ISSN P 2321 - 5690

Volume - 2

Issue - 1

Jan. - June - 2014

Indian Journal of Physical Therapy

An Indian National Journal

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Editor's Desk

Dear Physiotherapists,

It gives me immense pleasure to declare the third issue of Indian Journal of Physical Therapy. To make more convenient for readers Indian Journal of Physical Therapy has also launched e-jounral free for interested candidates. Hoping for best response for this time also from readers. I want to take the opportunity to congratulate all the authors who has put their efforts and sent their research work to us.

The third issue of Indian Journal of Physical Therapy includes research articles from most of specialties of physiotherapy. Readers are requested to give their suggestions and feedback regarding this issue.

Thanks.

Dr Dinesh M Sorani
Editor
Indian Journal of Physical Therapy

Indian Journal of Physical Therapy

January-June 2014, Volume. 2, Issue. 1

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DURATION OF MAINTAINED HAMSTRING FLEXIBILITY GAINS AFTER A ONE-TIME, MODIFIED HOLD-RELAX STRETCHING PROTOCOL IN FEMALES.

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ABSTRACT
AIM: *To measure the duration of maintained hamstring flexibility gains after a one-time, modified hold-relax stretching protocol in young healthy females.*
BACKGROUND: *The hamstring muscle are important contributory to the control of human movement and are involved in a wide range of activities from running and jumping to forward bending during sitting or standing and a range of postural control action. Hamstring muscle strains are the most common muscle injuries in athletes because of insufficient flexibility strength.*
METHODS: *A total of 30 female subjects were selected on the basis of inclusion and exclusion criteria and divided into two groups A and B. Group A as experimental included 15 subjects having hamstring tightness with mean age of [121.133 + 2.0656], mean weight of [55.000 + 9.2505] and mean height of [158.00 + 7.020] and they were subjected to hold-relax stretching protocol. Group B as control included 15 subjects having hamstring tightness with mean age of [22.000 + 1.3628], mean weight of [53.467 + 8.6921] and mean height of [157.40 + 5.962] were lying supine after warm up. And then measurements were taken before and after stretching at immediate (0min), 2, 4, 6, 8 and 10 min for both the groups.*
RESULT*: Paired Sample t-test within the groups for both the groups and result of pre stretch vs. different durations showed significant difference (p=0.0001). Independent t-test between the groups for both control & stretched limb showed non-significant difference in the pre stretch value and significant difference for post stretch values. ANOVA of post stretch within the group for stretched and controlled limb showed significant difference (p=0.0001).*
CONCLUSION: *Modified Hold-relax stretching increased the duration of hamstring flexibility after one-time hold-relax stretching protocol.*

KEYWORDS: Hamstring, Modified Hold-relax stretching, Active knee extension, flexibility

INTRODUCTION

Flexibility is a key component for injury, prevention and rehabilitation. Stretching is important for reducing injury and improving performance in sports and for overall physical fitness. Athletes are often given stretching protocols to improve their flexibility. Several stretching techniques are used to increase ROM. Flexibility is the ability to move a joint through a series of articulations in a full non-restricted pain-free range of motion (ROM)[2]. A number of previous studies have demonstrated that PNF stretching techniques produce greater increase in ROM than passive stretching method[1,7,8,12]. The technique used, flexibility gains in the hamstring muscle have been demonstrate after a multiple-day stretching program, and some studies have shown that frequency and duration of PNF stretching affect ROM gain. However the duration of flexibility gains after a single stretching session has received limitation study.

Hamstring stretching is popular among physical therapists, athletics, trainers and fitness / coaching professionals, who all have an interest in improving flexibility in both asymptomatic and symptomatic clinical. Hamstring strain is a common in athletics injury with a tendency to recur. Lack of flexibility has been suggested as a predisposing factor to hamstring strains. Clinicians are generally consider flexibility training to be an integral component in prevention and rehabilitation of injuries as well as a method of improving one's performance in daily activities and sports[3].

The hamstring muscle are important contributor to the control of human movement and are involved in a wide range of activities from running and jumping to forward bending during sitting or standing and a range of postural control action. The proposed etiology involved

insufficient flexibility strength (force generating capacity) impairment or imbalance a dyssynergic contraction that can place excessive strain on the hamstring muscle. Static stretching of the hamstring muscle to maintain flexibility and improve performance has been proposed as a proactive and preventive strategy and is now in common use in studies. Reduce hamstring muscle flexibility has been implicated in lumbar spine dysfunction with a number of studies showing a strong positive correlation between decreased hamstring flexibility and low back pain[3].

However one of the literature view "Effect of stretching position hamstring flexibility gains" [4], the result has shown that ROM gained in supine is greater than standing position will be used to gain the maximum flexibility. Thus the present study was done to evaluate the duration of maintained hamstring flexibility gains after a one time modified hold relax stretching protocol in females.

METHOD

SUBJECTS

This was experimental study with 30 females with hamstring tightness. Characteristics of sample are described in Table.1

TABLE 1

Demographic variables	t value	p value
Age	1.356	0.186
Weight	0.468	0.644
Height	0.252	0.803

All 30 female subjects were selected on the basis of inclusion and exclusion criteria and divided into 2 groups A and B. The subjects were recruited from the department of physiotherapy, dolphin (PG) institute of biomedical and natural sciences Dehradun. The inclusion criteria were age between 17-23year, young healthy female with hamstring tightness (limitation of 200 or more from full extension of knee). Subjects with injury to trunk and lower extremity for previous 6 months, mental retardation and hypermobility of hip and knee joint were excluded.

PROCEDURE

The subject found suitable on the basis of inclusion and exclusion criteria were requested to sign the written informed consent forms. The study and consent form were approved by the institutional ethics review committee. The subjects were then randomly assigned to the two groups (Group A and Group B) following lottery method. They had a visible evidence of hamstring tightness, defined as a limitation of 20^o or more from full knee extension as determined by active knee extension (AKE) test[5]. The subject were positioned in supine where the right hip maintained in 0^o flexion and left lower extremity was placed in 90^o of hip flexion with knee 90^o flexion with the help of cross bar. The subjects left hip was flexed at 90^o until the anterior thigh just touch the cross bar of the alignment of apparatus the right hip was perpendicular to the horizontal surface of the table for all AKE measurement. Throughout the AKE procedure, the right hip remained at 0^o of flexion. The fulcrum of the goniometer was placed on the lateral epicondyle of the femur, the stationary arm was aligned with the line joining greater trochanter and lateral epicondyle of the femur and movable arm was aligned with the line joining the lateral epicondyle of the femur and lateral malleolus to measure knee range of motion. All the subjects were then asked to perform 6 warm-ups active knee extension with a 60 sec rest period between repetitions. The first 5 AKEs served as warm-up to decrease any effect that may occur with repeated measures are performed from cold start. The 6th AKE was recorded as the prestretch measurement. When the subject could not extend her lower leg any further without her thigh moving away from the cross-bar, she inform the examiner and held that position for approximately 2 to 3 sec. until a measurement was taken.

The 15 subjects of experimental group received visual and verbal predetermined time intervals for stretching, contracting and relaxing were used for stretching. The examiner passively stretched the hamstring until the subject first reported a mild stretch sensation and held that position for 7 seconds. Next the subject maximal isometrically contracted the hamstring for 7 seconds by attempting to push her leg towards the table against the resistance of the examiner. After the contraction, the subject relaxed for 5 sec. This sequence was repeated 5 times on each subject in the experimental group for left extremity. Then post-stretch measurement were performed in the same manner as pre-stretch measurement. AKE measurement was taken at 0 minute (immediately), 2, 4, 6, 8, 10 minutes after the final stretch in the experimental group and measurement of the angle of knee joint ROM was recorded. Whereas the control group lay supine on the table for 5 minutes. Then the control group underwent the same post-stretch measurement protocol immediately after 5 minutes of lying quietly on the table at 0 minute (immediately), 2, 4, 6, 8, 10 minutes. Measurement of angle of knee ROM was recorded.

DATA ANALYSIS

Data was analyzed using SPSS (12.0) version. Paired sample "t-test" was done within the group for controlled and stretched limb. Independent "t-test" was done between the groups for stretched and controlled limb to determine the significance level of pre and post-stretch. ANOVA of the post-stretch within the group was done for both stretched and controlled group and to determine the significance levels for both the groups

RESULT

Mean values and Standard Deviations of the outcome variables during both the tests are displayed in Table 2 and Table 3

TABLE 2: INDEPENDENT 'T' TEST BETWEEN THE GROUPS

Duration	Mean ± SD (Group A)	Mean ± SD (Group B)	p value
Prestretch	36.33± 4.86	35.33±6.03	0.621
Zero min.	22.53 ± 7.20	37.87±5.88	0.001
Two min.	25.60 ±6.41	39±5.95	0.001
Four min.	28.93 ±6.32	41.60±5.75	0.001
Six min.	32.60 ±5.93	43.60±5.79	0.001
Eight min.	36.33 ± 5.58	45.60±5.79	0.001
Ten min.	39.73 ± 5.09	47.67±5.90	0.001

Independent sample "t-test" was done between the two groups of age, height and weight and the result showed insignificant difference in Age (p= 0.186), weight (p=0.644) and height (p=0.803) [Table-1].

Paired sample "t-test" was done within the group A for stretched limb and result of prestretch Vs starting min (p=0.0001), prestretch Vs two minutes (p=0.0001), prestretch Vs four minutes (p=0.0001), prestretch Vs six minutes (p=0.0001), Prestretch Vs eight minutes (p=0.0001) and prestretch Vs ten minutes (p=0.0001) showed significant difference as shows in fig 1.

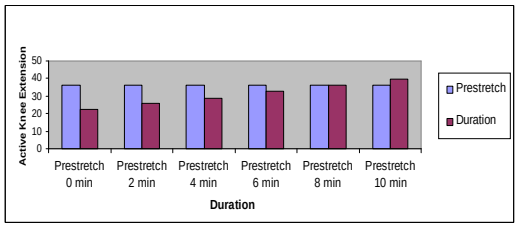

FIGURE 1: GRAPHICAL REPRESENTATION OF THE COMPARISON OF PRESTRETCH VERSUS DIFFERENT DURATION FOR GROUP A

Similarly paired samples "t-test" was done within the group B for controlled limb and result of prestretch Vs starting min (p=0.0001), prestretch Vs two minutes (p=0.0001), prestretch Vs four minutes (p=0.0001), prestretch Vs six minutes (p=0.0001), Prestretch Vs eight minutes (p=0.0001) and prestretch Vs ten minutes (p=0.0001) showed significant difference as in fig 1.2.

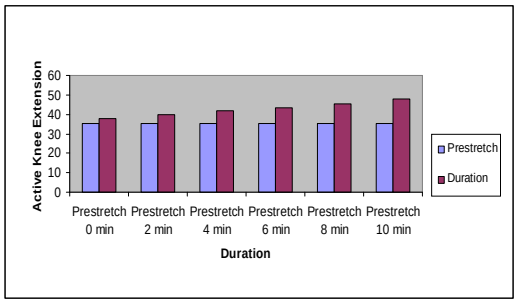

FIGURE 2: GRAPHICAL REPRESENTATION OF THE COMPARISON OF PRESTRETCH VERSUS DIFFERENT DURATION FOR GROUP B

Independent "t-test" was done between the groups for both control and stretched limb, and the result of prestretch (p=0.621), showed insignificant difference whereas starting min (p=0.0001), two minutes (p=0.0001), four minutes (p=0.0001), six minutes (p=0.0001), eight minutes (p=0.0001) and ten minutes (p=0.0001) showed significant difference as shows in table 2 and fig. 1.3.

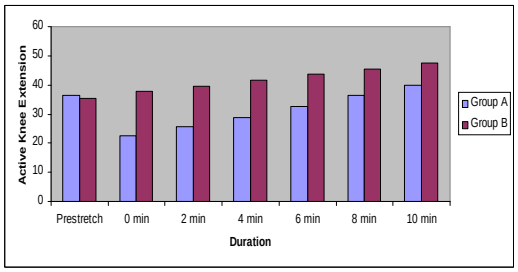

FIGURE 3: GRAPHICAL REPRESENTATION OF THE COMPARISON OF GROUP A AND B

ANOVA of post-stretch within the group was done and the result of group A for stretched limb (p=0.0001) and group B for control limb (p=0.0001), showed significant difference, [Table-3].

TABLE 3: ANOVA OF POST-STRETCH WITHIN THE GROUPS

Groups	F value	P value
Group A	16.96	0.0001
Group B	5.98	0.0001

DISCUSSION

Flexibility is a key component for injury prevention and rehabilitation. Stretching is

important for reducing injury and improving performance in sports and for overall physical fitness. Athletes are often given stretching protocols to improve their flexibility. Several stretching techniques are used to increase joint range of motion (ROM)[6].

The purpose of this study was to measure the duration of maintained hamstring flexibility gains after a one-time, modified hold-relax stretching protocol in young females. In this study the hypothesis was that the PNF stretching technique (Hold-Relax) will increase the duration of maintained hamstring flexibility.

In this study, ANOVA was done to compare each post-stretch measurement to determine the significant difference among the two groups. The result showed significant difference for the group

In a previous study using a static stretching protocol, hamstring flexibility increased significantly but only remained increased for 3 minutes after stretching.3 Although another studies supported greater increases in ROM with PNF stretching techniques than with passive, static, or ballistic stretching methods[1,7,8,12]. However, some studied suggest no difference between PNF and other stretching techniques[9,10].

One of the study was done by William D Bandy et al on The effect of time on static stretch on the flexibility of hamstring muscle suggested that duration of 30 sec is an effective time of stretching for enhancing the flexibility of hamstring muscle. Occurred by increasing the duration of stretching from 30 to 60 sec is more effective[11].

Moreover, a review by Sady SP et al on Flexibility training by using ballistic, static or proprioceptive neuromuscular facilitation suggested that flexibility training by ballistic static or PNF indicates that PNF may be the preferred technique for improving flexibility[1].

Another study using static stretching protocol by Glen M. DePino et al which was on the Duration of maintained Hamstring Flexibility after cessation of an acute static Stretching protocol and they were suggested that hamstring flexibility significantly improved of knee estimation ROM in the experimental group that was lasted for 3 minutes[3].

Sullivan MK et al[10], studied on the Effect of pelvic position and stretching on hamstring muscle flexibility and showed the comparison of static stretching and PNF techniques while maintaining the pelvis in anterior or posterior pelvic tilt. They used ANOVA comparing stretching technique and pelvic position revealed those anterior pelvic tilt groups significantly increase the hamstring flexibility. There was not a significant difference between static or PNF stretching technique in anterior pelvic tilt.

FUTURE RESEARCH

- It can be done by including the more number of samples.
- It can also be done by increasing the time of research.
- It can be done by taking older people.
- It can also be done on other group of muscles

RELEVANCE TO CLINICAL PRACTICE

The hamstring tightness subject indicated an increased amount of flexibility after one-time modified hold-relax stretching. These findings may have clinical implication in terms of how often a stretching routine should be performed in a day to maintained flexibility gains, especially if a person had primarily sedentary life style

CONCLUSION

It was concluded that modified hold-relax stretching increased the duration of hamstring flexibility after one-time hold-relax stretching protocol in young female.

ACKNOWLEDGEMENT:

The author acknowledges support of DR. Promod Kumar Rathore, MDS (periodontics), Sr. Lecturer in Shree Bankey Bihari dental college.

CONFLICT OF INTEREST

There is no conflict of interest.

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MUSCULOSKELETAL PAIN AND INJURY IN PROFESSIONAL DANCERS: PREVALENCE, PREDISPOSING FACTORS AND TREATMENT

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ABSTRACT

BACKGROUND: *Dance- related musculoskeletal injury and pain have been described as a physical condition that causes discomfort resulting in a limitation, restriction or cessation in participation in dance. This study investigated the prevalence of musculoskeletal pain and injury among professional dancers in Lagos state, Nigeria.*

METHOD: *The study was a cross sectional descriptive survey. One hundred and eighty (180) professional dancers (95 male and 85 female) selected from 10 dance groups in Lagos state, Nigeria completed a 31-item questionnaire. They were selected using a sample of convenience technique.*

RESULTS: *A 12-month prevalence of musculoskeletal disorders and pain was 86.1 %. Fifty six (36%) respondents had injury at the time of study while 91 (58%) had the injury two to four weeks before the study. The most commonly affected body parts were the knee (54.8%), the lower back (32.9%) and the ankle (25.2%). 56.7% of the respondents reported having strain. Eighty four (54.1%) respondents reported that injury occurred during training mainly while attempting skills beyond ability. Sixty three (35%) respondents had self-treatment. Chi-square analysis showed that there was a statistically significant association between the frequency of training per week and the prevalence of musculoskeletal pain and injury.*

CONCLUSION: *There was high prevalence of musculoskeletal pain and injury among professional dancers in Lagos state, Nigeria. Injury occurred mainly while attempting skills beyond their abilities especially during training. Increased training periods per week is a significant factor contributing to the high level of musculoskeletal pain and injury.*

KEYWORDS: Musculoskeletal pain, injury, professional dancers.

INTRODUCTION

Dance is an art form that generally refers to movement of the body, usually rhythmic and to music, used as a form of expression, social interaction or presented in a spiritual or performance setting[1]. It not only involves flexibility and body movement, but also physics of the body. If the proper physics is not taken into consideration, injuries may occur[2]. World Health Organization (WHO) defined a dance injury as "a physical condition that causes pain or discomfort resulting in a limitation, restriction or cessation in participation in dance[3-5].

Dancers are a unique blend of artist and athlete particularly susceptible to musculoskeletal injuries and pain which can be difficult to diagnose[6]. Musculoskeletal injury is the most frequently reported medical problem among classical and modern dancers. It affects dancing performance, hinders participation in dance, and may result in temporary unemployment, loss of salary or an end to a career of a professional dancer[7]. The high incidence of injury in dancers has been attributed to several factors including; excessive dance training at an early age (before puberty), extensive and intense rehearsals, insufficient warm-up, fatigue, technical errors, physical characteristics of footwear, inappropriate or ill-maintained dance floors, and dietary habits common to dancers[7,8]. Dance-related injuries usually result from inherent biomechanical factors, environmental and training issues, as well as technical competence. The rates of injuries appear almost twice as high in male dancers as in female dancers. Gender differences in injury characteristically result from differences in imbalance, inflexibility and strength as well as differences in performance of specific roles[9]. Men are more inclined to ankle and back injuries because of the jumping, leaping, and lifting that their roles often require[10]. Age may also have a significant impact on injury incidence. Adolescent dancers may be more subject to overload injury because of muscle tissue quality and technical skill typical of that age. There is evidence to show that as dancers age they are likely to be more aware of the warning signs of injury and to take steps to prevent it[11]. Injuries are also more likely to occur in the late afternoon, a reflection of muscular and psychological fatigue[5].

Overuse injuries account for 60-76% of all dance injuries and most injuries affect the

lower extremities and back[12]. The most common locations for injuries are ankles, lower leg/calf, and back, usually caused by overuse, muscle strains, and sprains[13]. Musculoskeletal conditions often manifest with the onset of pain and the resulting physical limitations. It is one of the most common reasons for self-medication and entry into the health care system[14]. Knowing how to evaluate, treat, and prevent disorders in this unique population will help optimize patient outcomes[15]. The problems of musculoskeletal pain and injuries among professional dancers have not been extensively explored in Nigeria. Hence, this study was designed to investigate the prevalence of musculoskeletal pain and injury among professional dancers in Lagos, Nigeria.

MATERIALS AND METHODS

One hundred and eighty (180) professional dancers (95 male and 85 female) selected from 10 dance groups in Lagos state, Nigeria participated in the study. They were aged 18 years to 40 years and were selected by a sample of convenience. Ethical approval was obtained from the Research and Ethics Committee of the Lagos University Teaching Hospital, Idi-Araba, Lagos. An informed consent was attached to a structured 31-item questionnaire which each of the participants completed. This questionnaire titled 'Prevalence of musculoskeletal pain and injury in professional dancers' was adopted from a previous epidemiological study of injuries in highland dancers by Logan-Krogstad[16] but was slightly modified by a panel of 5 experienced clinical and academic physiotherapists to suit the purpose of this study. The questionnaires were first given to ten model subjects to fill in order to ascertain if the questions were easy to understand and were suitable for data collection. It had six sections. Section A (items 1-3) collected information on the demographic data of the participants. Section B (items 4-11) collected information on the professional dance history of participants, section C (items 12-24) collected information on the prevalence musculoskeletal pain and injury, section D (items 25-26) collected information on the predisposing factor to musculoskeletal pain and injury, section E (items 27-29) collected information on the participants' limitations due to pain and injury and section F (items 30-31) collected information on the participants' treatment history.

DATA ANALYSIS

Descriptive statistics of frequency, percentages and inferential statistics of chi-square were used for data analysis. The results were represented using tables, histograms, bar charts and pie charts. The level of significance was $p<0.05$.

RESULTS

The mean age, years of professional dancing and training hours per day of the respondents were 24.2 ± 4.36 years, 5.20 ± 3.40 years and 3.60 ± 3.40 hours respectively (Table 1). One hundred and twenty two (67.8%) of the respondents danced contemporary while 15 (8.3%) danced jazz (Fig 1). One hundred and fifty five (86.1%) of the respondents reported that they had injury or pain within the last 12 months of the study while 25 (13.9%) reported they did not have pain or injury (Fig 2). Concerning the point prevalence of musculoskeletal pain and injury, 56 (36%) respondents had injury at the time of the study while 91 (58%) had injury within the last one to two weeks of the study (Fig 3).

Eighty eight (48.9%) respondents attributed their injury and pain to dance while 48 (26.7%) did not (Table 2). Twenty eight (15.6%) respondents got injured monthly while 5 (2.8%) had pain or injury daily (Table 3). Four most injured parts of the body were the knee, lower back, ankle and shoulder/hip. Eighty five (54.8%) respondents had injury and pain at the knee, 51 (32.9%) at the lower back and 5 (7.1%) at the shin (Fig 4). The knee was the most injured part of the body for such dance types as Hip hop, Contemporary, African contemporary and African dance (Fig 5). Twenty two (12.2%) respondents had pain severity rated 4 while 2 (1.1%) had 10 (Table 4). One hundred and two (56.7%) respondents had strain as the type of injury while 3 (1.7%) had tendonitis (Fig 6). Eighty four (54.1%) respondents reported that the injury occurred during the training periods while 20 (12.9%) reported during warm-ups (Table 5). One hundred and twenty six (70%) respondents had the injury suddenly while 106 (58.9%) had gradual onset of injury (Fig 7). Sixty six (36.7%) respondents reported that the injury was caused by attempting skills beyond ability while 2 (1.1%) reported that it was caused by fatigue (Table 6).

Sixty five (36.1%) respondents modified their training as a coping strategy while 115 (63.9%) respondents did not modify their training (Fig 8). Eighty eight (56.7%) respondents did not miss on either training or performance while 26 (16.8%) missed performance (Table 7). One hundred and twenty two (78.7%) of the respondents who had musculoskeletal pain and injury received treatment while 33 (21.3%) of them did not receive treatment (Fig 9). Sixty three (35%) respondents had self-treatment while 48 (26.7%) received treatment from physiotherapy. Some of the respondents had two or more types of treatment (Table 8). One hundred and fourteen

(73.5%) respondents reported that pain and injury did not affect their daily activities while 41 (21.7%) reported that it affected theirs (Table 9).

Chi-Square analysis showed that there was no significant association between the prevalence of musculoskeletal pain and injury and the age of professional dancers ($\aleph^2 = 13.70, p = 0.89$) (Table 10), the type of dance ($\aleph^2 = 6.78, p = 0.45$) (Table 11) and the training hours per day ($\aleph^2 = 13.82, p = 0.05^*$) (Table 12).

Chi-square analysis showed that there was a significant association between the training time and prevalence of musculoskeletal pain and injury (13.82= 2ϰ, p=0.05*) (Table 13).

