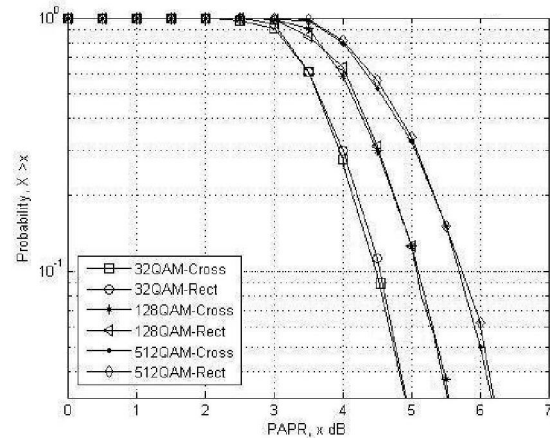
4.3dB for α=1.

Figure 5: CCDF of the PAPR for Cross & Rectangular QAM Constellations with Equal Transmitted Energy

The proposed scheme is also compared with the dynamic constellation shaping technique (DCS) (Sezginer et al., 2005). In dynamic constellation shaping symbols are pre-distorted based on a cost function. Comparison of the proposed technique with dynamic constellation shaping scheme for 16-QAM, is shown in Figure 7. It is observed that in case of dynamic constellation shaping technique (DCS) improvement in performance is on the order of 2.3dB while for the proposed technique (TDCS) performance gain is approximately 4.3dB.
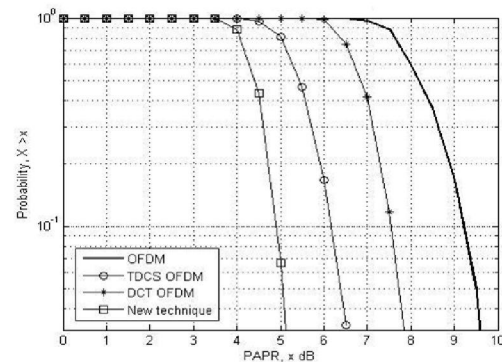

Figure 6: CCDF Performance Comparison of the Proposed Scheme with OFDM, TDCS based OFDM and DCT based OFDM for 16-QAM Constellation

In this section the BER performance of the proposed technique is explored. Figure 8 presents the BER performance of the proposed technique for 16-QAM, N=256 and α varying from 0 to 1.5 with step 0.5. It can be seen that BER performance of the proposed technique degrades with the increase in value of α. BER performance of OFDM signal without PAPR reduction is given by α=0.
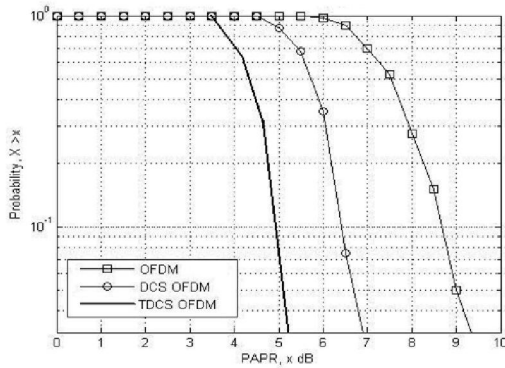
Figure 7: CCDF Performance Comparison of the Proposed Scheme with OFDM and DCS based OFDM**8 BER Performance of proposed technique**
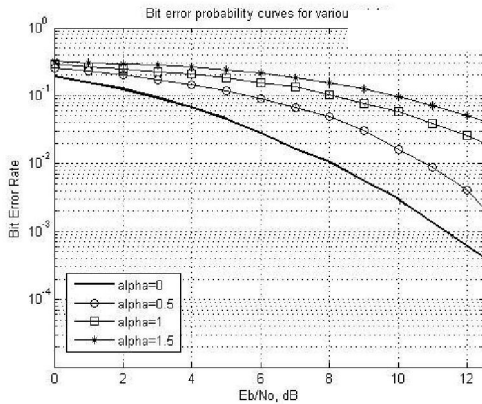

Figure 8: BER Performance of the Proposed Technique for Various Values of Alpha

8.1 BER Performance comparison with competitive techniques

BER performance of the proposed scheme is the same as that of original time domain constellation shaping technique. Figure 9 shows the BER comparison of the proposed DCT transform based scheme (New Technique DCT) with time domain constellation shaping (TDCS) and trigonometric based OFDM (DCT OFDM) for 16-QAM with N=256 and α=0.5. OFDM signal performance without PAPR reduction is also shown as a reference. BER in case of proposed scheme is slightly degraded compared to the original OFDM signal reference. It is observed that BER performance of the proposed scheme overlaps that of original time domain constellation shaping technique. It is also observed that for the proposed technique BER degradation is on the order of 1.5dB for α=0.5.

Figure 10 shows the BER comparison of the proposed DCT transform based scheme with competitive techniques for 16-QAM with N=256 and α=1.
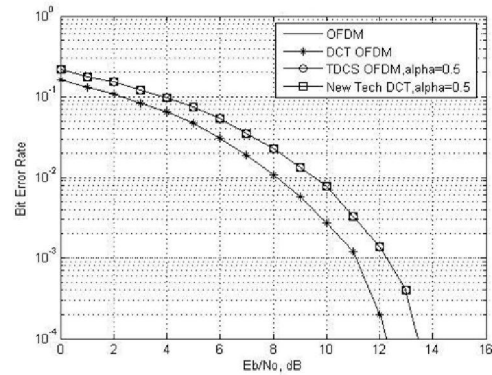

Figure 9: BER Performance Comparison of the Proposed Technique with Existing Techniques

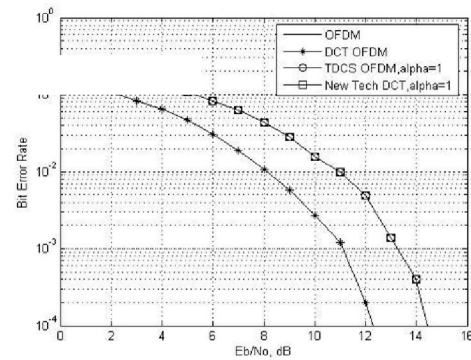Figure 10: BER Performance Comparison of the Proposed Technique with Existing Techniques with alpha = 1

It can be seen that the only degradation that occurs is due the time domain constellation shaping technique (TDCS). The integration of DCT with time domain constellation shaping technique in the proposed scheme does not further degrades BER. It is observed that for the proposed technique BER degradation is on the order of 2dB for α=1.

It can be concluded that for a 4.3 dB gain in the CCDF performance there is approximately a 2 dB loss for 16-QAM and α=1 in case of proposed technique.

9 Conclusion

We have proposed a constellation shaping technique which achieves a considerable PAPR reduction in OFDM system by employing the energy packing capability of sinusoidal transforms to generate an OFDM signal for modification in time domain by a simple transformation. Closed form expression for the CCDF performance of PAPR distribution is derived and verified by the simulation results. Performance evaluation of the proposed technique with other schemes shows better performance in terms of PAPR reduction

without increasing the signal power at the cost of slight degradation in BER performance. Comparison between the cross and rectangular QAM for odd number of bits per symbol is analyzed for same minimum distance and same energy. The proposed technique outperforms other recently proposed PAPR reduction schemes without much increase in system complexity.

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