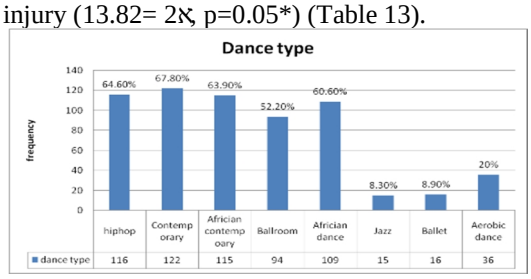

Figure 1: Dance types

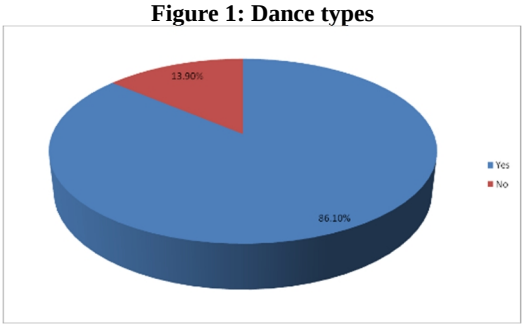

Figure 2: Twelve months prevalence of musculoskeletal disorders among professional dancers

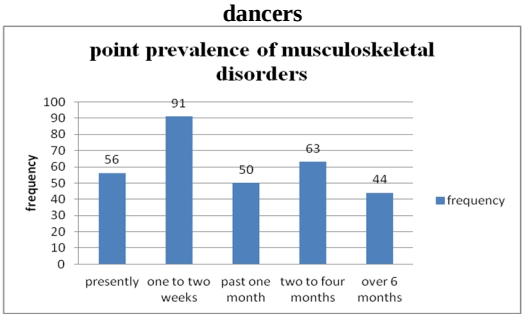

Figure 3: Point prevalence of musculoskeletal disorders among professional dancers

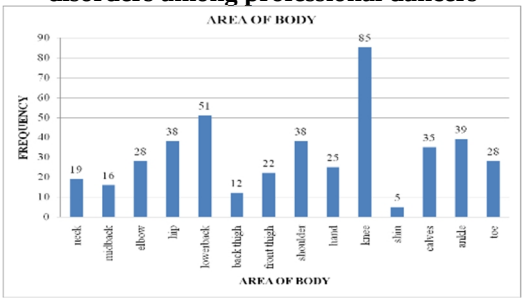

Figure 4: Areas of pain and injury

TABLE 1: CHARACTERISTICS OF THE RESPONDENTS

	Mean	± SD
Age (years)	24.2	4.36
Years of professional dancing (years)	5.5	3.40
Hours of training	3.6	3.40

TABLE 2: RESPONDENTS' ASSOCIATION OF MUSCULOSKELETAL DISORDERS TO DANCE.

Associating MSD to dance	Frequency (n)	Percent (%)
Yes	88	48.9
No	48	26.7
Not applicable	44	24.7
Total	180	100

Key: MSD = Musculoskeletal disorders

TABLE 3: HOW OFTEN THE RESPONDENTS HAD INJURY

How often respondents had pain and injury	Frequency (n)	Percent (%)
Daily	5	2.8
Weekly	17	9.4
Monthly	28	15.6
Never	27	15.0
Others	103	57.2
Total	180	100

TABLE 4: SEVERITY OF PAIN FELT BY THE RESPONDENTS ON A SCALE OF ONE TO TEN.

Level of pain felt	Frequency (n)	Percent (%)
0	77	42.8
1	4	2.2
2	15	8.5
3	21	8.3
4	22	12.2
5	19	10.6
6	10	5.6
7	4	2.2
8	4	2.2
9	2	1.1
10	2	1.1
Total	180	100

TABLE 5: WHEN THE INJURY LIKELY OCCURRED.

When the injury occurred	Frequency (n)	Percent (%)
Training	84	54.1
Performance	28	18.0
Warm up	20	12.9
Others	23	14.8
Total	155	100

TABLE 6: CAUSES OF INJURY

Causes of injury	Frequency (n)	Percent (%)
Loss of balance	60	33.3
Attempting skill beyond ability	66	36.7
Fatigue	2	1.1
Insufficient warm	43	23.9
Loss of balance	8	4.4
Total	155	100

TABLE 7: MISSING TRAINING OR PERFORMANCE DUE TO PAIN OR INJURY

	Frequency (n)	Percent (%)
Respondents who missed training	41	26.5
Respondents who missed performance	23	16.8
Respondents who did not missed training or performance	88	56.7

TABLE 8: TYPES OF TREATMENT RECEIVED BY RESPONDENTS

Types of treatment received	Frequency (n)	Percent (%)
Doctor	50	27.8
Physiotherapy	48	26.7
Self medication	63	35.0

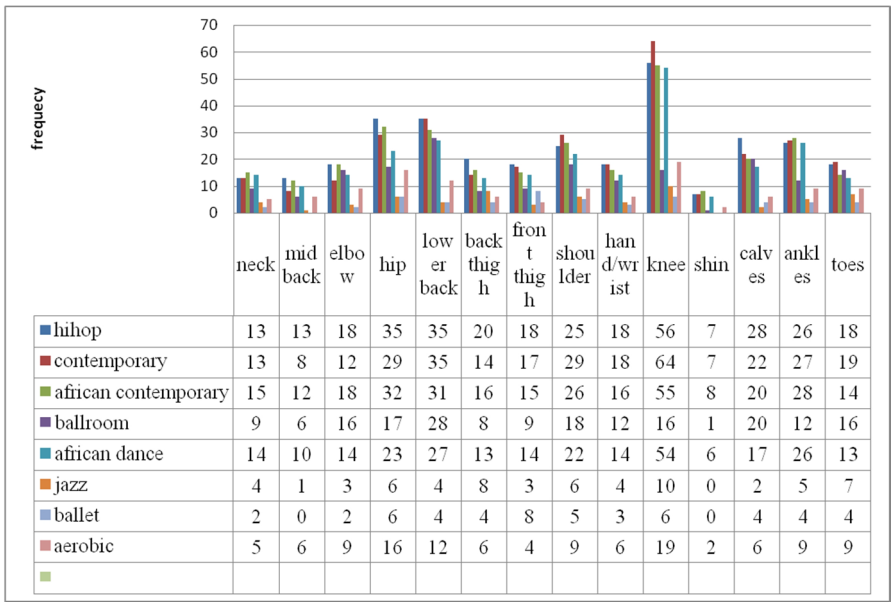

Figure 5: Areas of pain and injury due to different types of dance

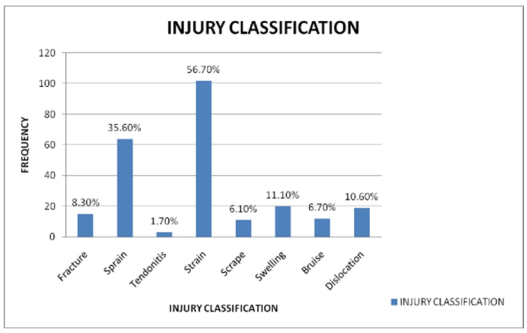

Figure 6: Injury classification

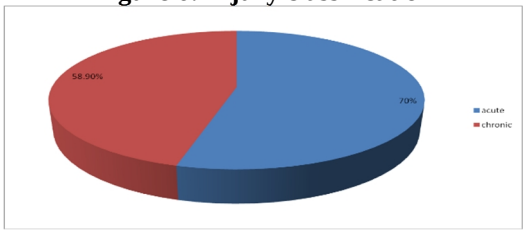

Figure 7: The nature of injury sustained by the Respondents

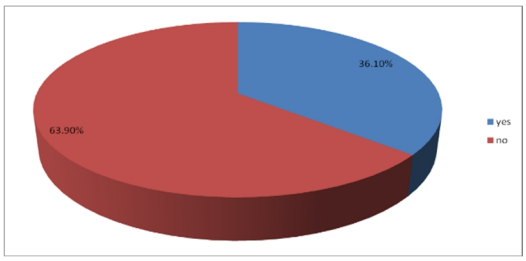

Figure 8: Respondents' modification of training due to pain

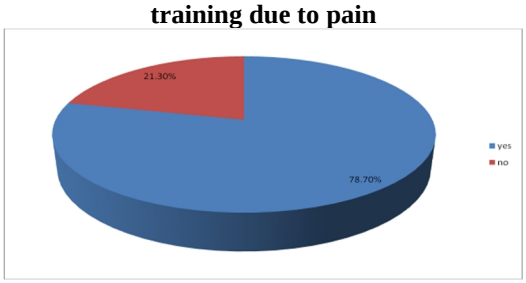

Figure 9: Respondents who received treatment

TABLE 9: PAIN AND INJURY AFFECTATION OF DAILY ACTIVITIES

If pain and injury affected activities of daily living	Frequency (n)	Percent (%)
Yes	41	21.7
No	114	73.5
Total	155	100

TABLE 10: RELATIONSHIP BETWEEN AGE AND PREVALENCE OF MUSCULOSKELETAL PAIN AND INJURY

Age	Prevalence		X^2	p-value
	Yes	No		
18-20	34	8	13.70	0.89
21-25	42	6		
31-35	7	1		
36-40	4	0		

TABLE 11: RELATIONSHIP BETWEEN THE TYPE OF DANCE AND PREVALENCE OF MUSCULOSKELETAL DISORDERS AMONG PROFESSIONAL DANCERS

Types of dance	Prevalence		X^2	p-value
	Yes	No		
Hip hop	91%	8.6%	6.78	0.45
Contemporary	90%	9.8%		
African contemporary	86%	13.9%		
Ballroom	86.1%	13.8%		
African dance	85.3%	14.7%		
Jazz	100%	0%		
Ballet	87.5%	12.5%		
Aerobic	94.4%	5.6%		

TABLE 12: RELATIONSHIP BETWEEN LENGTH OF TRAINING HOURS PER DAY AND PREVALENCE OF MUSCULOSKELETAL PAIN AND INJURY IN PROFESSIONAL DANCERS

Training hours per day	Prevalence		X^2	p-value
	Yes	No		
1 hour	7 (4.5%)	1 (4.0%)	5.28	0.26
2 hours	13 (8.4%)	3 (12%)		
3 hours	32 (20.6%)	10 (40.0%)		
4 hours	56 (36.1%)	6 (24.0%)		
>5 hours	47 (30.3%)	5 (20.0%)		

TABLE 13: RELATIONSHIP BETWEEN THE TRAINING TIME PER WEEK AND PREVALENCE OF MUSCULOSKELETAL DISORDERS AMONG PROFESSIONAL DANCERS

Training hours per day	Prevalence		X^2	p-value
	Yes	No		
Once a week	12	1	13.82	0.05*
Twice a week	28	5		
Three times a week	58	18		
Four times a week	36	1		
Daily	17	0		
Other	4	0		

***** = significant ($p < 0.05$)

DISCUSSION

The study was designed to evaluate the prevalence of musculoskeletal pain and injury among professional dancers in Lagos state, Nigeria. The 12 months prevalence of musculoskeletal pain and injury among professional dancers was 86.1%. This implies a high prevalence of musculoskeletal pain and injury among professional dancers in Lagos state, Nigeria. The knee was the most frequently injured area especially for most of the dance types followed by the low back, ankle and then the shoulder/hip. Over half of the professional dancers had strain as the type of injury. Pain severity for most of the injured dancers was rated average. Over half of the injured professional dancers had the injury during the training periods. Over two-thirds of the surveyed professional dancers had the injury suddenly. Over a third of the professional dancers had injury when attempting skills beyond their abilities. Over half of the surveyed professional dancers neither modified their training nor missed training / performance as a result of musculoskeletal pain and injury. More than one-third of the professional dancers who had musculoskeletal pain and injury went for self-treatment instead of seeking treatment from professionals.

The high prevalence of musculoskeletal pain and injury among professional dancers observed in this study corroborates previous studies[4,12,17-20]. Ruanne et al[19] reported that musculoskeletal injury rates in professional dance companies and pre-professional dancers range from 67% to 95%. Cho et al (2009)[20] reported an injury rate of 95.2% among male Korean break-dancers.

The finding that the knee was the most frequently injured area especially for most of the dance types followed by the low back, ankle and then the shoulder/hip corroborates previous finding[12,13,21]. Anthony et al[13] reported that the most common locations for injuries were the knee, lower back, ankles and lower leg/calf. Bronner et al[12] and Rickman et al[21] observed that most musculoskeletal disorders occurred at the lower back and lower extremities. This may be as a result of the anatomic structures of these areas and the demands made on them when performing the different dance routines. The joints of the lower extremities bear much of the weight of the body. Studies have shown that the occurrence of injuries is related to the type of dance being performed, the dancers' technique, experience, physiology and psychological factors[22-25]. Shah et al[18] observed that the foot and ankle was the most common site of injury, followed by the lower back and the knee among professional contemporary dancers in the USA. Rietveld and van de Wiel[26] reported that dance injuries are often caused by faulty technique due to compensation for physical limitations. Janey Holcer et al[27] stated that many dancers often stretch their physical capabilities and endurance

and neglect their physical limitations. Again, dance floors play a significant role in the occurrence of acute and chronic injuries, even in experienced dancers[28]. It was observed that most floors that the professional dancers in Lagos state, Nigeria performed their dance were made of concrete. Koutedakis[29] observed that dancers who danced on concrete floor had more injury than those dancers that danced on properly sprung floor.

The fact that more than half of the professional dancers had strain as the type of injury may also be due to the forceful impact of dance upon the body and the different twisting movements that the joints and muscles are subjected to when dancing. Anthony et al[13] also observed that strain and sprain were common among professional dancers. Cho et al[20] reported that sprain, strain and tendinitis accounted for the most injury in break-dancers.

The finding that most of the injured professional dancers rated the severity of their pain as average may not be quite accurate as perception of pain is not a valid indicator of the severity of pain[19]. This is because perception of pain varies widely among dancers and perceived severity of pain is negatively correlated with the levels of both skill and experience[30,31].

The observation that more than two-thirds of the surveyed professional dancers had the injury suddenly may also be due to the forceful impact of the dance types upon the body especially the lower limbs. Bowling[32] observed that more than half of professional dancers have reported at least one chronic injury. Wong et al[7] reported that majority of dance injuries are overuse injuries which usually develop slowly over time.

Over half of the injured professional dancers had the injury during the training periods mainly while attempting skills beyond their ability. Dancers go through rigorous training to master new techniques through repetitive practices and this may pose a risk to injury as anatomic and physiologic capabilities of body structures are usually exceeded. Young et al[33] found out that musculoskeletal injuries occurred mainly during the end of training sessions due to fatigue and overuse of body structures.

The observation that more than half of the surveyed professional dancers neither modified their training nor missed training / performance as a result of musculoskeletal pain and injury may be because they do not want to lose time from training. Shah et al[18] also observed that most professional contemporary dancers missed no performances due to injury.

The finding that more than one-third of the professional dancers who had musculoskeletal pain and injury went for self-treatment instead of seeking treatment from professionals corroborates previous studies which reported that injured dancers often fail to seek medical attention[34,35]. This may be due to concerns for loosing time from training and a feeling of not being understood by medical practitioners[19].

There was no significant relationship between prevalence of musculoskeletal pain and injury and age of professional dancers. This means that age of professional dancers did not predispose them to musculoskeletal pain and injury, although professional dancers within the ages of 21 and 25 years had the highest prevalence. Stretanski and Weber[36] observed that there was a significant relationship between the age and prevalence of musculoskeletal pain and injury among professional dancers and that there was high prevalence of musculoskeletal pain and injury between the ages of 21 and 25 years.

There was no significant relationship between prevalence of musculoskeletal pain and injury among professional dancers and the type of dance. Ruanne et al[19] reported that the occurrence of injuries is related to the type of dance being performed.

There was no significant relationship between prevalence of musculoskeletal pain and injury among professional dancers and the training hours per day. Cho et al[20] reported that the number of injury sites was not significantly correlated with the amount of training in male Korean break-dancers.

This study showed significant relationship between the time spent on training per week and prevalence of musculoskeletal pain and injury. This means that those who trained three times a week had more musculoskeletal pain and injury than those that trained once. Clark et al[37] reported that dancers tend to have musculoskeletal pain and injury when training is done more than once a week.

CONCLUSION

There was high prevalence of musculoskeletal pain and injury among professional dancers in Lagos state, Nigeria. Injury occurred mainly while attempting skills beyond their abilities especially during training. Increased training periods per week is a significant factor contributing to the high level of musculoskeletal pain and injury. Self-treatment was the most commonly practiced treatment option by these dancers.

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A STUDY TO EVALUATE THE HEMODYNAMIC RESPONSE TO REPETITIVE MCKENZIE EXERCISE IN HEALTHY SUBJECTS

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ABSTRACT

BACKGROUND & OBJECTIVES*: Low back pain (LBP) is a highly prevalent and disabling conditions worldwide. Repetitive exercises recommended by McKenzie for the lumbar spine, such as flexion and extension exercises in standing (FIS and EIS) and lying positions (FIS and EIS) have been used extensively, have cardiovascular effects in people with no cardiovascular or cardiopulmonary conditions. So the purpose of the study was to examine the hemodynamic response of stability exercises in normal population, so when these exercises are incorporated in the treatment of LBP, monitoring can be done for the safety of the individuals.*

METHODS: *80 subjects (39= male, 41=female) without cardiovascular or cardiopulmonary disease with mean age of 28.3 ±5.99 years who were representative of people susceptible to low back pain were studied. Subjects were randomly assigned to 1 of 4 groups, 20 subjects in each, (FIS, EIS, FIL and EIL) were performed sets of 10, 15 and 20 repetitions of the assigned exercises, with a 15- minutes rest between sets. Pulse rate (PR), Blood Pressure (BP) and Rate pressure Product (RPP) were recorded after each sets of repetitions.*

RESULTS*: ANOVA analysis of resting SBP, DBP, PR and RPP for group 1, 2, 3 and 4 before training reveals non-significant changes. There was a significant difference in SBP, PR and RPP after 15 and 20 repetitions in group 1, 2 and 3 ($p < 0.05$) while group 4 showed significant changes in DBP along with SBP, PR and RPP after 10, 15 and 20 repetitions. The result showed flexion and extension in lying were more hemodynamically demanding exercises than in standing. This trend persisted for 15 and 20 repetitions; however at 20 repetitions effects were different (FIL>EIL>FIS>EIS).*

CONCLUSION*: Flexion exercises is more stressful than extension (FIL>EIL) in lying. In upright position, flexion is more stressful than extension (FIS>EIS). After 10 repetitions, McKenzie exercises for "extension in standing" is the least stressful hemodynamically. These effects may be important with respect to cardiac work, and patient for whom these exercises are indicated, so these patients should have a cardiac and pulmonary risk factors assessment to determine whether heart rate and blood pressure should be monitored in them.*

KEYWORDS*: McKenzie exercises, Hemodynamic Response, RPP, BP*

INTRODUCTION

Low back pain (LBP) is a common condition comprising a major health problem worldwide[1]. It is one of the most common musculoskeletal ailments in the general population, affecting approximately 60–80% of the general population[2]. It is the most commonest complaint of the working age population which causes a substantial economic burden due to the wide use of medical services and absence from work[2].

Recently, various literatures have revealed the most common LBP treatment approaches which include Maitland mobilization, McKenzie approach, exercises, advice and electrotherapeutic modalities. Therapeutic exercises are intended to help to achieve reconditioning, improved muscle strength and length, and optimal range of motion. They also indirectly provide pain relief and a better quality of life[2].

For 2 decades, lumbar spine exercises advocated by McKenzie for low back pain have been used for the management of patients with spinal disorders. These exercises are used to classify patients as having 1 of 3 syndromes (postural, dysfunction, and derangement syndromes) and to guide treatment. These exercises include repeated flexion and extension movements performed in different body positions as part of a routine lumbar spinal assessment and exercise program. McKenzie exercises are successful method for decreasing and centralizing the pain and increasing spinal movements in patients with LBP[3].

The McKenzie exercises involve muscle co-contraction to stabilize the trunk and arm exercise, both of which are associated with disproportionate cardiovascular demand to a given load compared with leg work[4]. Patients with cardiac conditions or high BP are routinely cautioned about exercises requiring isometric muscle contractions and arm work, because these exercises are associated with increased cardiovascular stress as manifested by increased work of the heart, which is reflected by increased heart rate (HR) and BP for a given submaximal load compared with leg exercise[5].

The cardiovascular effects of repetitive McKenzie exercises could have implications for patients with low back pain who have coexistent cardiovascular conditions. Guidelines for the use

of these exercises, however, are typically not accompanied by cautions about potential cardiovascular stress. Thus, understanding the cardiovascular responses to McKenzie exercises can be useful for clinicians using these exercises for diagnostic purposes and as an intervention[5].

Several researchers have investigated the effect of various types of submaximal work performed by the upper extremities on the RPP versus the lower extremities[6]. The increase in HR and systolic BP per unit of increase in work is greater during upper-extremity exercise than during lower-extremity exercise. Isometric exercise has been shown to increase both HR and BP and, therefore, RPP. Increases in HR and BP are proportional to the torque produced by the muscles[7]. Lumbar spinal flexion and extension involve upper-extremity work using both concentric and eccentric contractions. Eccentric muscle contractions are associated with less oxygen demand than concentric muscle contractions[8].

To our knowledge, there are very less studies of the cardiovascular effects of repetitive McKenzie exercises. The aim of our study, therefore, was to examine the cardiovascular effects of 4 common McKenzie exercises i.e. lumbar spinal flexion and extension in standing and lying—when these exercises are repeated 10, 15, and 20 times. We hypothesized that repetitive McKenzie exercises of the lumbar spine would produce marked changes in the work of the heart and that these effects increase with multiple repetitions.

METHODOLOGY

Sampling: Simple Random Sampling
Study design: Cross-sectional study
Sample size: The study was conducted on 80 healthy males and females volunteers between age group of 20-40 yrs. Subjects were taken from around Rajkot on the basis of random sampling. Prior to the participation all subjects were explained briefly about the aims and objectives of the study, health benefits of the exercises and about the procedure of measuring pulse rate, blood pressure. All subjects were screened and a detail medical history was taken to exclude any serious illness. Health screening tool questionnaire (AACVPR) was used to identify the serious illness in the subject. Informed consent was signed for their voluntary participation.

INCLUSION CRITERIA:

1. Age: 20-40 years.
2. Healthy male and female were included.

EXCLUSION CRITERIA:

1. Subjects with recent episode of back ache
2. History of any cardiovascular, musculoskeletal, neurological problem
3. History of smoking
4. Subjects with regular participation in any athletic activity
5. Anemia
6. History of metabolic disorders

TESTING PROCEDURE:

To examine the cardiovascular effects of the 4 exercise groups, subjects were randomly assigned in blocks so that each group consisted of 20 subjects. The exercise groups were designated as flexion in standing (FIS), extension in standing (EIS), flexion in lying (FIL), and extension in lying (EIL).
The experimental protocol was based on established clinical standards for performing repetitive exercises of the lumbar spine as advocated by McKenzie[9].
Prior to testing, the height, weight and BMI of each subject were recorded.
Subjects were instructed not to eat an hour before and not to wear tight clothes.
Subject were instructed not to hold breath during exercise.
Subjects become familiar with 1 of the 4 exercise by verbal instruction, demonstration, and practice, before being instructed to perform the exercise for 3 sets of consecutive repetitions (10, 15, and 20 repetitions)[7].
During the 15-minute rest period between exercise sets, cardiovascular measurements were recorded until they returned to baseline. The PR and BP data were used to calculate the RPP after each set of repetitions (multiply PR and arterial systolic BP and then multiplying the product by $10^{-2)}$ [7].
After each set was completed and the subject returned to the reference position (within 30 seconds), the tester recorded pulse rate (PR) and blood pressure (BP). The mean of 2 measurements of PR and BP were obtained from each subject after each set[10].
The same protocol was repeated after the sets of 15 and 20 repetitions of the assigned exercise.

MEASUREMENT PROCEDURE:

The subject was seated in a relaxed position in a firm armchair for 5 minutes, during which time a questionnaire was completed and the consent form was reviewed and signed.

The reference position, in which PR and BP were recorded, was sitting in a chair. BP was obtained with a sphygmomanometer applied to

the left arm. Cuff width, position, tightness, and deflation rate were controlled in accordance with American Heart Association standards to maximize the validity (i.e. agreement with intra-arterial measurements, reliability of the measurements) [11].

GROUP A: FLEXION IN STANDING [9]

It was tested by asking the subjects to bend forward (toe touching) from stride standing without bending his/her knees and maintain the position for 1 to 2 seconds.

GROUP B: EXTENSION IN STANDING [9]

It was tested by asking the subject to band backward in standing position by keeping hands on either side of waist.

GROUP C: FLEXION IN LYING [9]

It was tested by asking the subject to lie on his/her back with both feet flat on the ground. Asked the subjects to grasp the front of both knees and pull them towards the chest till they feel comfortable stretch across the low back. Hold the position for 1-2 seconds and release the knees and allow the feet to rest back on the ground.

GROUP D: EXTENSION IN LYING [9]

It was tested by asking the subject to lie in prone position and extend the lumbar spine by pushing up on hands by extending the elbows.

Subjects were instructed to perform exercise for 3 sets of consecutive repetitions (10, 15 and 20 repetitions) and take rest for 15 minutes after each sets to ensure that their HR and BP returned to resting levels prior to performing the next sets of exercises. SBP, DBP, PR, RPP were measured at before exercise, after 10, 15 and 20 repetition of exercise.

RESULTS

TABLE 1: DISTRIBUTION OF DIFFERENT AGE GROUPS

Age (year)	No. of subject	Percent (%)
20.00	8	10.0
21.00	4	5.0
22.00	5	6.3
23.00	4	5.0
24.00	3	3.8
25.00	5	6.3
26.00	2	2.5
27.00	7	8.8
28.00	6	7.5
29.00	7	8.8
30.00	7	8.8
32.00	4	5.0
33.00	1	1.3
34.00	2	2.5
35.00	3	3.8
37.00	3	3.8
38.00	1	1.3
39.00	4	5.0
40.00	4	5.0
Total	80	100.0

TABLE 2: MEAN AGE

Total number of subjects	80
Mean	28.3000
Std. Deviation	5.99029
Minimum (Age)	20.00
Maximum (Age)	40.00

TABLE 3: GENDER PROPOSITION

	No of Subject	Percent (%)
Male	39	48.8
Female	41	51.3
Total	80	100.0

TABLE 4: MEAN SCORES OF SBP, DBP, PR AND RPP

	Baseline	After 10 rep	After 15 rep	After 20 rep
Group-1 (FIS) SBP	111.6	113.8	125.2	137.2
Group-2 (EIS)SBP	117.35	114.6	129.2	120.7
Group-3 (FIL) SBP	114.7	125.9	140.2	151.8
Group-4 (EIL) SBP	113.4	119.2	134.2	147
Group-1 (FIS) DBP	79.5	79.3	82	82.8
Group-2 (EIS)DBP	80.3	85.4	83.4	83.8
Group-3 (FIL) DBP	79.4	79.9	83.9	87.1
Group-4 (EIL) DBP	77.9	78.8	82.3	78.6
Group-1 (FIS) PR	77.4	85.7	89.5	91.7
Group-2 (EIS) PR	78.9	85.4	78.5	79
Group-3 (FIL) PR	79	87.8	100.3	145.2
Group-4 (EIL) PR	78.1	89.2	98.9	111.6
Group-1 (FIS) RPP	86.02	97.23	112.5	126.06
Group-2 (EIS) RPP	92.03	91.26	101.5	95.27
Group-3 (FIL) RPP	90.33	110.45	140.92	219.78
Group-4 (EIL) RPP	88.53	106.22	132.77	160.70

TABLE 5 COMPARISON OF SBP, DBP, PR AND RPP AFTER 10, 15 AND 20 REPETITION BETWEEN GROUP 1, 2, 3 AND 4

PARA-METERS	GROUP-1 (FIS)			GROUP-2 (EIS)			GROUP-3 (FIL)			GROUP-4 (EIL)		
	10 REP	15 REP	20 REP	10 REP	15 REP	20 REP	10 REP	15 REP	20 REP	10 REP	15 REP	20 REP
SBP	113.8	125.2	137.2	114.6	129.2	120.7	125.9	140.2	151.8	119.2	134.2	147
DBP	79.3	82	82.8	85.4	83.4	83.8	79.9	83.9	87.1	78.8	82.3	78.6
PR	85.7	89.5	91.7	85.4	78.5	79	87.8	100.3	145.2	89.2	98.9	111.6
RPP	97.23	112.5	126.06	91.26	101.5	95.27	110.45	140.92	219.78	106.22	132.77	160.7

TABLE 6: MULTIPLE COMPARISONS FOR MEAN DIFFERENCE OF SBP, DBP, PR AND RPP IN GROUP 1 (FLS)

Group- 1 (FIS)	Repetition	Mean Difference	Std. Error	Sig.
BASELINE SBP	AFTER 10 REP	-2.2000	2.87329	.870 NS
	AFTER 15 REP	-13.6000(*)	2.87329	.000 S
	AFTER 20 REP	-25.6000(*)	2.87329	.000 S
BASELINE DBP	AFTER 10 REP	.2000	1.80511	1.000 NS
	AFTER 15 REP	-2.5000	1.80511	.513 NS
	AFTER 20 REP	-3.3000	1.80511	.268 NS
BASELINE PR	AFTER 10 REP	-8.1000(*)	2.53216	.011 S
	AFTER 15 REP	-12.1000(*)	2.53216	.000 S
	AFTER 20 REP	-14.3000(*)	2.53216	.000 S
BASELINE RPP	AFTER 10 REP	-11.2100	4.44120	.064 NS
	AFTER 15 REP	-26.4240(*)	4.44120	.000 S
	AFTER 20 REP	-40.0440(*)	4.44120	.000 S

* The mean difference is significant at the .05 level.
S= Significant, NS= Not significant

TABLE 7: MULTIPLE COMPARISONS FOR MEAN DIFFERENCE OF SBP, DBP, PR AND RPP IN GROUP 2 (EIS)

Group- 2 (EIS)	Repetition	Mean Difference	Std. Error	Sig.
BASELINE SBP	AFTER 10 REP	.5000	2.70715	.998 NS
	AFTER 15 REP	-14.1000(*)	2.70715	.000 S
	AFTER 20 REP	-5.5000	2.70715	.186 NS
BASELINE DBP	AFTER 10 REP	-5.1000(*)	1.10203	.000 S
	AFTER 15 REP	-3.1000(*)	1.10203	.031 S
	AFTER 20 REP	-3.5000(*)	1.10203	.011 S
BASELINE PR	AFTER 10 REP	-.6000	2.16363	.992 NS
	AFTER 15 REP	.4000	2.16363	.998 NS
	AFTER 20 REP	-.1000	2.16363	1.000 NS
BASELINE RPP	AFTER 10 REP	.7660	3.40204	.996 NS
	AFTER 15 REP	-9.4640(*)	3.40204	.034 S
	AFTER 20 REP	-3.4920	3.40204	.735 NS

* The mean difference is significant at the .05 level.
S= significant, NS= Not significant

TABLE 8: MULTIPLE COMPARISONS FOR MEAN DIFFERENCE OF SBP, DBP, PR AND RPP IN GROUP 3 (FIL)

Group- 3 (FIL)	Repetition	Mean Difference	Std. Error	Sig.
BASELINE SBP	AFTER 10 REP	-11.3000(*)	2.66907	.000 S
	AFTER 15 REP	-25.8000(*)	2.66907	.000 S
	AFTER 20 REP	-37.0000(*)	2.66907	.000 S
BASELINE DBP	AFTER 10 REP	-.5000	1.18021	.974 NS
	AFTER 15 REP	-4.3000(*)	1.18021	.003 S
	AFTER 20 REP	-7.7000(*)	1.18021	.000 S
BASELINE PR	AFTER 10 REP	-8.8000(*)	2.10551	.000 S
	AFTER 15 REP	-21.3000(*)	2.10551	.000 S
	AFTER 20 REP	-65.9000(*)	2.10551	.000 S
BASELINE RPP	AFTER 10 REP	-20.1640(*)	4.14863	.000 S
	AFTER 15 REP	-50.6400(*)	4.14863	.000 S
	AFTER 20 REP	-129.4960(*)	4.14863	.000 S

* The mean difference is significant at the .05 level.
S= Significant, NS= Not significant

TABLE 9: MULTIPLE COMPARISONS FOR MEAN DIFFERENCE OF SBP, DBP, PR AND RPP IN GROUP 4 (EIL)

Group- 4 (EIL)	Repetition	Mean Difference	Std. Error	Sig.
BASELINE SBP	AFTER 10 REP	-5.8000	2.52956	.109 NS
	AFTER 15 REP	-20.8000(*)	2.52956	.000 S
	AFTER 20 REP	-30.7000(*)	2.52956	.000 S
BASELINE DBP	AFTER 10 REP	-.9000	1.01696	.813 NS
	AFTER 15 REP	-4.4000(*)	1.01696	.000 S
	AFTER 20 REP	-.7000	1.01696	.901 NS
BASELINE PR	AFTER 10 REP	-11.1000(*)	2.89687	.001 S
	AFTER 15 REP	-20.8000(*)	2.89687	.000 S
	AFTER 20 REP	-33.4000(*)	2.89687	.000 S
BASELINE RPP	AFTER 10 REP	-17.6920(*)	4.49502	.001 S
	AFTER 15 REP	-44.2420(*)	4.49502	.000 S
	AFTER 20 REP	-72.1780(*)	4.49502	.000 S

* The mean difference is significant at the .05 level.
S= Significant, NS= Not significant

TABLE 10: ANOVA ANALYSIS FOR SBP, DBP, PR, RPP BETWEEN GROUP 1, 2, 3 AND 4 AFTER 10 REPETITION

Variables	Variation	Sum of Squares	df	Mean Square	F	Sig.
SBP	Between groups	25.788	20	1.289	1.025	.449 NS
	Within groups	74.212	59	1.258		
DBP	Between Groups	22.309	11	2.028	1.775	.076 S
	Within Groups	77.691	68	1.143		
PR	Between groups	18.550	15	1.237	.972	.494 NS
	Within groups	81.450	64	1.273		
RPP	Between groups	77.667	62	1.253	.954	.578 NS
	Within groups	22.333	17	1.314		

S= Significant, NS= Not Significant

TABLE 11: ANOVA ANALYSIS FOR SBP, DBP, PR, RPP BETWEEN GROUP 1, 2, 3 AND 4 AFTER 15 REPETITION

Variables	Variation	Sum of Squares	Df	Mean Square	F	Sig.
SBP	Between groups Within groups	36.824 63.176	20 59	1.289 1.258	1.610	.079 NS
DBP	Between Groups Within Groups	16.453 83.547	11 68	2.028 1.143	1.359	.218 NS
PR	Between groups Within groups	43.963 56.037	15 64	1.237 1.273	1.695	.053 S
RPP	Between groups Within groups	82.667 17.333	62 17	1.253 1.314	1.027	.511 NS

S= Significant, NS= Not significant

TABLE 12: ANOVA ANALYSIS FOR SBP, DBP, PR, RPP BETWEEN GROUP 1, 2, 3 AND 4 AFTER 20 REPETITION

Variables	Variations	Sum of Squares	df	Mean Square	F	Sig.
SBP	Between groups Within groups	45.758 54.242	20 59	1.289 1.258	2.054	.015 S
DBP	Between Groups Within Groups	20.419 79.581	11 68	2.028 1.143	1.586	.123 NS
PR	Between groups Within groups	74.000 26.000	15 64	1.237 1.273	3.231	.000 S
RPP	Between groups Within groups	99.500 .500	62 17	1.253 1.314	13.446	.004 S

S= Significant, NS= Not significant

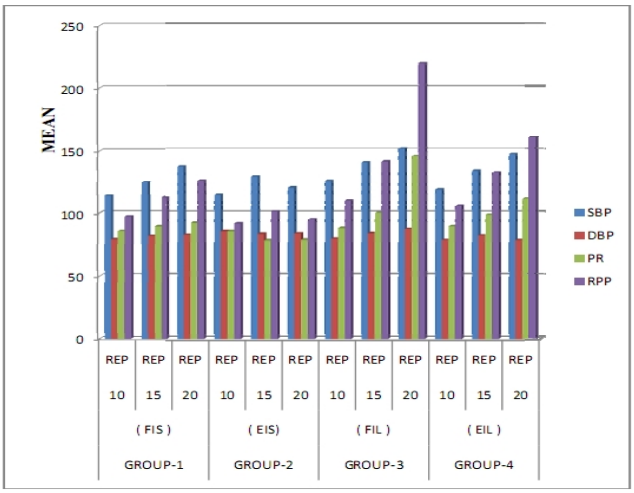

FIGURE 1: SHOWS THE COMPARISON OF SBP, DBP, PR AND RPP AFTER 10, 15 AND 20 REPETITION BETWEEN GROUP 1, 2, 3 AND 4

DISCUSSION

The results of present study support the experimental hypothesis that there was a significant increase in the hemodynamic response (SBP, PR and RPP) following McKenzie exercises after 15 and 20 repetition in Group 1 ($p < 0.05$), while there was no significant difference in SBP, DBP, PR and RPP in Group 2 ($p < 0.05$). Group 3 and Group 4 ($p < 0.05$) showed a significant change in SBP, DBP, PR and RPP after 10, 15 and 20 repetition.

Repetitive McKenzie exercises, when performed, place the cardiovascular system at a greater stress than normal exercises. The result of study supports the idea with the study done by **Saud Al-Qbaidi et al (2001)** [9] which documented that repetitive McKenzie exercises for the lumbar spine used in management of LBP have cardiovascular effects in people with no cardiovascular or cardiopulmonary conditions and shows the significant increase in HR and SBP. It has already been proved by many studies that some risk factors associated with back pain like obesity, smoking, increased serum lipids and arteriosclerosis have found a strong co-relation for developing cardiovascular diseases. These effects were greater with increased numbers of repetitions.

One-way ANOVA analysis for SBP, DBP, PR, and RPP after 10 repetition in between Group 1, 2, 3 and 4 was done. The F value showed significant difference in DBP (F= .076) but there is no significant difference in SBP, PR and RPP i.e. F= .449, .494, .578 respectively ($p< 0.05$). One-way ANOVA analysis after 15 repetition shows significant difference in PR i.e. F= .053 but no significant difference in SBP, DBP and RPP i.e. F = 0 .079, 0 .218, 0.511 respectively ($p< 0.05$). After 20 repetition, there is a significant difference in SBP, PR and RP i.e. F= .015, .000 and .004 respectively.

A study done by **Jovarka et al., (2002)** explains the possible mechanism behind increase in the cardiovascular parameters. During exercise, cardiovascular parameters change to supply oxygen to working muscles and to preserve perfusion of vital organs. The vascular resistance and HR are controlled differently during physical activity. At the onset of exercise HR elevation is mediated mostly by central command signals via vagal withdrawal. As work intensity increases and HR approaches 100 beats min, sympathetic activity begins to rise, and further increasing HR was found[10].

The study done by **CLM Forjaz et al., (1998)**[11] shows that increased RPP is an indicator of increased myocardial oxygen demand which supports the concept of our study that the product of SBP and HR is well correlated to myocardial oxygen consumption in young healthy subjects as well as in cardiac patient. Cardiovascular demands were greater after 20 repetitions of each of the 4 exercises, with the demands of the exercises increasing to a greater extent in lying positions (FIL>EIL) than in upright positions (FIS>EIS).

Both FIL and EIL produced increases in PR, BP, and RPP following 15 and 20 repetitions of exercise. This can be explained by study of **Wayne A. Macmasters et al. (1987)** which showed that FIL involves the work of a large muscle mass of the upper and lower extremities, the abdominal muscles, and the trunk muscles; therefore, which increases the demand for oxygen to contracting muscles. Consequently, the HR, BP, CO, and SV were also increased[12].

In the present study, subjects performed exercise for 3 sets of consecutive repetitions (10, 15, and 20 repetitions) with rested for 15 minutes after each set to ensure that their PR and BP returned to resting levels prior to performing the next set of repetitions.

Results of present study strongly support the idea that physical therapists should consider monitoring the cardiovascular status of patients with spinal problems for which McKenzie exercises are indicated and hemodynamic responses also should be considered when they are prescribed for home exercise program.

CONCLUSION

- Hemodynamic response were greater after 20 repetitions of each of the 4 exercises.
- In lying position, flexion is more stressful than extension (FIL>EIL).
- In upright position, flexion is more stressful than extension (FIS>EIS).
- After 10 repetition McKenzie exercise of "EIS" is the least stressful hemodynamically.

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COMPARISON OF THE EFFECT OF CHAIR RISING EXERCISE AND ONE-LEG STANDING EXERCISE ON DYNAMIC BODY BALANCE IN GERIATRICS: AN EXPERIMENTAL STUDY

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ABSTRACT

INTRODUCTION: *The impairment of muscle strength and muscle power of the lower extremities, balance/postural control and walking ability have been recognized as important risk factors for falls. These parameters are known to become progressively more impaired with aging, increasing the risk of falls among the elderly. A one-leg standing exercise, in terms of static body balance training, is useful for improving body balance. Chair-rising exercise may improve muscle power and also body balance. The objective of this study was to compare the effects of chair rising exercise and one-leg standing exercise in improving dynamic body balance in geriatric subjects.*

METHOD: *An experimental study was set as home based exercises. 30 subjects (10 males and 20 females) with mean age of 66.4 years were randomly divided into 2 groups: Chair-rising exercise (CR) group and One-leg standing (OLS) exercise group. All participants performed calisthenics of the major muscles, tandem gait exercise, and stepping exercise and as per the group, chair rising and one leg standing. Exercises were performed 3 times per week for 3 weeks. Chair rising time, one leg standing time, 3m tandem gait time, Timed up and go (3m), 5m walk time were evaluated at baseline and at the end of 3 weeks.*

RESULT: *Chair rising time, one-leg standing time, timed up & go, tandem gait time and walking time improved significantly from the baseline value in the CR group ($p=0.0003$, $p=0.0039$, $p<0.0001$, $p=0.0007$, $p<0.0001$ respectively). One leg standing, tandem gait time and walking time improved significantly from the baseline value in the OLS group ($p=0.0455$, $p=0.0159$ and $p=0.0025$ respectively). The improvements in chair-rising time, walking time and 3m tandem gait time were significantly greater in the chair rising exercise group than in the one-leg standing exercise group ($p=0.015$, $p=0.0269$ $p=0.0001$ respectively).*

CONCLUSION: *The chair-rising exercise is more effective than the one-leg standing exercise for improving dynamic body balance in geriatrics.*

KEYWORDS: Chair rising exercise, One leg standing exercise, Body Balance, Geriatric

INTRODUCTION

Aging is a process of growing old which describes a wide array of physiological changes in the body system. Falls are a common problem among elderly people. Fall is often defined as a situation in which the older adult falls to the ground or is found lying on the ground. Fall is an unintentional loss of balance that leads to failure of postural stability[1].

Fall-related injuries, including head injuries and fractures, are serious problems among the elderly, as they often lead to prolonged or even permanent disability. Thus, the prevention of falls and, therefore, of the injuries associated with them would reduce disability, improve quality of life, and reduce the costs of health care.

American College of Sports Medicine position stand have shown that although no amount of physical activity can stop the biological aging process, there is evidence that regular exercise can minimize the physiological effects of an otherwise sedentary lifestyle and increase active life expectancy by limiting the development and progression of chronic disease and disabling conditions[2]. Thus, exercise aimed at improving physical function must be initiated as early as possible after 60 years of age.

The impairment of muscle strength and muscle power of the lower extremities, balance/postural control, and walking ability has been recognized as important risk factors for falls[3]. These parameters are known to become progressively more impaired with aging[4], increasing the risk of falls among the elderly. Muscle strength of the lower extremities, balance, and walking ability can be improved with appropriate exercise[5].

Muscle strength should be distinguished from muscle power; muscle strength is defined as the maximal force that a muscle can produce against a given resistance, while muscle power (force x velocity) is defined as the product of force and speed[3,6]. The former is related to bone strength, whereas the latter is related to falling[4-8]. Thus, the improvement of muscle power, rather than muscle strength, is likely to be important for preventing falls.

Various exercises are used to improve balance. A one-leg standing exercise, may

improve balance in terms of static body balance is reportedly useful for reducing the cumulative number of falls among the elderly[9]. Chair-rising exercise may improve muscle power, and also dynamic body balance. Both exercise regimens may be utilized in combination for fall-prevention exercise programs[10]. An intervention study was therefore conducted with the aim to compare the effect of one-leg standing and chair-rising exercises on body balance in geriatric subjects.

METHODOLOGY

The experimental study was conducted at S.B.B. College of physiotherapy, Ahmedabad. The inclusion criteria were both males and females between the age of 60-75 years, a fully ambulatory status without aids and the ability to perform the parameters described below as outcome measures. The exclusion criteria were the use of vitamin D3 supplements for osteoporosis[11], gait disturbance requiring an ambulatory aid, a severely rounded back because of osteoporosis, an acute disease phase, and severe cardiovascular disease. Thirty ambulatory subjects (10 men and 20 women) were recruited in this study. They were given information about the study and written informed consent was obtained from the subjects prior to the study. Level of significance was kept at 5%.

PROCEDURE

Subjects were randomly divided into two groups (n=15 in each group): Chair-rising exercise group (CR group) and one-leg standing exercise group (OLS group). Outcome measures were taken at baseline and in the end at 3 weeks. Physical function and balance were evaluated by measuring the 5-m walking time, timed up & go (3 m), the chair-rising time (5 times), the one-leg standing time, and the 3-m tandem gait time[1]. Chair-rising time (5 repetitions of rising from a chair as quickly as possible with arms crossed over the chest) is an index of muscle power[3]. The one-leg standing time[12] is an index of static body balance. The tandem gait time is an index of dynamic body balance. The 5- m walking time, the timed up & go (3 m), the chair-rising time (5 times), and the 3-m tandem gait time was each determined by obtaining the mean value of two measurements. The one leg standing time was determined by obtaining the mean value for the right and left sides[13].

Exercise program

The daily exercise program consisted of a one-leg standing exercise (1 min or as much as possible x 3 sets on each leg per day) in the OLS group and a chair-rising exercise (10 times x 3 sets per day) in the CR group[13].

All participants performed exercises for the back muscles, iliopsoas, hamstrings, and calf muscles, tandem standing (3 min with each leg forward x 2 sets), a tandem gait exercise (10 steps x 5 sets), and a stepping exercise (in which the subject stepped forward, back, to the right, and to the left x 10 times for each step) per day[10, 13]. All the exercises were performed three days per week and required about 30 minutes to perform. The guidelines of the French Society of Geriatrics and Gerontology recommend rehabilitation exercises with a professional to extend the rehabilitation benefits[14]. Thus, one session per week was supervised by the physical therapist, and the other two sessions were performed at home under family supervision. All the participants were given written exercise protocol in understandable language to perform at home for 2 sessions[13].

STATISTICAL ANALYSIS AND RESULTS

Data was analysed using graph pad prism. The mean age of the participants was 66.4 years. Data are expressed as the means ± SD. No significant differences in any parameters at baseline were observed between the two groups. Table 1 shows the demographic characteristics of the subjects.

TABLE 1: BASELINE CHARACTERISTICS OF STUDY SUBJECTS

	CR	OLS
Gender: Male; Female/ total	4 males; 11females /15	6 males; 9 females /15
Age (years)	67.06 ± 4.9	65.86 ± 4.8

CR: chair rising exercise group, OLS: one-leg standing exercise group

TABLE 2: PRE AND POST MEANS± SD AND P VALUE IN CR AND OLS GROUPS

	CHAIR RISING GROUP			ONE LEG STANDING GROUP		
	Baseline	Endpoint	p value	Baseline	Endpoint	p value
Chair rising time	15.32 ±5.72	13.42±4.62	0.0003	14.09 ±7.01	18.83 ±6.59	0.1290
One-leg standing time	5.79 ± 3.0	8.37±4.28	0.0039	6.92 ±4.85	8.07 ±5.14	0.0455
Timed up & go (3 m)	14.47 ±5.79	12.80±5.52	<0.0001	15.707 ±6.32	13.79 ±6.80	0.3389
3-m tandem gait time	17.90 ±4.71	12.80±5.52	0.0007	17.59 ±1.53	16.22 ±1.92	0.0159
5-m walking time	11.34 ±3.08	8.48±2.71	<0.0001	11.34 ±3.08	8.48±2.71	0.0025

Paired t test was used for analysis within the groups. Difference in means in chair rising time, one leg standing time, timed up and go, 3m tandem gait time and 5m walking time in CR group and one leg standing time, 3m tandem gait time and 5m walking time in OLS group showed significant results.

TABLE 3: DIFFERENCE IN MEANS BETWEEN GROUPS

Physical function	Means ± SD		U value	p value
	CR	OLS		
Chair rising time	1.94± 1.67	0.29± 0.28	40.5	0.0015
One-leg standing time	2.61± 3.18	1.65±1.24	110	0.4669
Timed up & go (3 m)	2.44 ± 3.79	1.8± 0.74	73	0.052
3-m tandem gait time	3.77± 4.18	2.32± 3.9	65.5	0.0269
5-m walking time	2.85± 1.49	0.95± 0.55	23	0.0001

DISCUSSION

Data analysis within groups showed that chair rising time, one-leg standing time, timed up & go, tandem gait time and walking time improved significantly from the baseline value in the CR group ($p=0.0003$, $p=0.0039$, $p<0.0001$, $p=0.0007$, $p<0.0001$ respectively). One leg standing group showed significant improvement in one leg standing time, 3m tandem walk time and 5m walk time ($p=0.0455$, $p=0.0159$ and $p=0.0025$ respectively). Between group results showed improvements in chair-rising time, walking time and 3m tandem gait time were significantly greater in the chair rising exercise group than in the one-leg standing exercise group ($p=0.015$, $p=0.0269$ $p=0.0001$ respectively).

Chair rising time was significantly improved from baseline in chair rising group but was insignificant in one leg standing group. According to Yamshita F, chair-rising exercise may train the quadriceps and gluteus medius muscles and improve joint movement of the lower extremities, possibly improving body balance. Whereas one leg standing exercise only improves static body balance so there was no change in chair rising time in one leg standing group[13]. Sherrington C concluded that balance training which contained a higher dose of exercise, and did not include walking training had the greatest effect on reducing falls. Exercise aimed at improving not only body balance but also muscle power is important for preventing falls[15]. The one-leg standing exercise is a static body balance training method, while the chair-rising exercise is a muscle power training method, both of which were convenient and well tolerated in subjects with locomotive disorders. In particular, muscle power, as evaluated using the chair-rising test, plays a crucial role in the aging process[16].

One leg standing time is an index of static body balance. In CR group and OLS group, one leg standing time improvement was significant but more in CR group. So it shows that one leg standing exercise and chair rising exercise improves static body balance. CR group shows better results than OLS group in one leg standing time because of effect of chair rising exercise on muscle power which is required in one leg standing.

Timed up and go which mainly consists of chair-rising, walking, turning, and sitting, is known to be a reliable and valid test for quantifying functional mobility[17] showed statistically significant improvement in CR group and no significant results in OLS group. Timed up and go is an index of muscle power and dynamic body balance. Yamashita F et al concluded that after 5-months exercise program, the timed up & go, one-leg standing time, and tandem gait time improved significantly in the one-leg standing exercise group, while the walking time and chair-rising time in addition to above parameters improved significantly in the chair-rising exercise group. The improvements in the walking time, chair-rising time, and tandem gait time were significantly greater in the chair rising exercise group than in the one-leg standing exercise group. The present study showed that the chair-rising exercise was more effective than the one-leg standing exercise for improving walking velocity and dynamic body balance[13].

3m tandem gait time showed statistically significant difference in OLS group. CR showed greater improvement than OLS group due to improvement on dynamic body balance. One leg standing exercise showed improvement due to static body balance which is required to maintain the body position in tandem stance.

Difference in 5m walk time was statistically highly significant in CR and OLS groups. Walking requires dynamic body balance so showed greater improvement in CR than OLS group.

Jacobson et al reported that a static balance exercise resulted in the improvement of the 30-sec chair test repetition, the 8-foot up and go test, balance assessments, and leg function in frail elderly individuals (18). Kuptniratsaikul et al also reported that a simple balancing exercise improved the timed up & go and chair stand in elderly patients with a history of frequent falls[19].

During one leg standing exercise, due to fear of falling, muscle weakness and poor balance, patients tend to take support and only lack of support improves balance. Whereas, chair rising exercise are safer than one leg standing exercise and helps in improving muscle power as well as dynamic body balance. Along with chair rising exercise, tandem walking, active movements of lower limb can give beneficial effects in improving functions in geriatrics.

In geriatrics, it is important to reduce fear of fall and prevent fall related injuries. So chair rising exercise are beneficial in geriatrics to reduce falls and improve dynamic body balance and muscle power. This exercise can be performed at home with less or no supervision. Whereas, one leg standing exercise is beneficial in improving static body balance. So one leg standing exercise can be included in an exercise program to improve balance.

LIMITATIONS

Long term follow up was not taken.

CONCLUSION

Chair rising group shows more improvement than one-leg standing group in walking time, tandem gait time and chair rising time. So chair-rising exercise may be more effective than the one-leg standing exercise for improving dynamic body balance in geriatrics and may reduce fall related injuries.

CLINICAL IMPLICATION

Chair rising exercise is well tolerated and has no adverse effects as was observed during this exercise program, suggesting the usefulness and convenience of physical function as well as it may be helpful in improving muscle power which is needful in normal activities.

ETHICS APPROVAL: Study was approved by Institutional Ethics Committee of S.B.B. College of physiotherapy, Ahmadabad. Ethical Approval no. PTC/IEC/29/2012-13.

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A STUDY TO FIND OUT THE CORRELATION BETWEEN HANDGRIP STRENGTH AND HAND SPAN AMONGST HEALTHY ADULT MALE

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ABSTRACT

BACKGROUND: *Grip strength is widely accepted indicator of nutritional status, bone mineral content, muscular strength and functional integrity of upper extremity. The assessment of grip strength plays a vital role in determining the efficacy of different treatment strategies of hand. In all hand anthropometric variables, hand span and grip span play important role in hand as it is used in various manipulative skill such as gross and prehension activity. Since men are the most important source of work force, their hand grip strength and anthropometric data are essential for ergonomic considerations, so present study has been undertaken to generate hand grip strength and hand span of healthy adult men to determine whether these parameters are correlated.*

METHODOLOGY: *120 healthy adult male with age group between 18-35 years were selected. Subjects were divided into two groups 18 to 26 years and 27 to 35 years by simple random sampling. The hand span of dominant hand was measured with measure tape from tip of the thumb to tip of little finger and grip strength was measured using Jamar Hand Dynamometer.*

RESULTS: *The data was analyzed by Pearson's correlation coefficients to correlate hand span and grip strength in healthy adult male which showed positive correlation ($r = 0.794$, $p < 0.05$).Unpaired t test was done to compare the hand span and grip strength in age group of 18-26 years and 27-35 years which showed significant difference between hand span ($t = 3.244$, $p < 0.05$) and grip strength ($t = 4.794$, $p < 0.05$).*

CONCLUSION: *There is a significant positive correlation between hand span and hand grip strength in healthy adult male.*

KEY WORDS: Hand span, Hand grip strength, Grip span, Jamar Dynamometer

INTRODUCTION

Grip strength is often used as an indicator of overall physical strength, hand and forearm muscles performances, as a functional index of nutritional status and physical performance[1]. The assessment of grip strength plays a cardinal role in hand rehabilitation[1]. It evaluates the patient's initial limitation and renders a rapid reassessment of patient's improvement throughout the rehabilitation[2]. It is also recommended as a good simple measure of muscle strength when 'measured in standard conditions' and plays a vital role in determining the efficacy of different treatment strategies of hand[3].

Hand grip strength is a physiological variable that is affected by a number of factors including hand size/ hand span[4], age, gender, different angle of shoulder, elbow, forearm, and wrist[5], posture[6], grip span, muscle length insertion, angle of tendon at time of contraction, nutritional status, BMI[7], fatigue, hand dominance, time of day, pain, cooperation of the patient and presence of amputation, restricted motion, sensory loss, hip/waist circumference, body size, arm and calf circumferences, various subcutaneous skin folds, a range of functional ability variables, rotator cuff weakness[8]. Longitudinal studies confirm that grip strength declines after midlife, with loss accelerating with increasing age and through old age. As an assessment measure grip strength has been shown to have predictive validity and low values are associated with falls, disability, impaired health-related quality of life.

Hand grip strength is widely used test in experimental and epidemiologic studies in young healthy individuals. Hand span is correlated with grip span. Hand grip strength is influenced by hand span, which implies the need for adjustment of the grip span of hand dynamometer to the hand span. So there will be adjustment of grip span during the grip strengthening exercise according to hand size[9].

Grip strength measurement have a variety of clinical implication such as assessment of general strength in order to determine work capacity, the extent of injury and diseases process and the potentials for the progress for the rehabilitation[2]. Grip strength measurement is used in the investigation and the follow up of the patients with the neuromuscular disease[1]. Several studies have examined the relationships between hand grip strength and hand span, but information related to the correlations of handgrip strength and hand span are limited, So the present study was conducted to find out the correlation between hand span and handgrip strength amongst healthy adult male since men are the most important source of work force in India, their hand grip strength and anthropometric data are essential for ergonomic considerations.

METHODOLOGY

Study Design: Cross-sectional observational study

Sampling Technique: Simple Random Sampling

Study Setting: Various Industries In and Around Rajkot

Sample Size: The study was conducted on 120 healthy adult male with age group of 18 - 35 years who were selected by Random Sampling Techniques. The proposed title and procedure was being approved by ethical committee members, subjects were selected who fulfilled the inclusion and exclusion criteria, the details and purpose of the study were explained to all subjects for maximum co-operation and written consent was taken from them. All Participants were assessed for hand span and hand grip strength.

INCLUSION CRITERIA:

- Age: 18-35years
- Healthy adult male were participated

EXCLUSION CRITERIA

- Subjects with any upper limb and hand injuries
- Any pathological condition of Upper Extremity
- Subjects who participated in sports
- Any neurological impairments of upper limb
- Any traumatic condition in past 6 months
- History of metabolic disorders
- Uncooperative subjects
- Measurement Procedure :

Before starting the test, all the subjects were oriented towards the study and were given a detailed theoretical explanation of how to perform the test followed by practical demonstration of how to perform the test.

All subjects were given few trials before reading was taken till they were clear about the procedure and confident to perform the test. All subjects were reassessed and corrected until they were able to perform without error.

Measurement of hand span: 10 Hand span was measured from the tip of the thumb to the tip of the small finger with the hand opened as wide as possible (Figure 1).

MEASUREMENT OF HAND GRIP STRENGTH[10]

Handgrip strength was measured using a Jamar Hand dynamometer (Figure 2).

Grip strength is tested by placing the subject in seated position with his arm side, elbow flexed 90°, forearm in mid-prone position, wrist extended between 0°- 30° & ulnarly deviated 15°. The subject alternatively grips the dynamometer with his dominant and non-dominant hands, performing 3 trials, using different grip spans in random order, allowing a 1-minute rest between the measurements.

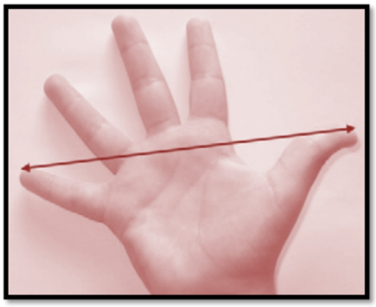

FIGURE 1: MEASUREMENT OF HAND SPAN

FIGURE 2: MEASUREMENT OF GRIP STRENGTH

RESULTS

TABLE 1: DESCRIPTIVE ANALYSIS FOR DIFFERENT AGE GROUP

Age Group	Mean	SD
18-26year	20.768	±2.51551
27-35year	24.667	±3.71842

TABLE 2: GENDER PROPOSITION

Total Subjects	**Male**	**Female**
120 (%)	51 43% male	69 57% female

TABLE 3: CORRELATION BETWEEN HAND SPAN AND HAND GRIP STRENGTH IN HEALTHY ADULT MALE

NO	VARIABLES	MEAN±SD	r value	p value
1	Hand span	20.51±1.95	0.794	0.0001**
2	Hand grip strength	27.28±8.18	0.794	0.0001**

r value=0-1 shows moderately positive correlation

** indicates the result is highly significant as p value is <0.0001

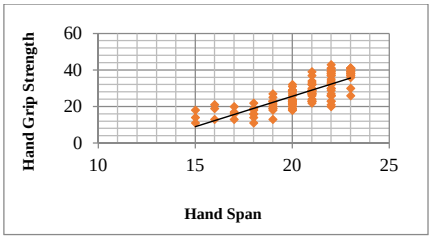

FIGURE 3: CORRELATION BETWEEN HAND SPAN AND HAND GRIP STRENGTH IN HEALTHY ADULT MALE

TABLE 4: CORRELATION OF HAND SPAN AND HAND GRIP STRENGTH IN AGE GROUP OF 18-26 YEARS

NO	VARIABLES	MEAN±SD	r value	p value
1	Hand span	20.22±1.987	0.763	0.0001**
2	Handgrip strength	25.65±7.887	0.763	0.0001**

r value=0-1 shows moderately positive correlation, ** indicates the result is highly significant as p value is <0.0001

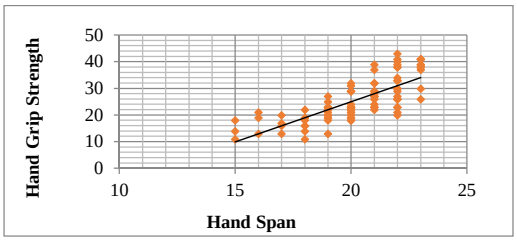

FIGURE 4: CORRELATION OF HAND SPAN AND HAND GRIP STRENGTH IN AGE GROUP OF 18-26 YEARS

TABLE 5: CORRELATION OF HAND SPAN AND HAND GRIP STRENGTH IN AGE GROUP OF 27-35 YEARS

NO	VARIABLES	MEAN±SD	r value	p value
1	Hand span	21.772±1.109	0.869	0.0001**
2	Hand grip strength	34.545±4.925	0.869	0.0001**

r value=0-1 shows moderately positive correlation, ** indicates the result is highly significant as p value is <0.0001

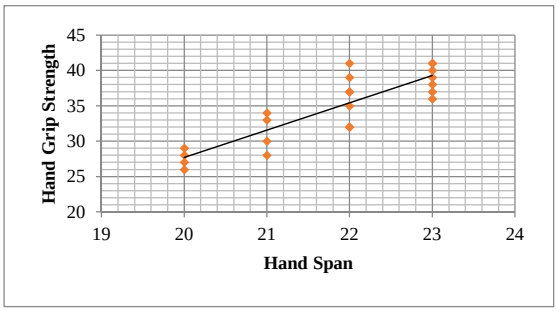

FIGURE 5: CORRELATION OF HAND SPAN AND HAND GRIP STRENGTH IN AGE GROUP OF 27-35 YEARS

TABLE 6: COMPARISON OF THE HAND SPAN AND HAND GRIP STRENGTH BETWEEN AGE GROUP OF 18-26 YEARS AND 27-35 YEARS

Variable	MEAN±SD		t	P	Result
	18-26years	27-35years			
Hand span	20.2245±1.98723	34.5455±4.92542	3.244	0.02*	S
Hand grip strength	25.6531±7.88722	21.7727±1.10978	4.794	0.0001**	HS

S = Significant, HS = Highly Significant, ** indicates the result is highly significant as p value is <0.0001,
* indicates the result is significant as p value is <0.05

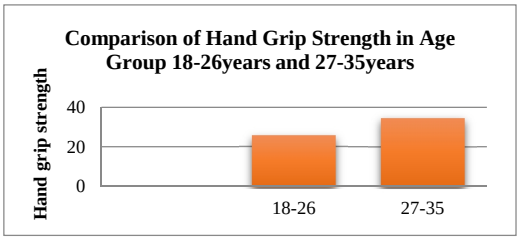

FIGURE 6: COMPARISON OF HAND GRIP STRENGTH IN AGE GROUP 18-26YEARS AND 27-35YEARS

DISCUSSION

Hand grip strength is influenced by hand span, which implies the need for adjustment of the grip span of dynamometer to the hand span. Hand grip strength is widely used test in experimental and epidemiologic studies in young healthy individuals. The results of the present study supports experimental hypothesis which shows positive correlation between hand span and hand grip strength measured in male industrial workers with age group of 18-35 years.

According to Pearson correlation test, there is a positive correlation between hand span and hand grip strength ($p<0.001$) in healthy adult male which is supported by Vanesa España-Romero et al., (2006)[9] who revealed that an optimal grip span to determine the maximum handgrip strength was identified for both genders may guide clinicians and researchers in selecting the optimal grip span on the hand dynamometer when measuring grip strength.

There is a positive correlation between hand span and hand grip strength in young healthy individuals because hand span is affected by grip force, exertional level, maximal grip strength and submaximal grip strength which is supported by Oh and Radwin (1993)[11] who reported that hand span affects grip strength, grip force, and exertion level.

The comparison of hand span and hand grip strength between 18-26 years of age and 27-35 years of age group was done shows significant difference in hand span and hand grip strength in both the groups because age is positively correlated with hand grip strength. With

increasing age, the size of the limb gradually increases, the length and width of hand also increase.

In this study it was found that the hand grip strength is influenced by hand span and a positive correlation was found between grip strength and hand span. This finding is in agreement with the findings of MacDermid et al (2002)[12], where in significant correlations were noted between hand grip strength and hand length, hand breadth and hand span of respective sides in healthy population.

A study showed that the middle grip span allowed for greater absolute forces than smaller or larger ones. However the association between hand size and optimal grip span was not analyzed in the study. Firrell and Crain (1996)[13] studied setting about the dynamometer which produced maximal grip strength and correlated that setting with characteristics of the individual. They reported that the majority of the hands (89%) had a maximal strength at setting II (of V) of a hand dynamometer, whereas no clear significant correlation between hand size and maximal setting was found.

In this study jamar hand dynamometer was used to measure the hand grip strength. Jamar Hand dynamometer is reliable and valid instrument for measuring hand grip strength in young healthy individuals. This is supported by Mathiowetz V. (2002) [14] who found that Jamar Hand dynamometer have stronger concurrent validity (r=0.9994) and excellent inter-instrument reliability (0.90-0.97).

A research reveals that a Dominant hand is approximately 10% stronger than the non dominant hand. Thus in this study the subjects hand grip strength and hand span was taken for dominant hand. A supported study was documented which found that dominant hand is significantly stronger in right handed subjects but no such significant difference between sides could be documented for left handed people[15].

This study suggests that hand span is positively correlated with hand grip strength because hand span affects maximal and submaximal handgrip strength and also hand span affects grip strength, grip force, and exertion.

LIMITATION OF THE STUDY

- Only power grip was tested, precision grip was not tested.
- There was no control group in this study.
- The sample size was unequal in age group of 18-26 years and 27-35 years.

FURTHER RECOMMENDATION

- In future studies, measurement of hand span and hand grip strength can be taken in sports person, subjects working in the small scale industries (like diamond workers, silver smith, imitation jewelry workers, auto parts & machinery workers etc.)
- Study can be done with different age group.
- Study can be done with patients with hand disability to find out the status of hand function.

CONCLUSION

There is positive correlation between hand span and hand grip strength in young healthy individuals. There is a significant positive correlation between hand span and hand grip strength in 18-26 years age group and 27-35 years age group.

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AWARENESS AND KNOWLEDGE OF PHYSIOTHERAPY AMONG THE GENERAL PUBLIC IN AN AFRICAN MARKET IN ACCRA METROPOLIS, GHANA

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ABSTRACT

BACKGROUND: *Any profession that has a great role to play in the society must have a clear identity with the public who should demonstrate a high level of awareness of the profession. This study was designed to ascertain the general public's awareness of physiotherapy in Accra, Ghana.*

METHODOLOGY: *Participants were 500 individuals drawn from the general public at Makola market in Accra, Ghana. They completed a structured questionnaire designed to test knowledge of physiotherapy profession and services provided by physiotherapists. Response frequencies for the survey questions were collated and displayed in tables, pie charts and bar charts.*

RESULTS: *Three hundred and forty-three (343, 68.6%) of the respondents had previous knowledge of physiotherapy as a profession. The mass media were the main sources of their information, with newspapers reported as the major sources. Majority of the respondents (229, 66.8%) stated that physiotherapy services can be received in hospitals. Many respondents shared the view that physiotherapists treat disorders affecting bones and joints (180, 52.8%).*

CONCLUSION: *Majority of the participants had a high level of awareness of physiotherapy. However, there is still the need to increase the knowledge by educating the Ghanaian general public on the role and importance of physiotherapy.*

KEYWORDS: Awareness, knowledge, physiotherapy, general public.

INTRODUCTION

Physiotherapy is an internationally recognised health profession which may be practiced by qualified and, where required by state or national legislation, duly registered or licensed physiotherapists only[1]. It is a dynamic profession which uses a range of treatment techniques to restore movement and function within the body[2]. Physiotherapists promote the health and well-being of individuals and also prevent impairments, functional limitations, and disability in individuals at risk of altered movement behaviours due to health or medically related factors, socio-economic stressors and lifestyle factors[3]. They also work to combat a broad range of physical problems, in particular those associated with neuromuscular, musculoskeletal, cardiovascular and respiratory systems[2]. Physiotherapy is an essential part of health care delivery system[4], and it is practiced independently of other health care providers and also within inter-disciplinary rehabilitation programmes for the restoration of optimal function and quality of life in individuals with loss and disorders of movement (Steins et al 2001; Rothstein 2002)[5,6].

Physiotherapy is a growing profession in Ghana, West Africa, though it was first introduced into the country in 1944 by a British expatriate. The services are not readily available throughout the country because there are less than 200 practicing physiotherapists (as at June 2011) for a population of 24 million[7]. These few physiotherapists provide services either in public hospitals or private clinics, or in rehabilitation centres, residential homes, and health spas. The monthly records in public hospitals reveal that physiotherapists offer comprehensive care for patients with diverse medical and surgical conditions such as arthritis, burns, pain disorders, paediatrics disorders, pulmonary disorders, neurological disorders, cardiac disorders, trauma, and sport injuries.

Although physiotherapy has a great role to play in the society, it seems to lack a clear identity with the public who demonstrate limited awareness and understanding of the scope of the profession's role and have difficulty differentiating it from alternate practitioners[8,9]. How can the physiotherapy profession be made known and utilised by the public if a pool of aspiring profession seekers is not aware of its existence? A number of studies have been conducted to ascertain the general publics' awareness and knowledge of physiotherapy[10,11]. The results obtained from these studies may not reflect the situation in developing countries because of differences in health care systems. In Ghana, there have been several attempts to integrate the profession into the society and raise the level of public awareness about physiotherapy. The establishment of a 4-year undergraduate physiotherapy education programme at the University of Ghana in 2001

was one of such attempts. This cross-sectional descriptive study was undertaken to assess the level of awareness and knowledge about physiotherapy among the general public in a typical African market located in Accra metropolis, Ghana.

AIMS & OBJECTIVES

The main aim of this study was to ascertain the awareness and knowledge of physiotherapy among the general public in a typical African market in Accra, Ghana.

The specific objectives of the study were to determine

(1) knowledge of where physiotherapy service can be received (2) knowledge of conditions treated by physiotherapists (3) knowledge of treatment modalities used in physiotherapy and (4) how respondents make use of their knowledge of physiotherapy.

METHODOLOGY

Participants for the study were recruited from a local market place called Makola Market, which is the largest market in Accra metropolis and one of the busiest in West Africa. It occupies a large part of the Central Business District of Accra, the capital city of Ghana, and harbours over 10,000 sellers of various commodities including clothing, food stuffs, electrical appliances, cosmetics and cooking utensils. Major inclusion criterion was ability to read and understand the contents of the survey questionnaire.

DESCRIPTION OF THE INSTRUMENT

Data was collected with a survey questionnaire which comprised 20 closed ended questions divided into three sections. Section A contained questions on the demographic characteristics of the respondents. Sections B and C contained items which evaluated awareness and knowledge of physiotherapy among the public. The questionnaire was adapted from previous studies[8,10,12]. It was deliberately made simple to facilitate comprehension due to the assumed low literacy level of the participants. Content validity was determined by a panel of 5 experienced clinical and academic physiotherapists. The questionnaire was pilot-tested on 20 traders drawn from another market (Kaneshie market) in Accra.

Process of administration of the instrument

On each day of data collection, one of the researchers (MTA) visited stalls and shops in the market to introduce herself, explain the purpose of the study and present the questionnaire to the respondents. Questionnaires were given to the owner / keeper of every 10th shop, who was given enough time to read the document and give informed consent to participate. The starting point and direction of movement on each day were determined at random such that a large part of the market was covered over the 2-month period of the study. Each respondent read and completed the questionnaire while the researcher waited to collect it.

DATA ANALYSIS

The statistical package used in analysing the data was Epi-Info 2002 version. Response frequencies for the survey questions were collated and displayed in tables, pie charts and bar charts.

RESULTS

Demographic characteristics of respondents

A total of 500 respondents comprising 209 (41.8%) men and 291 (58.2%) women participated in the study. They were aged 20 years and above. As seen in Table 1, the highest number of participants was in the age range of 30-49 years (54.2%). Very few participants (12 or 2.4%) were in the age group ≥ 70 years.

Awareness of Physiotherapy Services

Three hundred and forty three participants (68.6%) had previous knowledge of physiotherapy services while 157 (31.4%) participants had no such knowledge. The sources of information about physiotherapy services included information obtained from health professionals (n=120), newspapers (n=83), television (n=59), radio (n=43), and other sources (n=36) such as relations who benefited from physiotherapy services (Figure 1). Of the 343 participants who had previous knowledge of physiotherapy, 165 (48.1%) were of the opinion that it is a branch of medicine, 84 (24.5%) thought that it is massage, 54 (15.8%) considered it as exercises while 40 (11.7%) expressed the view that it is human body mobilization.

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS (N=500)

	Gender		Age (years)					
	Male	Female	20-29	30-39	40-49	50-59	60-69	≥ 70
N	209	291	106	136	135	73	38	12
%	41.8	58.2	21.2	27.2	27.0	14.6	7.6	2.4

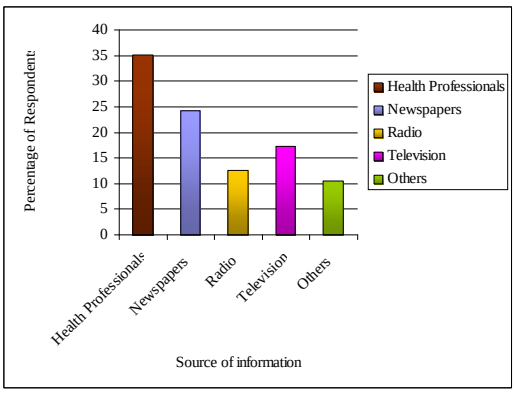

FIGURE 1: RESPONDENTS'SOURCES OF INFORMATION ABOUT PHYSIOTHERAPY SERVICES

TABLE 2: KNOWLEDGE OF WHERE PHYSIOTHERAPY SERVICE CAN BE RECEIVED.

Place	Frequency	Percentage
Hospitals	229	66.8
Keep-fit clubs	51	15.0
Rehabilitation centres	35	10.2
Schools	25	7.3
Others	3	0.9
Total	343	100

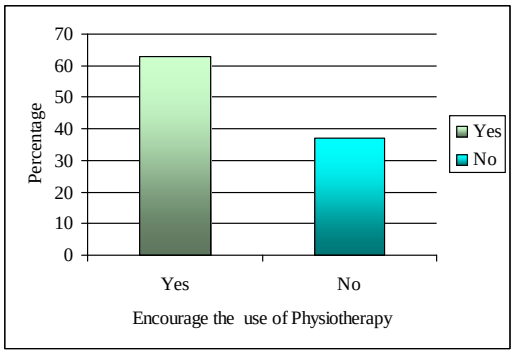

FIGURE 2: RESPONDENTS' ENCOURAGEMENT OF THE USE OF PHYSIOTHERAPY SERVICE

Knowledge of where physiotherapy service can be received.

Majority of the respondents 229 (66.8%) stated that physiotherapy service can be received in hospitals, 51 (15%) were of the opinion it can be received in keep-fit clubs while 35 (10.2%) stated that physiotherapy service can be obtained in rehabilitation centres (Table 2).

Knowledge of conditions treated by physiotherapists

Participants were asked about their knowledge of various conditions treated by physiotherapists. Majority of the respondents gave the response that physiotherapists treat disorders affecting bones and joints (180, 52.8%) while 131 (38.4%) responded that physiotherapists treat disorders affecting muscles. Only 4.4% believed that physiotherapists treat or manage disorders of the cardio-respiratory system (Table 3).

TABLE 3: KNOWLEDGE OF DISORDERS TREATED BY PHYSIOTHERAPISTS

Disorder	Frequency	Percentage
Blood	2	0.6
Bones and joints	180	52.5
Brain	9	2.6
Heart	11	3.2
Muscles	131	38.2
Cardio-respiratory system	4	1.2
Skin	3	0.9
Urinary system	2	0.6
TOTAL	343	100

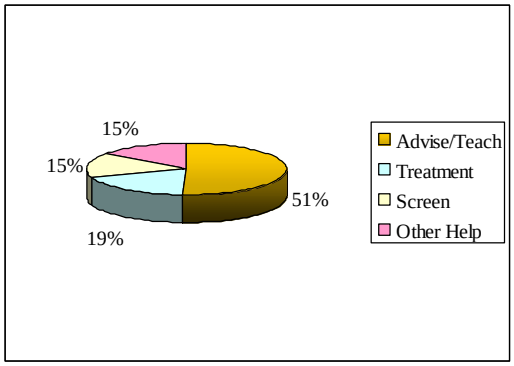

FIGURE 3: REASONS FOR ENCOURAGING THE USE OF PHYSIOTHERAPY SERVICE

TABLE 4: KNOWLEDGE OF TREATMENT MODALITIES USED IN PHYSIOTHERAPY

Modality	Frequency	Percentage
Ice	4	1.2
Electricity	19	5.5
Exercise	165	48.1
Heat	19	5.5
Massage	123	35.9
Water	5	1.5
Others	8	2.3
TOTAL	343	100

Knowledge of treatment modalities used in Physiotherapy

The participants' knowledge of the different treatment modalities used by physiotherapists can be seen in Table 4. Majority (165, 48.1%) had the knowledge that physiotherapists employ exercise as the main and frequently used modality for treatment, while 123 (35.9%) knew that physiotherapists use massage as modality for treatment. According to the respondents, cold, heat, water and others (such as iontophoresis, manipulation) were the least known modalities employed by physiotherapists in treatment.

Use of respondents' knowledge of physiotherapy.

When asked whether they would advise other people to seek the services of

physiotherapists, 216 (63.0%) responded in the affirmative (figure 2). As for the reasons why they would give such advice, 94 (43.5%) indicated that they would do this to enable other people obtain the physiotherapists' advice/teaching about prevention of illness, while 65 (30.0%) would do the same to enable others obtain treatment from physiotherapists (figure 3).

DISCUSSION

This study was undertaken to assess the level of awareness and knowledge about physiotherapy services among the general public in a typical African market located in Accra metropolis, Ghana. A large number of respondents in this study had previous knowledge of physiotherapy. Most of them acquired the knowledge through information obtained from health professionals and the mass media. Also, most of them were of the opinion that physiotherapy is a branch of medicine. Majority of the respondents stated that physiotherapy service can be received in hospitals and expressed the opinion that physiotherapists treat disorders of bones and joints. A large number of the respondents knew that physiotherapists employ exercise as the main and frequently used modality for treatment. Many of them would advise other people to seek the services of physiotherapists in order to obtain the physiotherapists' advice/teaching about prevention of illness, or receive treatment from physiotherapists. The small sample size was a notable limitation of the study. Also, the small geographical area covered by the survey entails that care should be exercised in comparing results of the study with those of other studies.

In Europe, majority of the public are aware of physiotherapy services and have knowledge on what the profession entails, such that there is a high demand for the services of physiotherapists among the people[13]. In Australia, physiotherapists enjoy professional autonomy and the level of awareness is high[14,15,16]. In Japan, many high school students lack appropriate information about the physiotherapy profession and are therefore unaware of the vast career opportunities open to them[17]. In Ghana, anecdotal reports suggested low level of awareness and knowledge of physiotherapy, and it appears that the profession lacks a clear identity with the public despite the great role it plays in the society. This observation could not be fully supported by the relatively high level of awareness (68.6%) demonstrated by respondents in this study, who were drawn from a market place; and were expected to show a low level of awareness.

At present, almost all physiotherapists in Ghana practice as clinicians in the hospitals, working as part of the multidisciplinary health team. Hence, the public associates the profession with the typical hospital environment. Therefore, it is not surprising that many respondents in the present study were of the opinion that physiotherapy is a branch of medicine and that physiotherapy service can be received in hospitals.

A large number of the respondents knew that physiotherapists employ exercise as the main and frequently used modality for treatment. When physiotherapists receive referrals to treat patients, they often introduce themselves, especially in the hospital wards, as people who give treatment by exercises. Statements such as "I am here to teach you exercise" or "I am here to make you do some exercises" are used. Hence, they might have earned the toga of exercise professionals, and those who came in contact with them in this way might have propagated the idea to the general public. The fact that exercise is associated with the physiotherapy profession had been reported earlier in a study by Higgs et al (2001) who noted the fact that exercise is considered as the backbone of physiotherapy practice[18].

In this study, most respondents expressed the view that physiotherapists treat disorders of muscles, bones and joints. This could be attributed to the large number of the referrals from orthopaedic units of the hospitals. Invariably, the small number of physiotherapists in the country might have limited physiotherapy referrals to mostly cases where the role of a physiotherapist is inevitable and most highly appreciated. In effect, the populace are only able to view physiotherapy services along the lines of mobilization of stiff joints and strengthening of weak muscles. Hence, it is not surprising that the public would not be aware that physiotherapy services could be available for conditions other than those of the musculoskeletal system[18]. A similar observation was made by Ogiwara and Nozoe (2005) in a study among high school students in Japan[17].

Many of the participants in this study who had previous knowledge about physiotherapy services would advise others to seek the services of physiotherapists. This would suggest that they had a positive outlook about physiotherapy services and would encourage other people to enjoy the benefits of physiotherapy service. A further confirmation of this positive outlook stems from the fact that the respondents would give such advice to enable other people obtain the physiotherapists' advice/teaching about prevention of illness or obtain treatment from physiotherapists.

CONCLUSION

Participants in this study demonstrated a high level of awareness of physiotherapy services. The mass media served as the main sources of information that enhanced the level of awareness. However, there is still a need for more enlightenment to enable the general public appreciate the importance of physiotherapy services in Ghana.

CLINICAL APPLICATION

Physiotherapists in Ghana need to maintain and even build upon the level of awareness of their profession among the general public in the country. A positive outlook about the profession will go a long way to boost their clinical practice and enhance the growth of the profession in the country.

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A COMPARATIVE STUDY OF ULTRASOUND AND EXERCISE VERSUS PLACEBO ULTRASOUND AND EXERCISE IN PATIENT WITH ORAL SUBMUCOUS FIBROSIS

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ABSTRACT

INTRODUCTION- *Oral sub mucous fibrosis is chronic disabling disease associated with habitual betel quid chewers. In India 2.5 million people are suffering from this disease. Characterized by limitation of oral opening resulting in difficulty in chewing. The pathological changes are irreversible. Physiotherapy isthe third dimension to the management apart from medication and surgery. Therapeutic ultrasound help makes fibrous tissue more pliable and helps in gradual stretching of oral tissue.*

METHODOLOGY- *A comparative study was conducted on a convenient sample of 30 subjects with diagnosis of OSMF grade-3 by E.N.T surgeon, above 18 years of age, In Civil hospital Ahmedabad. Subjects unwilling were excluded. Procedure- 30 subjects were divided in 2 groups. Group A received treatment in form of Ultrasound and exercise, Group B received placebo Ultrasound and exercise. MMO and VAS for pain were used for outcome measure.*

RESULTS*-Results revealed that both group had significant improvement in MMO and VAS. Ultrasound with Exercise were highly significant (p<0.0001) in Group A.*

KEYWORDS-Ultrasound, mouth opening, pain, oral sensitivity.

INTRODUCTION

Oral sub mucous fibrosis has now become an Indian epidemic with an estimated 2.5 million people being affected with this disease[1].The rate varies from 0.2-2.3% in males and 1.2-4.57% in females in Indian communities[2]. Oral sub mucous fibrosis also has a significant mortality rate because it can transform into Oral cancer, particularly squamous cell carcinoma, at a rate of 7.6%[1]. It is a premalignant condition with 15 % of all cases converted to malignancy[2].

Oral sub mucous fibrosis is a chronic debilitating disease of the oral cavity characterized by inflammation and progressive fibrosis of the sub mucosal tissues (lamina propria and deeper connective tissues). Oral sub mucous fibrosis results in marked rigidity and an eventual inability to open the mouth[2]. The buccal mucosa is the most commonly involved site, but any part of the oral cavity can be involved, even the pharynx[3].

The condition is well recognized for its malignant potential and is particularly associated with areca nut chewing, the main component of betel quid. Betel quid chewing is a habit practiced predominately in Southeast Asia and India that dates back for thousands of years. It is similar to tobacco chewing in westernized societies. The mixture of this quid, or chew, is a combination of the areca nut and betel leaf, tobacco, slaked lime, and catechu[1]. Lime acts to keep the active ingredient in its freebase or alkaline form, enabling it to enter the bloodstream via sublingual absorption. Arecoline, an alkaloid found in the areca nut, promotes salivation, stains saliva red, and is a stimulant.

In most patients with oral sub mucous fibrosis, areca nut was chewed alone more frequently than it was chewed in combination with pan[2] or had a higher areca nut content[4].

The term oral sub mucosal fibrosis derives from oral (meaning mouth), sub mucosal (meaning below the mucosa of the mouth), and fibrosis (meaning hardening and scarring)[2]. Chewable agents, primarily betel nuts (Areca catechu), contain substances that irritate the oral mucosa, making it lose its elasticity. Nutritional deficiencies, ingestion of chilies, and immunologic processes may also have a role in the development of oral sub mucous fibrosis[1].

The treatment of patients with oral sub mucous fibrosis depends on the degree of clinical involvement. If the disease is detected at a very early stage, cessation of the habit is sufficient. Most patients with oral sub mucous fibrosis present with moderate-to-severe disease. Moderate-to-severe oral sub mucous fibrosis is irreversible. Medical treatment is symptomatic and predominantly aimed at improving mouth movements.2 Treatment strategies include steroids, placental extracts[5,6], hyaluronidase[7], IFN-gamma[8], lycopene and pentoxifylline.

Surgical treatment is indicated in patients with severe trismus and/or biopsy results revealing dysplastic or neoplastic changes. Surgical modalities that have been used include simple excision of the fibrous bands, split-thickness skin grafting following bilateral temporalis myotomy or coronoidectomy,

nasolabial flaps and lingual pedicle flaps[9] and use of a KTP-532 laser[10].

The physiotherapy is third dimension of treatment in oral sub mucous fibrosis, which include

- Ultrasonic treatment: ultrasonic waves produce tissue heating at a deeper level than moist heat; this increase in local tissue temperature leads to increase in blood flow and removal of metabolic by products responsible for pain and may help decrease adhesions by disrupting collagen cross-linkage.
- Stretching exercises: Physical therapy using muscle-stretching exercises for the mouth may be helpful in preventing further limitation of mouth movements. This is often combined with medical and surgical therapy[11].

The purpose of study was to compare the effect of ultrasound over placebo ultrasound in patient with oral sub mucous fibrosis.

METHODOLOGY

A comparative study was performed on convenient sample of 30 subjects at Govt. Physiotherapy College, civil hospital, Ahmedabad. The subjects were selected by simple random sampling. Inclusion criteria were (1) Patients who are willing to participate in the study (2) Age: 20-40 years. (3) Both sex (4) Patients diagnosed as oral sub mucous fibrosis by qualified ENT specialist (stage 3). Stage 3 includes Burning sensation and dryness of mouth, Irritation with spicy food, Vertical fibrotic bands on buccal mucosa and retromolar areas. Subjects excluded were (1) Malignancy (2) Injections of Steroids (3) Metal Implants (4) Previous trauma/fracture around TMJ.

Prior to the Commencement of the study, consent was taken from all subjects. 30 were subjects divided in to 2 groups, Group A having 15 subjects and Group B having 15 subjects. Group A, 15 subjects were treated with Ultrasound and Exercise. Group B, 15 subjects were treated with Placebo Ultrasound and Exercise. Study duration was 4 weeks, every subjects were treated 6 days in week one session daily. The subjects also asked the exercise programmes at home.

ULTRASOUND[11,12,13]: Treatment was given with following dosage:

- Mode: Pulsed
- Frequency: 1 MHz
- Intensity: 0.5 Watt/ cm^2
- Duration: 5 minutes/ session
- Use of mouth opening device to provide stretch during application of US.

Exercise includes:

STRETCHING EXERCISES[11,14]:

(1)With the use of mouth opening device:

- Patient's position : supine
- Mouth opening device was used .Held for 20 seconds.4-5 repetitions per session.

(2) Active and passive stretching:

- The patient is instructed to actively open the mouth as wide as possible. The opening position should be held for 5 seconds followed by relaxation in the rest position for 5 seconds.
- In passive stretch patient is instructed to actively open the mouth. Then finger pressure is applied by therapist to the maxillary and mandibular dentitions with use of thumb and index finger.
- Stretching exercises is performed by using ice cream sticks for 5-10 minutes 3-4 repetitions 4 times in a day. Stretching exercises is performed at home using ice cream sticks for 5-10 minutes 3-4 repetitions 4 times in a day.

ISOMETRIC EXERCISES[11,15]:

- The resistance is applied by therapist or patient using hand or fingers placed on mandible.
- Resistance applied to the all movements. Hold for 6-10 seconds for 10 times for each movement. Patient should be on home programmed.

PLACEBO ULTRASOUND:

- Placebo Ultrasound is given in switch off Mode of machine.
- It is only given for Placebo Effect.

There were two outcome measures were used.

(1) Maximum Mouth Opening: MMO is a reliable, objective measure of mouth opening. Maximal mouth opening was measured in mm using ruler. Measurement was taken with subject in sitting or supine position. Measurement of maximal voluntary mandibular opening can be obtained by measuring between the maxillary and mandibular incisal edges with a ruler scaled in millimeters.

(2) VAS scale for pain: Visual analogue scale is used to represent measurement quantities, in terms of a straight line placed horizontally on paper. The subject is asked to place a mark on that line, which is 10 cm in length. The left end of line represents no pain and right end represents severe pain.

Clinical examination was done with exactly the same protocols after the treatment period i.e. at the end of 4 weeks to measure VAS for pain and MMO in OSMF patients in both groups.

DATA ANALYSIS

Mean of the pre and post treatment MMO and VAS was taken and then standard deviation was calculated. Wilcoxon test was applied for comparison of pretreatment and post treatment pain scores as on VAS within Group A and Group B. Mann-Whitney test was applied for comparison of post treatment VAS score between Group A and Group B. Paired t test was applied for comparison of pretreatment and post treatment maximal mouth opening within Group A and Group B. Unpaired t test was applied for comparison of post treatment maximal mouth opening between Group A and Group B.

RESULTS

Out of 30 subjects 13 were females and 17 were males. Wilcoxon test was applied for comparison of pretreatment and post treatment pain scores as on VAS within Group A and Group B. For group A, W = 45.00 and the two-tailed p value is 0.008, considered significant. For group B, W = 23.00 and the two-tailed p value is 0.01, considered significant.

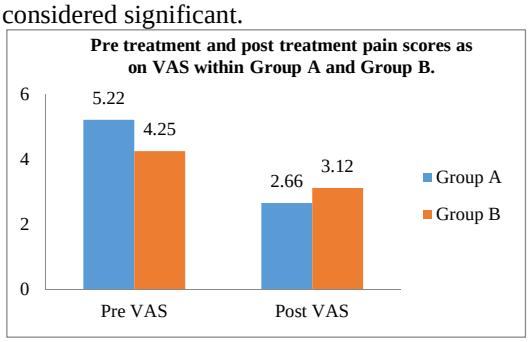

FIGURE 1: PRETREATMENT AND POST TREATMENT PAIN SCORES AS ON VAS WITHIN GROUP A AND GROUP B.

Mann-Whitney test was applied for comparison of post treatment VAS score between Group A and Group B and value of U=7.5, the two-tailed p value is 0.0005, considered significant.

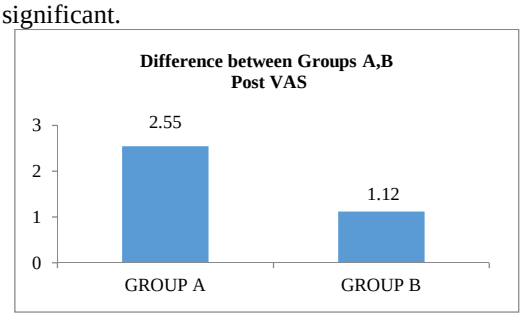

FIGURE 2: VAS DIFFERENCE BETWEEN GROUPS A AND B

Paired t test was applied for comparison of pretreatment and post treatment maximal mouth opening within Group A and Group B. For group A, t = 20.92 with the two-tailed p value is 0.0001, considered significant. For group B, t = 7.48 with the two tailed p value is<0.0001, considered significant.

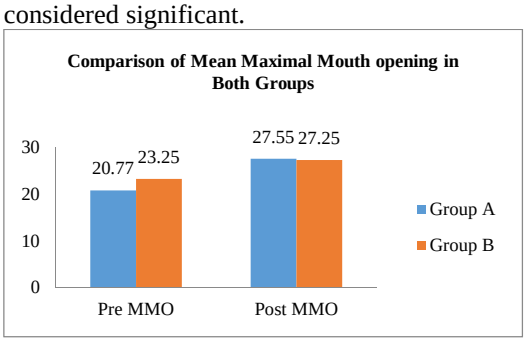

FIGURE 3: COMPARISON OF MEAN MAXIMAL MOUTH OPENING IN BOTH GROUPS

Unpaired t test was applied for comparison of post treatment maximal mouth opening between Group A and Group B. And value of t = 4.56 with two-tailed p value is 0.0004, considered significant.

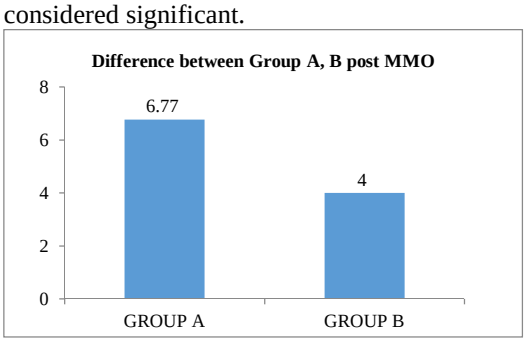

FIGURE 4: PRE AND POST MAXIMAL MOUTH OPENIND DIFFERENCE BETWEEN GROUP A AND B

DISCUSSION

The results of present study showed that the reduction in pain and improvement in maximal mouth opening was appreciably significant in both the groups. The results indicated that Ultrasound when given along with Exercise resulted in significantly better subjective and objective outcomes than Placebo ultrasound and Exercise in patients with Oral sub mucous Fibrosis.

The electrotherapeutic modality given was ultrasound. Pain relief by ultrasound occurs by directly influencing the transmission of painful impulses by eliciting changes within the nerve fibers and elevating pain threshold. Whereas indirect pain reduction occurs as a result of increased blood flow and increased capillary permeability to the affected area. This effect of pain reduction was reflected by reduction on the score of VAS[16].

According to Byl, NN (1992) cycloaminoglycan and hydroxyproline which were the essential components for collagen production were increased following low dose pulsed ultrasound. Cavitation and acoustic streaming facilitate collagen synthesis. This increased rate of `collagen synthesis in disc results in healing and increased tensile strength of disc[16].

Binder A et al (1985) studied the effectiveness of ultrasound in TMD patients. He compared ultrasound with placebo. He found improvement in pain score and mouth opening. Pulse ultrasound was not found to be effective as a sole treatment in treating chronic temporomandibular pain. Similar procedure used in the study by Haker and Lundenberg (1991) in which they report no beneficial effect for pulsed ultrasound over placebo ultrasound[18].

The use of ultrasound on this condition was based on the effect of ultrasound which is both thermal and non-thermal, producing an increase in extensibility of soft tissue (Richard A Ekstrom et al, 2002) and stimulation of collagen synthesis through ultrasound induced cavitation (Webster et al, 1980).

Exercise therapy has long been used in the treatment of TMDs. Therapeutic exercise interventions are prescribed to address specific TMJ impairments and to improve the function of the TMJ and craniomandibular system. Most exercise programs are designed to improve muscular coordination, relax tense muscles, increase range of motion, and increase muscular strength (force-generating capacity).The most useful techniques for re-education and rehabilitation of the masticatory muscles have been reported as manual therapy, muscle stretching, and strengthening exercises. Passive and active stretching of muscles or range-of motion exercise are performed to increase oral opening and decrease pain[17].

The progressive fibrosis, which occurs in the patients, diagnosed with Oral sub mucosal fibrosis, seem to improve with stretching exercise as stretching causes better alignment of fibrotic tissue. This method was considered in the study conducted at the school of dentistry, Taiwan, by Lis DR and associated (1995).

LIMITATIONS

- The sample size was small.
- Home programme taught to the patients was not supervised.
- Body mass index was not noted.

CONCLUSION

The result of this study suggest that the average improvement in pain and maximal mouth opening in the Group A was almost twice the magnitude of the improvement observed in the Group B. On assessing few patients who came for follow up, it was found that subjects in the Group A treated with Ultrasound appeared less likely to be taking medications and were more satisfied with the overall outcome of their rehabilitative treatment at 4 weeks compared with subjects in the Group B with Placebo Ultrasound.

CLINICAL APPLICATION

The programme of Ultrasound with Exercise is safe & effective if an early & regular basis carried out in Oral Sub Mucous Fibrosis .This is useful in improving the pain and mouth opening.

FUNDING

The above study is not funded by any institute or person and is completely based upon authors at their own interest.

CONFLICTS OF INTEREST

There was no personal conflicts of interest.

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TO ASSESS AND COMPARE THE SHORT TERM EFFECT OF ATLANTO-OCCIPITAL JOINT MANIPULATION AND SUBOCCIPITAL MUSCLE INHIBITION TECHNIQUE ON ACTIVE MOUTH OPENING RANGE

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ABSTRACT

INTRODUCTION: *The temporomandibular joint is directly related to the cervical and scapular region. Disturbances in the temporomandibular joint can affect the positioning of the skull over the cervical region and can determine the postural imbalance through a common neuromuscular system. The purpose of this study was to assess and compare short term effect of atlanto-occipital joint manipulation and sub-occipital muscle inhibition technique on active mouth opening range.*

MATERIAL AND METHODS: *30 subjects were selected to participate in this study. TMJ opening range was measured. The subjects were divided randomly in two groups. Group A received Atlanto-occipital joint manipulation. Group B received Sub-occipital muscle inhibition technique. The treatment was given daily for 1 week. The TMJ opening range was measured after a week (6th day). Paired and unpaired t-test was used for data analysis.*

RESULT: *Both atlanto-occipital joint manipulation and sub-occipital muscle inhibition technique was effective in improving active mouth opening range. But atlanto-occipital joint manipulation was more effective in improving active mouth opening range then sub-occipital muscle inhibition technique.*

CONCLUSION: *The result of this study concluded that atlanto-occipital joint manipulation was more effective in improving active mouth opening range then sub-occipital muscle inhibition technique.*

KEYWORDS: Temporomandibular Joint; Active Mouth Opening Range.

INTRODUCTION

Temporomandibular disorders (TMD) are a group of disorders affecting the masticatory muscles and/or temporomandibular joint (TMJ)[1,2]. TMD affects more than 25% of the general population[3]. It is estimated that between 85 to 95 percent of population will exhibit one or more of symptoms of TMD in their lifetime with 5 to 6 % of the population reporting clinically significant TMD related jaw pain[4,5]. TMD can be classified as joint or muscular disorder or both. Joint disorders include internal derangement, dislocation, inflammatory conditions, arthritis, ankylosis and deviation in form. Myofacial pain, myositis, spasm, and muscle contracture comprise the muscular group[6]. TMD have a wide range symptoms including restricted range of mouth opening, locking, clicking, headaches and commonly joint and muscle pain. It is also commonly associated with other symptoms affecting the head and neck regions such as headache, ear-related symptoms and cervical spine disorders[7,8]. Patients with chronic TMD frequently report symptoms of depression, poor sleep quality, and low energy[9].

One of the signs often associated with TMD is a reduction in mouth-opening capacity[10]. The reference range of mouth opening reported in the literature ranges from 41 to 50.7 mm[11,12]. Mouth-opening measurements are generally greater in men, in tall, and in young individuals. A mouth-opening measurement less than 40 mm is considered restricted[12]. During normal mouth opening, extension occurs at the cervico-cranial junction; and restriction in the upper cervical spine may decrease a patient's mouth-opening capacity[13]. De Laat et al (1998) found that segmental limitations in the upper cervical spine (C0-C3) were significantly more present in patients with TMD than controls[14]. Various studies have also shown the evidences of a greater number of cervical spine signs and symptoms in temporomandibular dysfunction patients and vice-versa.

Any alteration in TMJ range leads to Masticatory muscle imbalance and subsequently TMD, which in turn affects the cervical musculature and leads to postural dysfunction. Hence it's better to improve the TMJ range before the patient develops TMD and subsequent CSD. Usually in subjects with restricted mouth opening, there is restriction of upper cervical extension;

hence cervical manual therapy can be used to increase TMJ opening range.

The current study is being done to evaluate the effectiveness of atlanto-occipital joint manipulation and sub-occipital (upper cervical) muscle inhibition technique on active TMJ opening. The finding of this study can be used to modify treatment protocol in patients with TMD.

METHODS

SAMPLE SIZE

Total Sample size – 30

Group A – 15 subjects receiving Atlanto-occipital Manipulation.

Group B – 15 subjects receiving Sub-occipital muscle inhibition Technique.

TYPE OF STUDY

Comparative Study

STUDY SETTING

N.D.M.V.P College and Hostel.

INCLUSION CRITERIA

- People with restricted maximum active mouth opening; i.e. mouth opening ROM is less than 40mm.
- Aging from 18 to 30 years.
- Both the genders.

EXCLUSION CRITERIA

- Previous history of jaw and/or neck injury/surgery;
- previous or current TMJ or cervical pain lasting for more than 3 weeks;
- Any contraindications for cervical manipulation including acute fracture, vascular insufficiency, or cervical spine instability.
- General joint disorder involving head and neck including rheumatoid arthritis.

OUTCOME MEASURE

Active ROM of TMJ Opening (inter-incisor range) using Ruler (Walker et al 2000).

MATERIALS REQUIRED

Plinth/couch, Scale/Ruler, Pen, Paper

PROCEDURE

30 subjects were selected on the basis of inclusion criteria. Subjects were informed about the study and written consent was taken from them. Subjective data like name, age, sex, past history were collected. TMJ opening range was measured with ruler/scale10. The subjects were divided randomly in two groups, 15 in each group. Group A received Atlanto-occipital joint manipulation. Group B received Sub-occipital muscle inhibition technique.

Atlanto-occipital joint manipulation Technique:

The subject is taken in supine lying. The head is rotated to one side (restricted side of cervical rotation). With the middle and ring finger of inferior hand, the therapist contacts the mastoid process. With the palm of the cranial hand, the therapist contacts the subject's jaw line and cheek. Both forearms of the therapist are in plane parallel with the subject. A slight traction in cranial direction is introduced with both the hands. When joint tension is perceived by the therapist, a thrust is performed in the direction of traction with a gentle rotatory force. If no popping sound is heard on the 1st manipulative attempt, the therapist repositions again and performs a 2nd manipulation. A maximum of 2 thrust attempts is performed in 1 session on each subject.

Sub-occipital Muscle Inhibition Technique:

The subject is taken in supine; therapist is seated at his head with elbow resting on the surface of table. The therapist places both the hands behind the head of subject, with the palms facing upwards, the fingers flexed, and the finger pads positioned on the posterior arch of atlas, to allow the occiput to rest in the palm of hands. A force is applied with the finger pads over the atlas in a direction of ceiling with slight traction in cranial direction for 2 minutes.

The treatment intervention was given daily for 1 week. The TMJ opening range was measured with scale10 after a week (6th day).Paired and unpaired t-test was used for data analysis.

RESULTS

30 individuals with restricted mouth opening range were selected to participate in the study. The participants were divided into 2 groups;

Group A: 15 subjects receiving Atlanto-occipital joint Manipulations

Group B: 15 subjects receiving Sub-occipital muscle inhibition technique.

Descriptive data is given in table 1.

Paired t-test

It was used to compare the pre and post treatment active mouth opening range within the group.

Group A:

t= 12.2

Degrees of freedom = 14

The probability of this result is 0.000.

As t=12.2 and $p<0.05$, the result is statistically significant, i.e.; Atlanto-occipital

joint manipulations have significant effect in improving mouth opening ROM.

Group B

t= 6.81

Degrees of freedom = 14

The probability of this result is 0.000.

As t=6.81 and p<0.05, the result is statistically significant, i.e.; Sub-occipital muscle inhibition technique have significant effect in improving mouth opening ROM.

TABLE 1: DESCRIPTIVE DATA OF BOTH GROUPS

	Group A Atlanto-occipital Joint Manipulations		Group B Sub-occipital Muscle Inhibition Technique	
N	15 00		15	
	Mean	SD	Mean	SD
Age	21.6	3.57504579	22.33	3.457222
Pretreatment ROM	31.5mm	4.1380925	31.33mm	4.980916
Post treatment ROM (day 6)	41.73mm	5.18881581	36.67mm	3.086067

Unpaired t-test

It was used to compare post treatment mouth opening ROM between the group, i.e.; Group A and Group B.

Group A: Number of items= 15

Mean = 10.2

Standard Deviation = 3.23

Group B: Number of items= 15

Mean = 5.33

Standard Deviation = 3.04.

The result was, t= 4.25

Standard deviation= 3.14

Degrees of freedom = 28

The probability of this result is 0.000

As t=4.25 and p<0.05, the result is statistically significant, i.e.; Atlanto-occipital joint manipulations has more effect on mouth opening ROM then Sub-occipital muscle inhibition technique.

DISCUSSION

The result of this study demonstrated that both Atlanto-occipital joint manipulations and sub-occipital muscle inhibition technique have significant effect on mouth opening ROM. Though on comparison it was found that atlanto-occipital joint manipulation have better effect on mouth opening ROM then sub-occipital muscle inhibition technique.

James et al (2007) concluded that Manual therapy to the cervical spine did not significantly improve mouth opening in this asymptomatic population[3].

Natalia et al (2010) concluded that the application of an atlanto-occipital thrust manipulation or soft tissue technique targeted to sub-occipital muscles led to immediate increase in pressure pain threshold over latent trigger points and an increase in maximum active mouth opening[15].

The relationship between the temporomandibular joint and cervical spine is prove already in many previous study. Physiological dynamic equilibrium of both regions constitutes the ideal case. Hence changes in one region can lead to changes in other region too. The ideal posture of head places the center of gravity slightly anterior to the cervical spine. For this reason, when sitting or standing the head falls anteriorly if the muscles of the head and neck are totally relaxed. When the mouth is opened, the sub-occipital muscles counteracts the tilting forward of the head; conversely, when the head is bent backwards, the masticatory muscles are activated to prevent the mouth from opening automatically.

A forward head posture frequently involves extension of the occiput and upper cervical spine, leading to compensatory flattening of lower cervical spine and upper thoracic spine to achieve a level head position[16].With the occiput extended on atlas (c1) the sub-occipital muscles adapt and shorten. Increased tension from shortening of sub-occipital muscle may lead to headaches that originate in sub-occipital area, limitation in active range of motion, and temporomandibular joint dysfunction[16].

Thus, it is proposed that cervical posture should be normalized by sub-occipital muscle inhibition technique (to normalize sub-occipital muscle length) or atlanto-occipital joint manipulation (to normalize upper cervical spine active range of motion) to successfully either prevent if not present or treat dysfunction of temporomandibular joint.

LIMITATIONS

- Small sample size (15 in each group).
- There was no follow up study done.

SUGGESTIONS

- More studies with long term follow-up should be carried out.
- Exercise protocol should be added to the treatment for better results.

CONCLUSION

The result of this study concluded that atlanto-occipital joint manipulation was more effective in improving active mouth opening

range then sub-occipital muscle inhibition technique.

KEY POINTS

- The mandible and the base of skull presents the muscular and ligamentous connections with the cervical region, forming a functional system known as cranio-cervico-mandibular system.
- Atlanto-occipital joint manipulations have significant effect in improving TMJ opening ROM.
- Sub-occipital muscle inhibition techniques have good effect in improving TMJ opening ROM.
- Atlanto-occipital joint manipulation is more effective then Sub-occipital muscle inhibition technique in improving active mouth opening.

ACKNOWLEDGEMENT

The authors would like to acknowledge Dr. Mahesh Mitra (Principal, NDMVP College of Physiotherapy) for his contribution.

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AN ANALYTICAL STUDY TO FIND OUT THE EFFECTS OF FOUR ASANAS ON DECREASING BLOOD PRESSURE AND TO COMPARE IMMEDIATE EFFECTS ON BLOOD PRESSURE OF FOUR DIFFERENT SEQUENCES OF COMMON ASANAS USED IN TREATMENT OF HYPERTENSION

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ABSTRACT

OBJECTIVE: *To investigate the immediate effects of yoga asanas i.e. urdhvartadasana, tirayaktadasana, katichakrasana, tiryakbhujangasana, on B.P in hypertensive patients and also to compare which sequence of yoga asanas will be better in reducing B.P. in hypertensive patients. Random sampling method including age group of (30 – 60) years and subject with essential hypertension. The sequence of asanas which are being applied on subjects divided in four groups on random basis:-*

Group (a) urdhvartadasana → tirayaktadasana → katichakrasana → tiryakbhujangasana.
Group (b) tirayaktadasana → katichakrasana → tiryakbhujangasana → urdhvartadasana.
Group (c) katichakrasana → tiryakbhujangasana → urdhvartadasana →Tirayaktadasana.
Group (d) tiryakbhujangasana → urdhvartadasana → Tirayaktadasana → katichakrasana.

RESULT AND CONCLUSION*: The data analysis reveal that there was a significant reduction in the systolic B.P with application of all the four groups immediately after performing yoga asanas, but analysis of variance reveals that the mean reduction in systolic B.P between all the four groups failed to achieve significance. To conclude that patients within the age group of 30-60 years were observed and analysis clarified that all the groups displayed significant reduction in B.P, irrespective of sequences adopted but group (c) proved to be the most beneficial effect among all the four groups whereas all the other groups failed to achieve within the group significance.*

INTRODUCTION

Blood pressure is the force with which blood pushes against the artery walls as it travels through the body. It is measured by 2 numbers- systolic pressure & diastolic pressure. Systolic pressure measures cardiac output and refers to the pressure in the arterial system at its highest. Diastolic pressure measures peripheral resistance refers to arterial pressure at its lowest[1]. Normal blood pressure for an adult is 120/70(on average), but normal individual varies with the height, weight, fitness level, age and health of a person. Nearly 40% of all deaths among those 65 and older can be attributed to heart problems. By age 80, men are 9 times more likely to die of chronic heart failure then they were at age of 50. Among women, this risk increases 11 fold over the same time period[2].

Hypertension or high blood pressure can be defined as a reading of 140/90 on three consecutive measurements at atleast six hours apart. Consistently high BP causes heart to work harder than it should and can damage the coronary arteries, the brain, the kidneys & the eyes. Hypertension is a major cause of stroke[3]. Hypertension is commonly treated with medication and a combination of two or more drugs is common. Patients are usually given a diuretics to help them excrete excess fluids. However, most diuretics also cause excretion of potassium in the urine, and individuals on diuretics should monitor their potassium intake[4]. Drugs used to control hypertension include beta blokers (e.g., atenolol {tenorim}) which acts to slow heart rate and cause some vasodilation. Drugs that contain calcium channel blockers (e.g. amlopidine [norvasc] or angiotensin converting enzyme inhibitors also cause vasodilation[5].

Yoga improves physical, mental, psychic and spiritual health. It makes the physiological reflexes, reaction & responses more alert, sensitive and subtle[6]. It exercises and energies the various system of body[14]. The asanas are so designed that their effects may reach to the very ends of the peripheral nerve tips to the vasa nervorum and vasa vasorum and the nutrient arteries which pierce and ply through bones to supply the marrow and even to each individual cells[7]. Yoga awakens man to the realities of existence, infuses hope and courage, rekindles zest and zeal[8].

AIM & PURPOSE OF STUDY:

•To find the immediate effects of yoga asanas i.e. urdhvartadasana, tirayaktadasana, katichakrasana, tiryakbhujangasana on blood pressure in hypertensive patients with in the age group of 30-60 years.

•To compare which sequences of yoga asanas will be better in reducing blood pressure in hypertensive patients with in age group of 30-60 years.

METHODOLOGY

Population: All the people residing in Balawala, Dehradun, Uttrakhand.

Research design: it is an experimental study to find out the effects of yoga asanas i.e., urdhvartadasana, tirayaktadasana, katichakrasana, tiryakbhujangasana on blood pressure in hypertension patients.

Sample size: 60 subjects between the age group of 30-60 years.

Research setting: the research was conducted, outpatient department of SBSPGI, Dehradun, Uttrakhand.

Sampling method: random sampling method.

Inclusion criteria:

•Age 30-60 yrs.
•Subjects with essential hypertension.

Exclusion criteria:

•Any complaint of dizziness or vertigo.
•Patient on anti-hypertensive drugs.
•Neuro- musculoskeletal disorder.

Group allocation:

The sequence of asanas which are being applied on subjects divided in four groups on random basis:-

Group (a) urdhvartadasana → tirayaktadasana → katichakrasana → tiryakbhujangasana.
Group (b) tirayaktadasana → katichakrasana → tiryakbhujangasana → urdhvartadasana.
Group (c) katichakrasana → tiryakbhujangasana → urdhvartadasana → Tirayaktadasana.
Group (d) tiryakbhujangasana → urdhvartadasana → Tirayaktadasana → katichakrasana.

TECHNIQUE & PROCEDURE:

Subject is in sitting supported position with arm & hand also supported. Sphygmomanometer and stethoscope was used for measuring blood pressure. Firstly measure blood pressure before the asanas & then after the asanas one by one after every 4 asanas.

Urdhvartadasana: instruct the patient to stand straight. Clasp the hand and palm facing upward take it up straight above the head gradually raise both the heel upward and maintain it. Repeat this for 10 times with deep breathing.

Tirayaktadasana: instruct the patient to stand with both hands together and finger clasped on the head with palm facing upward. Feet to be apart with the distance of 1 feet. While on inhaling bend on the right side with arms in the stretched position. Ask not to flex the elbow. While exhaling get back to starting position and repeat the procedure on the left side & repeat this for 10 times.

Katichakrasana: instruct the patient to stand on wide base of support with right hand on left shoulder and dorsal surface of left hand on right buttock. Now ask the patient to rotate towards the left while inhaling and come back to normal position while exhaling & repeat this for 10 times.

Tiryakbhujangasana: patient position, prone lying on hands. Instruct the patient to keep Feet apart with the distance of 1 feet and ankle planter flexed. While inhaling lift the trunk up and try to see the same side of heel. Then ask to get back to normal position and repeat it again on the other side. Repeat this for 10 times.

FIGURE 1: URDHVARTADASAN

FIGURE 2: TIRYAKBHUJANGASANA

FIGURE 3: KATICHAKRAASAN

FIGURE 4: TIRAYAKTADASAN

DATA ANALYSIS & RESULTS

The data analysis reveal that there was a significant reduction in the Systolic Blood Pressure with application of all the four groups immediately after performing yoga asanas($p<0.05$), but analysis of variance(ANOVA) reveals that the mean reduction in Systolic Blood Pressure between all the four groups failed to achieve significance($p<0.05$).

TABLE 1: TABLE SHOWING THE MEAN VALUES OF PREASANAS SYSTOLIC BLOOD PRESSURE WITHIN THE GROUP A, B, C & D.

	Group A	Group B	Group C	Group D
Pre	152.25	160.5	164	147.25
Post	138.25	133.57	147.75	133
Significance	S	S	S	S

S= significant ($p<0.05$)
NS= Non- Significant ($p<0.05$)

TABLE 2: TABLE SHOWING THE MEAN DIFFERENCE IN THE SYSTOLIC BLOOD PRESSURE WITH IN GROUP A, B, C & D.

Group A	Group B	Group C	Group D	F value	significance
14.5	11	20.75	14.75	0.108	NS

TABLE 3: TABLE SHOWING THE IMPROVEMENT BETWEEN THE PRE-POST READINGS AFTER PERFORMING ASANAS.

Pre readings before performing asanas	Post readings after performing asanas	Significance
156	140.54	S

DISCUSSION

60 subjects between the age group of 30-60 years were randomly divided into 4 groups to see effectiveness of 4 yoga asanas in reducing Systolic Blood Pressure. Each group carried out 4 yoga asanas but in a different sequences. The data analysis revealed that all the 4 groups showed significant reduction in Systolic Blood Pressure ($p<0.05$) immediately after performing yoga asanas.

Interestingly, it was also observed that Group C showed significantly more improvement.

The results of a study done by YOGA ACHARYA MANDLIK (2008) also support the result of current study. His aim of study towards the effect of jalandhar bandha practiced properly during the kumbhaka, on blood pressure (Systolic & Diastolic). He observed that blood pressure increases during the practice of kumbhaka. It is also warned strictly in all Yogic Text to perform all 3 bandhas during kumbhaka. According to him while practicing the pranayama i.e. Kumbhaka, if the jalandhar bandha is not performed properly, the blood pressure will rise and it may lead to permanent hypertension. Hence it is essential to perform the jalandhar bandha properly to keep the blood pressure on the lower side during the practice of pranayama with kumbhaka[9].

The result of a study" Yoga package for heart patients" done by Dr. JayantSohoni et al (1998) also support the result of current study. His aim to study the effect of six months of regular practice of a package of selected yogic practices on heart patients & stated that Yoga, the process of being normalization, is studied since thousands of years[10]. Hence we planned to study the effect of Yoga Training Package on heart patients. It is also observed that the blood pressure and blood cholesterol reduced considerably. The patients experienced an overall relief of about 90%[11].

The result of a study done by McCfferey R et al (1998) also support the result of current study. His aim to determine the effectiveness of a yoga program on blood pressure and stress, a group of hypertensive patients in Thailand were studied, with the experimental group showing significantly decreased mean stress scores and blood pressure, heart rate and body mass index levels compared with the control group[12].

The results of study done by Fortsch also support the result of current study. His hypothesis is Yoga and Medication will improve the

parameters of endothelial function. Systolic and diastolic blood pressure, heart rate and body mass index, fasting glucose, lipids, C-reactive protein and endothelial function were all studied as a baseline and after 6 weeks of yoga practice. There were significant reductions in blood pressure, heart rate and BMI in the total cohort of yoga[13]. None of the laboratory parameters changed significantly with yoga. For the total cohort there was no significant improvement in endothelial-dependent vasodilatation with yoga training and meditation[14].

The results of study done by Alexander CR et.al, (1996) also support the result of current study. His objective was to test the short-term efficacy feasibility of 2 stress-reduction approaches for the treatment of hypertension. The study involved a follow-up subgroup analysis of a 3-month randomized, controlled, single-blind trial conducted in a primary care, inner-city health center. Subjects were 127 African American men and women, aged 55-85 years, with diastolic pressure of 90-104 mm Hg and systolic pressure less than or equal to 179mm Hg. Of these, 16 did not complete follow-up blood pressure measurements. Women practicing the Transcendental Meditation technique showed adjusted declines in systolic (10.4mm Hg, $P<0.01$) and diastolic (5.9mm Hg, $P<0.01$) pressures. Men in this treatment group also declined in both systolic (12.7mm Hg, $P<0.01$) and diastolic (8.1mm Hg, $P<0.01$) pressures compared with control subjects. Effects of stress reduction on blood pressure were found to generalize to both sexes and diverse risk factor subgroups and were significantly greater in the Transcendental Meditation treatment group[5].

LIMITATION OF THE STUDY

•The timing could not be analysed by this method.

•Find out at which level effects of yoga are seen.

Future scope of the study:

•Study can be carried out for a longer term effects.

•Study can be carried out on post menppasual women who are hypertensive.

•Study can be carried out with 2 different methods included in it. Like breathing exercise and relaxation technique.

IMPLICATION OF THE STUDY

Hypertension is prevalent by almost 40% of all adult population. It can be because of many things as a big example facing towards the stressful life. Medication are available for high blood pressure but it also comes with its adverse effects like habituation & so on. For avoiding & maintaining high blood pressure in control "YOGA" took a big place.

Yoga stretches can benefit both the body & mind bringing energy & balance. It levels out physiological instability by relaxing & gently stretches every muscle in the body, promoting better blood circulation & oxygenation to all cells & tissues.

CONCLUSION

60 patients with hypertension within age group 30-60year were taken & analysis showed all the groups showed that there was significant reduction of blood pressure irrespective of sequences adopted but Group C showed maximum beneficial effects but all the groups failed to achieve within the group significance. ($p<0.05$)

ACKNOWLEDGEMENT

I am thankful to all the subjects who volunteered to participate in this study. I am thankful to the almighty, my parents, my brother & sister and my husband Maj. Saurabh Kathait who always boosted my confidence and provided me constant support for finalizing this task.

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TO STUDY THE EFFECT OF PROPIOCEPTIVE NEUROMUSCULAR FACILITATION VERSUS WEIGHTED EXERCISES TO IMPROVE STAIR CLIMBING TASK IN CHRONIC STROKE PATIENTS- A COMPARITIVE STUDY

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ABSTRACT:

OBJECTIVE: *The objective of the study is to find out whether the Weighted Exercises (Stair Climbing Exercises) are beneficial or the Proprioceptive Neuromuscular Facilitation is beneficial to improve stair climbing task in subjects with chronic stroke.*

DESIGN: *It's a comparative study design. A sample of 30 subjects was included in the study with a pretest and post test study design. All the 30 subjects of hemiparasis was divided in two groups, (15 subjects each group), group A and group B. The subjects of group A received normal control exercise program which includes Passive movement, Stretching exercise and Active Exercises along with Stair Climbing Exercises. The subjects of group B treated with normal control exercise program which consist of Passive Movements, Stretching Exercises and Active Exercises with, including P.N.F. Data was taken on day zero, 45 and 90. Outcomes were taken according to Short Physical Protocol Battery and Duke Mobility Skill Profile.*

RESULT: *The result of the present study demonstrated that there is a significant improvement in functional performance activity of the lower extremity of the affected side. When two samples were conducted at the end of 45 days and after 90 days, it was found that there is significant improvement in functional activity in group A compared to Group B.*

CONCLUSION: *It has been recorded from the study that weighted exercise (stair climbing exercises) produces significant improvement in stair climbing task in chronic stroke subjects. It can seen that use of weighted exercises in patients with hemiplegia is beneficial. This can be used to enhance the functional outcome as well as strength in these patients.*

INTRODUCTON

Stroke is a complex and devastating disease. Despite treatment advances, stroke remains a leading cause of morbidity and mortality. 29% of stroke patients die within one year whereas 20% of these will die within 3 months.

Stroke or cerebrovascular accident is defined as a rapidly developing clinical sign of local or global disturbance of brain function lasting more then 24 hours or leading to death due to no reasons then the vascular origin. "WHO1999."

Prevalence rate for hemiplagia in south India was reported to be 56.9- 100,000 as compared to 150-186/1,00,000 population for USA and Europe.

Chao-Chung Lee et al- reported that the P.N.F. approach results in a trend of batter improvement on balance and functional mobility observed in patients with stroke. R.Y. Wang- found that there is an improvement in gait speed and cadence subjects with Hemiplegia, immediately after 1 session of P.N.F. and, was further enhanced after 12 sessions. S.S. Adler, M. Buck- mentioned in their book that P.N.F. is an integrated approach helps to patient, achieve their highest level of function and also increase patient's strength and avoid fatigue. Szymon Pasuit et al- reported in the study that P.N.F helps in reduction of spasticity. PNF has been used as a flexibility-treatment modality in rehabilitation after injury, surgery, and stroke (Voss, Ionta, & Myers). Lee MJ, Kilbreath SL, Davis GM, Singh MF, Zeman B and Lord S- reported Progressive Resistance Training significantly improves Power of leg muscles and Stair Climbing.

SL Morris, KJ Dodd, ME Morris- There is preliminary evidence that progressive resistance strength training program reduce musculoskeletal impairment after stroke. Virgil Aponte- reported Stair Climbing Exercises improves Anaerobic Conditioning, Lower Body Strength, Power development and Flexibility.

Jozsi et al- reported power gains of approximately 10% to 30% in older men and women, by Weighted Stair climbing exercises. Skelton et al- reported, in a study evaluating a potential home based P.R.T., there is 18% improvement in leg extensor power. Moreland et al reported in the study, Conventional therapy vs resistance exercise & conventional therapy Rehabilitation inpatients, < 6 months since stroke, at discharge, resistance group exercised with weights that were a mean 79–300% higher than at baseline. The increase was significant.

Improvements in Disability Inventory and 2-minute walk test did not differ between groups.

Sharp & Brouwer reported in their study- At 6 weeks, flexion & extension strength increased 16–154% on paretic side after resistive exercies.32Monger et al., 2002, reported in their study- At 3 weeks, significant improvements were demonstrated in Motor Assessment Scale sit-to-stand scores, walking speed, and timing of peak vertical ground reaction force in response to resistive exercise.

Kim et al found, improvement in stair climbing and gait velocity in response to isokinetic strength training. Weiss et al reported in their study that there is decrease in chair stand time by 21% and stair climb time is improved by 11%, due to strength training with weight machines. Teixera Salmela et al used isometric, ecentric and concentric exercises and found 42.3% increment in strength of paralytic limb, 28% increase in gait velocity and 37.4% increase in stair climbing. Engardt et al done study on isokinetic training of knee extensor concentric group and ecentric group, found concentric group: 25%-57% gains in concentricc strength, 13%-17% increase in ecentric strength, ecentric group 25%-30% increase in both concentric and ecentric strength.

The need of study is to find out whether Weighted Exercise or P.N.F. improves Stair Climbing Task in patient with post stroke hemiperasis.

The Aim of Study is to compare Proprioceptive Neuromuscular Facilitation and Weighted Exercise to improve Stair Climbing Task in Chronic Stroke Patients.

OBJECTIVE OF STUDY

•To find out the effect of Proprioceptive Neuromuscular Facilitation to improve Stair Climbing Task in Chronic Stroke Patient.

•To find out the effect of Weighted Exercise to improve Stair Climbing Task In Chronic Stroke Patient.

•To find out any significant difference in P.N.F. and Weighted Exercise to improve Stair Climbing Task in Chronic Stroke Patient.

RESEARCH APPROACH:-

To find out the statement of a problem for, Proprioceptive Neuromuscular Facilitation versus Weighted Exercises to improve stair climbing task in chronic stroke patients.

Study design:-

It's a comparative study design. A sample of 30 subjects was included in the study with a pretest and posttest study design.

Sample Design:

All the 30 subjects of hemiperesis with a duration between 6 month to 2 years and age group between 60-80 years was taken.

Place of Study:

All the 30 subjects will be taken from various Physiotherapy OPD as per the criteria.

Sampling Method

All the subjects will be taken by the convenient sampling method based on initial base line data and all the subjects will be referred by consultant Neurologist after diagnosis.

Inclusion Criteria:

- Chronic hemiperesis (male/female)
- Arterial involvement both ischemic and hemorrhagic.
- Age 60-80 years.
- Subjects with ability to walk.
- Subjects will be taken on the basis of Short Physical Performance Battery Score Sheet.

Exclusion Criteria:-

- Subjects who have any history of orthopedic disability or deformity.
- Subjects using walking aids.
- Subjects having functional odema.
- Mentally instable patients.
- Subjects with Hearing Impairment.

Measurement Scales:-

- Short Physical Performance Battery.
- Duke Mobility Skills Profile.

Time and Duration of the study:-

All the 30 subjects of hemiparasis was divided in two groups, (15 subjects each group), group A and group B. The subjects of group A received normal control exercise program which includes Passive movement, Stretching exercise and Active Exercises along with

Stair Climbing Exercises. The subjects of group B treated with normal control exercise program which consist of Passive Movements, Stretching Exercises and Active Exercises with, including P.N.F. and Data was taken on day zero, 45 and 90.

Protocol

All the 30 subjects were assigned in two groups and will be selected by convenient sampling method on the basis of inclusion criteria.

Group A subjects was treated with normal control exercise program which consist of Passive Movements, Stretching Exercise and Active Exercises along with Weighted Climbing Exercise.

Group B subjects were treated with normal control exercise program which consist of Passive Movements, Stretching Exercises and Active Exercises with, including P.N.F. Both the

two Groups were compared for better outcome measures.

Procedure

All the 30 subjects were divided into two Groups and the treatment was given according to mentioned Protocol.

Proprioceptive Neuromuscular Facilitation:

15 subjects with Hemiperasis secondary to Stroke will receive 30 min P.N.F. once in a day up to 12 weeks. The resistance was given to the subject's moving limb in one direction, as the end of the desired movement the action command was given to reverse direction, without relaxation, and gives resistance to the new motion starting with the distal part.

Weighted Stair Climbing Exercise

It include Progressive Resistive Training by using Vast. In training resistance initially set to 80% of one repetition maximum (1 RM). Then incremented by 2% of body mass per session. The subject was asked to wear weighted vast and then climb-up and down stairs with weights, was included 10 flights of stair climbing with one minute of rest between each flight

FIGURE 1: SUBJECT DOING STAIR CLIMBING EXERCISE

FIGURE 2: SUBJECT DOING STAIR CLIMBING EXERCISE

Data Collection Process

Base line assessment was done on the basis of primary performance and recording of all outcome measures was carried out on the following scales on day zero.

1. Short Physical Performance Battery.
2. Duke Mobility Skill Profile.

TABLE 1: DATA ANALYSIS OF BALANCE SCORE BETWEEN GROUP A & B

DAYS	GROUP A (N=15) M± SD	GROUP B (N=15) M±SD	t-VALUE	P-VALUE
DAY 0	3.33± .72	3.40±.74	-.250	.804
DAY 45	3.80±.41	3.53±.52	1.560	.130
DAY 90	3.93±.26	3.73±.46	1.474	.152

The result of the present study demonstrated that there is a significant improvement in stair climbing. When two samples was conducted after 45th & 90th day using Short Physical performance Battery and Duke Mobility Skill profile, It was found that there is a significant improvement after 45th day with p =0.130, and shows no significant after 90th day in GROUP A compared to GROUP B p=0.152

TABLE 2 : DATA ANALYSIS OF GAIT SPEED SCORE BETWEEN GROUPS A & B

DAYS	GROUP A (N=15) M± SD	GROUP B (N=15) M±SD	t	P
DAY 0	2.20± .41	2.33±.49	-.807	.426
DAY 45	2.53±.52	2.60±.51	-.357	.724
DAY 90	3.27±.46	2.73±.46	3.191	.003

The result of the present study demonstrated that there is a significant improvement in Stair climbing. When two samples was conducted after 45th & 90th day using Gait speed score, It was found that there is a significant improvement after 45th day with p =0.724, and significant after 90th day in GROUP A compared to GROUP B p=0.003

TABLE 3: DATA ANALYSIS OF CHAIR STAND SCORE BETWEEN GROUPS A & B

DAYS	GROUP A (N=15) M± SD	GROUP B (N=15) M±SD	t	P
DAY 0	1.67± .49	1.60±.51	.367	.716
DAY 45	2.07±.59	2.07±.59	.000	1.000
DAY 90	3.33±.49	2.87±.52	2.544	.017

The result of the present study demonstrated that there is a significant improvement in stair climbing. When two samples was conducted after 45th & 90th day using Chair stand score, It was found that there is a significant improvement after 45th day with p =1.00, and significant after 90th day in GROUP A compared to GROUP B p=0.17

TABLE 4: DATA ANALYSIS OF STAIR ASCENT SCORE BETWEEN GROUPS A & B

DAYS	GROUP A (N=15) M± SD	GROUP B (N=15) M±SD	t	P
DAY 0	1.67± .49	1.47±.52	1.090	.285
DAY 45	1.73±.46	1.60±.51	.756	.456
DAY 90	1.93±.26	1.73±.46	1.474	.152

The result of the present study demonstrated that there is a significant improvement in stair climbing. When two samples was conducted after 45th & 90th day

using Stair ascent score, It was found that there is a significant improvement after 45th day with p =0.456, and significant after 90th day in GROUP A compared to GROUP B p=0.152

TABLE 5: DATA ANALYSIS OF STAIR DESCENT SCORE BETWEEN GROUPS A & B

DAYS	GROUP A (N=15) M+ SD	GROUP B (N=15) M+SD	t	P
DAY 0	1.27± .46	1.13±.35	.894	.379
DAY 45	1.40± .51	1.13±.35	1.673	.105
DAY 90	1.67±.49	1.20±.41	2.824	.009

The result of the present study demonstrated that there is a significant improvement in stair climbing. When two samples was conducted after 45th & 90th day using Stair descent score, It was found that there is a significant improvement after 45th week with p =0.105, and significant after 90th day in GROUP A compared to GROUP B p=0.009

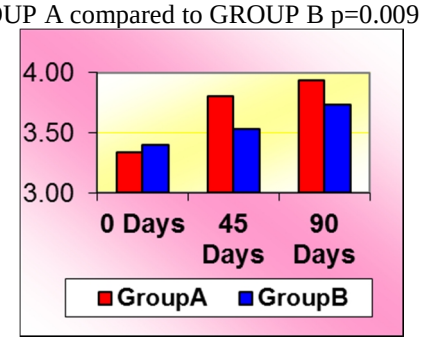

FIGURE 3: MEAN BALANCE SCORE OF GROUP A AND GROUP B

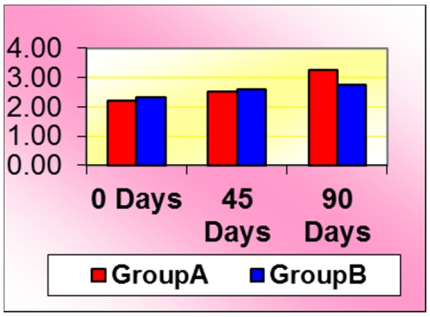

FIGURE 4: MEAN GAIT SPEED SCORE OF GROUP A AND B

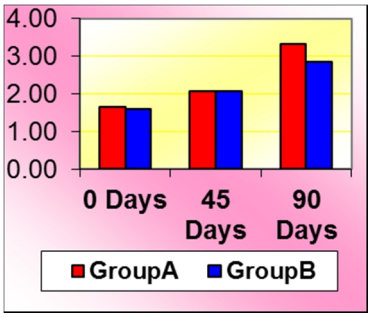

FIGURE 5: MEAN CHAIR STAND SCORE OF GROUP A AND B

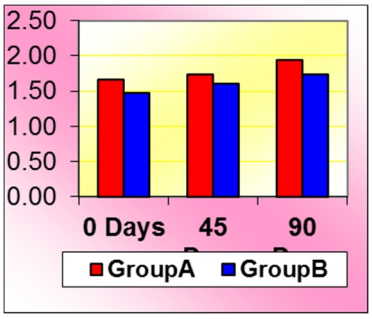

FIGURE 6: MEAN STAIR ASCENT SCORES OF GROUP A AND B

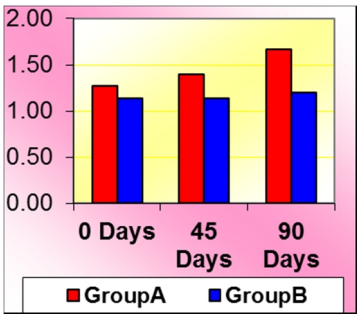

FIGURE 7: MEAN STAIR DESCENT SCORES OF GROUP A AND B

The result of the present study demonstrated that there is a significant improvement in functional performance activity of the lower extremity of the affected side in both the groups.

DISCUSSION

In this study of moderate hemiplegia we tried to assess the improvement in the strength of paralytic limb to improve stair climbing task using weighted exercise (stair climbing exercises) in one group (group A) and PNF in other group, along with normal control exercise program which consist of passive movements, stretching exercises and active exercises in both the groups.

In this study both the groups showed significant improvement after receiving treatment but mean score of group A (weighted exercise group) showed grater improvement.

The weighted exercise (stair climbing exercise) improves muscle strength through increasing the size of the muscle. Some EMG studies showed that as we trained to perform a specific task (stair climbing), we learn to activate our muscle more effectively for that task and learning occurs relatively quickly. As a result, at any time, the maximum strength that a subject demonstrates during the task is a function, both of neural control and muscle girth.

LIMITATIONS

The study is done on immediate bases i.e. one repetition maximum is measured by lifting the maximum weight through squat; there is no any equipment or method to check one repetition maximum. The hemiplegics were of both sides (right and left). It is known that right sided hemiplegics usually have some perceptual disorder also is not consider in the study, but nevertheless can affect the outcome.

It has been recorded from the study that weighted exercise (stair climbing exercises) produces significant improvement in stair climbing task in chronic stroke subjects. It can be seen that use of weighted exercises in patients with hemiplegia is beneficial. This can be used to enhance the functional outcome as well as strength in these patients. Hence alternate hypothesis is accepted at p=0.00 and null hypotheses is rejected.

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EFFECTIVENESS OF MANUAL TRACTION OF TIBIO-FEMORAL JOINT ON THE FUNCTIONAL OUTCOME IN KNEE JOINT OSTEOARTHRITIS

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ABSTRACT

The purpose of this experimental study is to analyze the effectiveness of manual traction on the pain, range of movement and the functional outcome in knee joint osteoarthritis. Traction is an oldest form of treatment for deformity correction, fractures and in treating disc prolapse. Very few studies are been performed to explore its effect in peripheral joints but no studies are reported in an experimental design. Totally forty participants were randomized into control and experimental groups. Baseline measurements of pain severity, active knee flexion range, Knee injury and osteoarthritis outcome score (KOOS) were measured. The control group received treatment in the form of pain relief modalities, exercises for muscle contractions and joint mobility. The experimental group received the same and in addition manual traction in high sitting position. All the measurements were taken after two weeks of treatment. There was significant improvement in experimental group compared to control group in terms of pain, subscales of KOOS and moderate improvement in active knee flexion range. This study adds the importance of manual knee traction, which is not commonly practiced for knee joint osteoarthritis. It further establishes traction as a means of stretching shortened, tightened structures without increasing pain severity during and after treatment. Overall the study also showed better improvements in functional outcome and in quality of life.

KEYWORDS: Knee, osteoarthritis, pain, active knee flexion, traction, KOOS.

INTRODUCTION

The knee joint is a common site of osteoarthritis of the tibio-femoral and patella-femoral joints, possibly because of its exposure to trauma and serving as a major weight bearing joint[1]. In Indian population KDJD older than 60 years is estimated to be 43% in women and 25% in men. The prevalence is estimated to be 15% for women and 5% for men[2]. Primary osteoarthritis has no known etiology; secondary osteoarthritis can be traced to abnormal joint mechanics. Abnormal knee mechanics produce secondary changes in the articular cartilage, subchondral bone, and supportive structures of the knee. Previous injury of soft tissues may be complicated by subsequent degenerative changes. Osteoarthritis may be a physiologic response to repetitive, longitudinal impulse loading of the joint. Changes may involve the medial or lateral tibio-femoral compartment, the patella-femoral joint or involving all three areas.

The sequelae of knee joint degeneration leads to pain, movement restriction, reduced muscle efficiency, alerted walking pattern, excessive energy expenditure, impaired joint functions and overall affecting the quality of life. Basically the treatment approach towards knee osteoarthritis involves reducing the joint inflammation, joint protection, training the weakened muscles and regaining the functional mobility of knee joint. As like any other joint, knee joint degeneration too has a mechanical cause. Until unless the mechanical cause is taken into consideration, the functional restoration of joint functions are incomplete. The most common alteration in alignment of the osteoarthritic knee is a varus deformity. This results in increased forces in the medial compartment, which creates a degenerative lesion of the medial meniscus and subsequent degenerative changes of the medial compartment. It's one of the commonest diagnostic radiological feature exhibiting medial joint space narrowing[3]. In advance stages, the cartilage is completely worn out, exposing the bony ends, approximating each other leading to joint replacement surgery.

It is strongly believed that all therapy related treatment approaches follow the principles of joint mechanics. When an altered mechanics is noted, therapist employs a manual way of correcting it terming as manual therapy or mobilization techniques. There are very few studies providing evidence on the efficacy of manual therapy of lower extremities[4].

Studies related to manual techniques in knee osteoarthritis have suggested that combination of manual physical therapy and supervised exercise yields functional benefits for patients with osteoarthritis of the knee and may delay or prevent the need for surgical intervention[5]. The type of manual techniques varies with therapist ranging from glides to distraction. The factors include direction of glide, force, magnitude, time period of sustaining glide, distraction force, duration etc. Many studies have focused on application of anterior/posterior glides, patellar glides to improve functional

outcomes[4]. In a comprehensive rehabilitation program of knee osteoarthritis, manual therapy program helps to regain mobility and function[6]. Outcomes of therapy are analyzed using functional outcome measures as like timed up and go walk test[4] step functions[7], osteoarthritis index[8] and knee osteoarthritis outcome survey. The drive for standardized instruments of outcome measures in practice not only considers the measurement of body function impairment (e.g.; strength, range of motion) but also should consider patient's point of view on activities of daily living and life participation[9]. Self-report measures assess the patient perspective on his/her ability to perform a task (Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Knee injury and Osteoarthritis Outcome Score (KOOS) whereas performance based measures capture the patient ability to perform a certain task[10].

The treatment module of passive glides, mobilization helps in regaining the movement deficit of the joint but not addressing the joint space narrowing. Traction is one such way of mobilization in practice for long many years. A very recent case series in 2010 have analyzed that manual traction mobilization to knee joint in patients with pain and movement dysfunction have not been assessed over time[11]. Of the passive treatment techniques advocated by Kaltenborn (1986) and Schneider (1988) traction is a well suited technique for treating pain with grade 2 or 3. The primary treatment effect is to stretch the periarticular soft tissues, increased mobility of hypo mobile joints and overall distraction at the narrowed medial joint space. The effectiveness of traction is well studied in vertebral column and upper extremity and the most under studied aspect in lower extremities[4]. Therefore the purpose of this experimental study is to analyze the effects of traction on pain response, mobility status and functional outcome in knee osteoarthtic patients.

MATERIALS AND METHODS

The experimental study was approved by the Head of Physiotherapy Department, Sri Ramachandra Hospital, Chennai.

Participants

The participants were selected from the outpatient physiotherapy department as a sample of convenience. The inclusion criteria for the study were 1) Knee pain with limitation in range of motion 2) diagnosed to have knee joint osteoarthritis 3) Radiograph showing medial joint space narrowing. Exclusion criteria included individuals 1) acute infective arthritis 2) history of previous trauma, unhealed fractures 3) Neurological disorders 4) Referred pain from low back region.

Study design

The study design is a single blinded, randomized controlled trail using simple randomization. All participants are randomly allocated to control and experimental group.

Outcomes

After screening process, a verbal explanation of the study protocol is made. An informed consent is obtained for authorizing their participation in the study. The evaluation includes patient profile (age, gender, hospital identity number) were recorded. Knee joint specific evaluation includes 1) Severity of Pain measured using visual analog scale 2) Knee joint flexion mobility using goniometer 3) Knee functions outcome using KOOS. The sub-scales include symptoms, stiffness, functions-daily living, sports, recreation activities and quality of life. The measurements are measured at baseline and two weeks after intervention.

Procedure

A total number of forty five participants were enrolled for the study, in which four of them did not meet the inclusion criteria and one was not willing to take part. A sample of forty participants were selected and randomly allocated to control and experimental group. The initial evaluator measured the baseline knee joint specific measures and post intervention. The principle evaluator administered the manual therapy techniques, pain control modalities and prescribed exercises. The evaluators were blinded of the group allocation and test results respectively.

Both the Control group and experimental group received the same line of management as referred but in turn the experimental group also received manual traction of knee joint. For pain relief, interferential therapy was given with two electrodes placed over the sides of knee joint for duration of fifteen minutes. A proper conducting medium is used. Isometric contractions of quadriceps, active mobility exercises in high sitting and in prone lysing are performed and educated to practice at home.

Manual therapy intervention

Distraction in sitting[12]

The participant is seated on the edge of the couch with toweling supporting the underside of the distal thigh. A trained manual therapist with good expertise performed the procedure. The therapist stands at the participant's side facing the patient's feet so as to direct his forearms in the line of force. A long axis distraction is produced by leaning forward with the trunk. It is performed in knee joint at ninety degree of flexion. This technique is used as general mobilization to increase tibio-femoral joint paly for pain control.to sustain the effect of distraction an

alternate method of sling is wounded around ankle with stirrup attachment for placement of therapist foot to apply distraction. This allows the therapist to palpate the joint space as the distraction is applied. The intervention was applied continuously for 30 seconds followed by a 10 second rest period. The sequence was repeated 4 times, for a total of 2 minutes of traction mobilization per session. Each participant received three sessions in a week and overall of 6 sessions of manual distraction for a 2 week period.

DATA COLLECTION

The data collection starts at baseline comprising patient profile, pain severity using visual analog scale (VAS), range of motion of knee joint using standard goniometer and KOOS questionnaire. The VAS has a test-retest reliability ranging from 0.71 to0.99[13]. The standard goniometer has high intra-tester reliability and validity[14]. KOOS is a validated outcome instrument for treatment effects in knee osteoarthritis[15]. The inter class correlation coefficients were over 0.75 for all subscales and this indicates needed test-retest reliability. Post intervention values are got after 2 weeks of intervention. The process of data analysis consists of baseline comparison between control and experimental groups, post treatment assessment between groups, pre and post treatment comparison of various variables in control and experimental group. The effectiveness of manual traction on pain, range of motion and functional outcome was analyzed using inferential statistics (two-tailed test). The data analysis was done using SPSS and statistical significance level was set.

RESULTS

The study on forty participants with 14 males and 26 females participated in this experimental study. Finally all forty participants were followed up till the end of the study and were able fulfill to measure all the variables (n=20).The mean age for all participants in control group is 59.10 and in experimental group is 57.35(table 1). All the participants were regular for follow up and there is no missing data.

On comparing the side of involvement, 50% showed right knee involvement and 42.5% has left knee involvement (Table 2)

TABLE-1 PATIENT DEMOGRAPHICS

GROUP		N	Mean	Std. Deviation	Sig. (2-tailed)
AGE	Control	20	59.10	11.073	.598
	Experimental	20	57.35	9.691	

TABLE-2 FREQUENCY AND PERCENTAGE OF SIDEDNESS

		GROUP		Total
		Control (%)	Experimental (%)	
Left	Count	8 (40.0)	9 (45.0)	17 (42.5)
Right	Count	12 (60.0)	8 (40.0)	20 (50.0)
Bilateral	Count	0 (0)	3 (15.0)	3 (7.5)

The mean value for pain severity (VAS) for the control group was 6.70 and after intervention the mean value of VAS was 5.25.The pain severity noted to be declined at a difference of 1.45. The mean value for pain severity (VAS) for the experimental group was 6.85 and after intervention the mean value of VAS was 4.00.The pain severity noted to be declined at a difference of 2.85.The differences in pain severity was statistically significant in experimental group($p<.01$)and no differences were noted in control group.

The mean value for knee flexion range for the control group was 118.25 and after intervention the mean value of flexion range was 119.75.The ROM noted to be minimally increased about 1.50. The mean knee flexion range for the experimental group was 118 and after intervention the mean value increased to 123.50.There is no significant changes in knee flexion after intervention in both the groups ($p<.001$).In experimental group, there is a significant difference in knee flexion ROM($p<.01$)

On analysis of each subscales of KOOS in control group, noted significant differences in subscale for pain, symptoms & ADL($p<.001$)and subscale of sports & recreation showed significant differences($p<.05$).Whereas in experimental group, all the subscales of KOOS were found to be significant($p<-001$).

Overall, all the variables of knee joint specific measures have found to be improved and statistical differences were noted in experimental group then control group.

TABLE-3COMPARISON OF PRE AND POST VALUES BETWEEN CONTROL AND EXPERIMENTAL GROUP

VARIABLES	GROUP	N	PRE	Sig. (2-tailed)	POST	Sig. (2-tailed)
			MEAN±SD		MEAN±SD	
VAS	Control Experimental	20 20	6.70±1.174 6.85±1.182	.689	5.25±1.482 4.00±1.451	.010
ROM	Control Experimental	20 20	118.25±12.169 118.00±18.238	.960	119.75±11.751 123.50±14.428	.373
K_SYMP	Control Experimental	20 20	62.1400±11.19779 64.4610±15.69518	.593	68.2095±9.75733 79.7955±10.98334	.001
K_PAIN	Control Experimental	20 20	57.2060±9.25045 53.7305±10.24725	.267	63.1740±7.85522 70.8080±7.83044	.004
K_ADL	Control Experimental	20 20	65.9505±8.49905 61.7595±9.07849	.140	69.33±8.230 76.24±7.448	.008
K_S&R	Control Experimental	20 20	40.75±23.579 42.00±20.417	.859	44.75±26.030 63.50±12.886	.006
K_QOL	Control Experimental	20 20	55.3125±5.83314 52.1875±11.51997	.286	57.9250±4.74972 61.8750±2.79508	.003

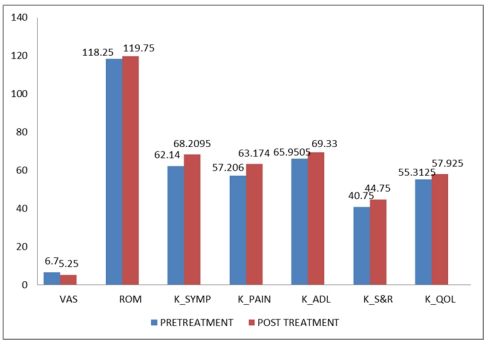

FIGURE 1: PRE AND POST TREATMENT COMPARISON ON VARIOUS VARIABLES IN CONTROL GROUP

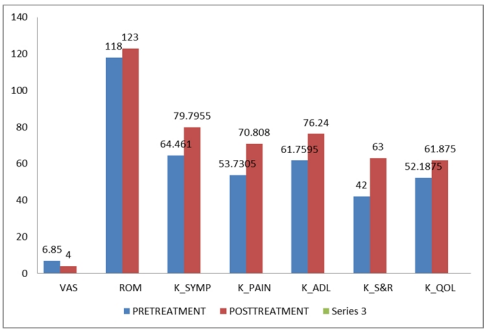

FIGURE 2: PRE AND POST TREATMENT COMPARISON ON VARIOUS VARIABLES IN EXPERIMENTAL GROUP

DISCUSSION

The study to analyse the effectiveness of manual knee traction on the various knee specific variables were analysed. It revealed that there is a significant decrement of pain severity, minimal differences in improvement of knee flexion range and improvement noted in overall functional outcome following six sessions of manual knee traction. The conventional physiotherapy management group showed decrement in pain severity and pain, symptoms, ADL subscales of functional outcome, leaving no differences in other variables.

Osteoarthritis has been largely investigated for pharmacological effects and physical therapy modalities including exercise. Much less emphasis has been placed on the manual therapy approaches. The treatment technique of manual traction to knee joint is not a common principle of practice. Generally traction is applied to vertebral joints and the similar physiological effects are expected at the knee joint also. The results indicated that the long axis distraction technique was successful in reducing self-reported present intensity of osteoarthritic knee pain in the short-term and that this change was statistically significant when compared with a control group. This change in short term pain reduction was also reported[16], who also applied manual therapy for osteoarthritic knee. Previous studies[17,18] reported improvement with exercise have ranged from 8% to 27% decreases in pain and 10% to 39% improvements in function.

The role of manual traction in range of knee flexion is noted to be increased compared to the control group. The increment in knee flexion range is not noted exemplary but compared to the baseline value a difference in ROM is noted. This finding goes in accordance to Sara Maher's study reported on significant change in passive knee flexion.

In physical therapy practice, a valid functional outcome questionnaire is needed to measure the net effects. KOOS was found to an easy tool to administer and it is an extension of WOMAC. All the subscales showed good improvement in functions as in intervention group. A very similar type of study by Gail D in 2000 showed improved WOMAC values following manual therapy in knee. Overall manual knee joint traction showed better improvements in terms of pain relief, increased range of flexion and better functional outcome.

As clearly quoted, any mechanical dysfunction need to be corrected through mechanical means. Hence manual therapy in the form of traction tends to distract the joint at the articular surface level. The mechanics involved in long axis traction is designed to distract the knee and assist in pulling the shortened soft tissues(ligament, capsule).The maneuver may temporarily decrease joint compression allow sufficient fluid mechanics[19]. However, this procedure requires intact ligamentous and capsular structures to operate successfully. It also requires practice by the practitioner to acquire the motor skills necessary to perform the procedure.

The study consisted of 3 treatments per week for 2 consecutive weeks, a total of 6 treatments that produced significant self-reported pain relief and improved functions and quality of life. In the near future estimating the relationship between dosage and outcome pertaining to the present study can be analysed.

The Preliminary findings of this study promote future research for manual therapy protocols being incorporated with exercise regimes in the management of knee joint osteoarthritis. Large Randomised clinical trials should also attempt to address the dosage and duration of treatment required to resolve or manage a condition.

The greater improvement compared with results of previous studies may be due to the manually applied treatment, which allowed the therapist to focus treatment on the specific structures that produced pain and limited function for each patient.

LIMITATIONS

The limitations include a small sample size and short term follow up of findings. The results reveal that better outcome following manual knee traction is only short term responses and long term analysis is needed. On the technical context, treatment technique is applied in one position (high sitting) and other positions as like prone lying traction can be carried out.

CONCLUSIONS

The study concludes and lends support for the use of manual knee traction or distraction of tibio-femoral joint in improving the overall functional outcome in knee osteoarthritis. This study also highlights the importance of manual techniques in restoring the altered mechanics occurring in knee joint pathologies. Hence the study supports the use of manual traction in rehabilitating knee joint arthritis.

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DOES POLARIZED LIGHT THERAPY IMPROVE CHRONIC MAXILLARY RHINOSINUSITIS?

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ABSTRACT:
PURPOSE: *The current study aimed to determine the effectiveness of polarized light on chronic rhinosinusitis.*
METHODS: *Forty patients of both sexes (18 male and 22 female) suffering from chronic rhinosinusitis participated in this study, they were divided randomly into two equal groups. Group (I) treated by placebo polarized light and medical care, while the second group (II) was treated by polarized light and the same medical care as the first group. The treatment course extended up to 4 weeks, the session extended for 10 minutes and applied day after day, evaluation was carried out by the sinusitis symptom score (SSS), assessment was performed before starting the treatment and once more after 4 weeks, paired t test was used to assess the gained results, and the probability value of <0.05 was considered significant.*
RESULTS AND CONCLUSION: *The statistical analysis of the gained results revealed that polarized light therapy was an effective treatment for reducing symptoms of chronic maxillary rhinosinusitis, as evidenced by high decrease in sinusitis symptom score.*

KEYWORDS: Chronic maxillary rhinosinusitis, polarized light, and sinusitis symptom score.

INTRODUCTION

Fluid mechanics is a branch of biomechanics study the mechanical behaviour of fluids inside the human body either blood vessels (arteries and veins), organs as (heart and lung) or cavities as the sinus. As result, there are two types of fluid flow inside the human body, laminar and turbulent flow. The laminar flow occur when object move with low velocity relative to fluid medium and it is characterized by smooth layers of fluid molecules flowing parallel to one another. While the turbulent flow occur when object move with high velocity relative to fluid medium and the layers of fluid near the surface of object. Nature of human body has arranged that the flow in normal condition is laminar while in pathological condition is turbulent[1].

The mechanics of rhinological diseases as allergic rhinitis, polyposis, vasomotor rhinitis, nasal hyper reactivity and chronic sinusitis is very important to understand to put the proper line of treatment either conservative or surgical[2].

Chronic rhinosinusitis (CRS) is a common long term condition and a significant health and socioeconomic problem. It negatively affects the quality of life, might impair function, and results in reduced work place productivity. The etiology of CRS is multifactorial (e.g. viral, bacterial or fungal infection, allergy, and environmental factors). The definition of CRS is based on signs and symptoms. The major symptoms of sinusitis are facial pain, pressure, nasal obstruction, nasal drip, hyposmia (weakness and disturbance of smell), purulence in nasal cavity on examination, and fever with acute episodes. While minor symptoms include headaches, halitosis (bad breath), fatigue, dental pain, cough, and ear pain mix figure 1. The minor symptoms achieve diagnostic significance when one or more of the major symptoms are present. Nasal obstruction or posterior discharge is usually the main complaint in patients with CRS[3].

FIGURE 1: THE FLOOR OF THE MAXILLARY SINUS IS CLOSELY RELATED TO THE ROOTS OF THE SECOND PREMOLAR AND FIRST MOLAR TEETH. THIS CREATES A POTENTIAL ROUTE FOR THE SPREAD OF DENTOGENIC INFECTIONS, AND A TOOTH EXTRACTION MAY CREATE A COMMUNICATION BETWEEN THE ORAL CAVITY AND MAXILLARY SINUS[4]

Sinusitis is one of the most common health care challenges in the United States. The incidence of sinusitis in the United States, as per national census data, has been estimated at 14.1% of the adult population. According to the American Academy of Otolaryngology, this condition leads to direct health care costs of $ 3.4 billion per year and chronic sinusitis alone results in 18 to 22 million US physician office visits annually[5].

CRS has a substantial negative health impact with respect to mood, body pain, energy

level, physical functioning. In some domains of general health medically resistant chronic sinusitis is substantially more debilitating than angina, congestive heart failure, chronic obstructive pulmonary disease, and chronic back pain or sciatica. CRS impacts both patients and the health care system, requiring repeated physician office visits, prescription medications, over the counter medications, and surgical therapy[6].

Rhinovirus is the most common viral pathogen and is easily transmissible.

95% of individuals challenged with intranasal rhinovirus drops became infected, and three quarters of them became symptomatic. Within 10 hours, newly replicating virus was found in the nasal secretions. As confirmed by sinus puncture, Streptococcus pneumoniae, Haemophilus influenza, and Moraxella catarrhalis make up the majority of the community acquired bacterial pathogens. One possible mechanism for introduction of pathogens from the nasal passages into the sinuses may actually be through nose blowing. From biomechanical point of view and in relation to the fluid mechanics, this process creates a negative intra nasal pressure with such force that nasal fluid is propelled from the middle meatus into the sinus cavity[7].

Distinguishing CRS from conditions with similar symptoms is difficult but important. Using CT imaging as the criterion standard, the true prevalence of CRS in patients referred for evaluation of potential CRS based on patient's reported symptoms ranging from 65% to 80%[8]. This prevalence may be accompanied by headache, fever, cough, halitosis, fatigue, dental pain, and other nonspecific signs or symptoms, the differential diagnosis of CRS includes allergic rhinitis, non allergic rhinitis, nasal septal deformity, vasomotor rhinitis, and non rhinogenic causes of facial pain. The later include neurologic disorders, such as vascular headaches, migraine, trigeminal neuralgia, and other facial pain syndromes[9].

Use of intra nasal saline has been shown to decrease nasal symptoms and improve quality of life in allergic rhinitis and CRS. Also nasal saline irrigation mechanically rinses away predisposing agents such as aeroallergens like pollen, and dust. Intra nasal corticosteroids have been shown to relieve symptoms in CRS, but it is unclear if this is due to simply a decrease in nasal congestion or to decreased inflammation in the sinuses themselves. Corticosteroids have multiple immune modulator mechanisms. Topical nasal corticosteroids are a very effective form of treatment for allergic rhinitis and CRS[10].

Polarized light has a selective effect on various cells of the immune system, as well as other biological model systems. It plays a selective cell specific role in the regulation of acute and chronic inflammatory reactions. The use of polarized light in the treatment of wounds accelerates wound closure and from biomechanical point of view increases tensile strength of scars[11].

Bioptron light therapy is ideally suited as a complementary treatment in rehabilitation. It is often required with standard physio-therapeutic procedures and it can be successfully used as an integral part of complex physio-therapeutic procedures for sports injuries, burn, ankle and knee injuries, as well as inflammatory conditions[12].

METHODS

Forty volunteers suffering from chronic maxillary rhinosinusitis, of both sexes (18 males and 22 females), and their age ranged from 35 to 45 years, they were divided randomly into two equal groups. The placebo group (GI), was treated by placebo polarized light therapy (10 min, day after day for 4 weeks), in addition to the routine medical care, while the treatment group (GII) was treated by polarized light therapy (10 min, day after day for 4 weeks) in addition to the routine medical care).

Inclusion criteria:

-All patients suffer from chronic maxillary sinusitis.
-Both sexes were involved.
-Their age ranged from 35 to 45 years old.

Exclusive criteria:

-Pregnancy
-Immune deficiency diseases as AIDS.
-Respiratory diseases as chronic obstructive pulmonary diseases (COPD).
-Patients with photo sensitivity.
-Patients with Hay fever (allergic rhinitis).
-Patients with common cold, tooth ache, or cough.
-Patients with life threatening disorders as renal failure.

Assessment: Sinusitis Symptom Score (SSS) was used to assess the improvement of cases; assessment was carried out before starting the treatment and once more after finishing the course. It involves the most common symptoms of sinusitis including; facial pain, post-nasal drip (PND), nasal obstruction, nasal discharge (ND), hyposmia (smell weakness and disturbance), and cough. And each symptom ranges from absent (0), mild (1), moderate (2), or sever (3); and each patient has to identify his degree on this scale[13].

RESULTS

Statistical analysis of the pretreatment results of both groups revealed no significant

difference between them as shown in table (1) as well as in figure 2.

TABLE 1: STATISTICAL ANALYSIS OF SSS PRETREATMENT FOR BOTH GROUPS

	Placebo group (GI)	Treatment group (GII)
Mean	17.4	17.6
± SD	0.88	0.89
SE	0.19	0.189
t. value	0.71	
p. value	0.65	
Significance	Non- significance	

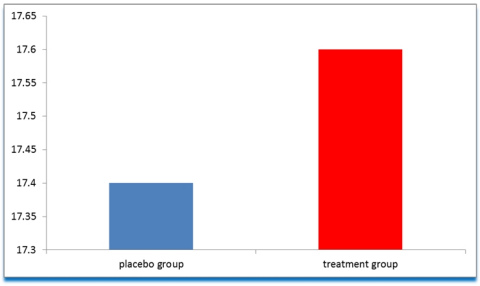

FIGURE 2: MEAN VALUES OF SSS PRE-TREATMENT FOR BOTH GROUPS.

The statistical analysis of pre and post treatment results for the placebo group revealed non significant difference ($p>0.05$). On the other hand the statistical analysis of the gained results for the treatment group pre and post treatment clarified a marked reduction of symptoms and showed a significant improvement ($p<0.05$), as revealed in table (2) and figure (3).

TABLE 2: PRE AND POST RESULTS OF SSS FOR EACH GROUP.

	Placebo group		Treatment group	
	Pre	Post	Pre	post
Mean	17.5	17.55	17.45	7.1
± SD	0.888	0.825	0.887	1.209
SE	0.198	0.184	0.1983	0.2705
t. value	1.0		-23.5	
p. value	0.33		0.001	
Significance	Non Significant		Significant	

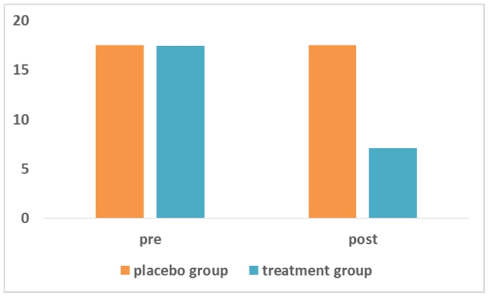

FIGURE 3: MEAN VALUES OF PRE AND POST RESULTS OF SSS FOR EACH GROUP.

On the other hand the statistical analysis of both groups post-treatment showed a significant difference with a clinical and statistical improvement of symptoms in the treatment group than that of the placebo group as explained in table (3) as well as in figure (4).

TABLE 3: STATISTICAL ANALYSIS OF SSS POST- TREATMENT FOR BOTH GROUPS

	Placebo group (GI)	Treatment group (GII)
Mean	17.5	7.5
± SD	0.83	1.3
SE	0.18	0.3
t. value	6.3	
p. value	0.002	
Significance	Significant	

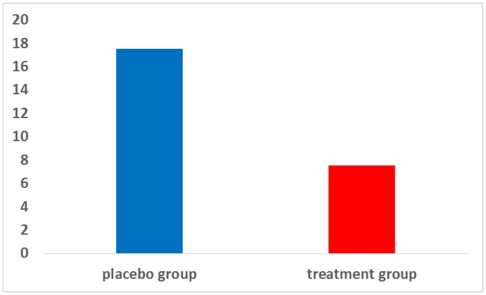

FIGURE 4: MEAN VALUES OF SSS POST-TREATMENT FOR BOTH GROUPS

DISCUSSION

Altland, 2005; reported significant effects of polarized light therapy in relieving symptoms and signs of chronic rhinosinusitis particularly nasal discharging as well as facial pain[14].

Medenicaand, 2004; approved that; visible light therapy could improve the symptoms of allergic rhinitis and sinusitis and might serve as a novel treatment modality. Additional insight into the mechanisms of action, short term and long-term effects, and adverse events are needed[15].

Results of the current study revealed that; there was non-significant difference between the pre and post-treatment means for the placebo group ($p>0.05$).While the pre and post measurements of the treatment group revealed a significant improvement of SSS ($p<0.05$), and such results were supported by the work of Webster, 2005[16].

As well as there was non-significant difference in means of pretreatment measures for both groups ($p>0.05$).

On the other hand the comparison of both groups after treatment revealed a significant improvement in the treatment group than that of the placebo group ($p<0.05$), and these results are in parallel with that of Spector, 2008[17].

The significant improvement of symptom is on line with the work of Nagi, 2005[18], who approved a high effect of intranasal photo

therapy than fexophenadine HCL in reducing clinical symptoms of seasonal allergic rhinitis.

Such significant improvement gained by polarized light therapy (BLT) might be attributed to the biostimulative effects of BLT, which are the results of synergy between different mechanisms of action as; improves microcirculation, harmonizes the metabolic processes, reinforces the human defense system, stimulates regenerative process of the entire organism, promotes wound healing, relives pain or decreases its intensity and general wellbeing. BLT leads to stimulation of neoangiogenesis, increasing phagocytosis, stimulation and activation of ATP production, enhancement of important specific enzymes involved in cell regeneration, increasing the activity and production of collagen, and reducing the excitability of nervous tissue[18,19].

CONCLUSSION

It could be concluded that our results support the expectations that polarized light therapy had valuable effects in treating chronic rhinosinusitis as evidenced by the significant decrease in SSS. The application of the Bioptron light therapy is easy, safe, and non-invasive for such patients, induced greater improvement of signs and symptoms of chronic rhinosinusitis.

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EFFECT OF CRANIOCERVICAL FLEXOR TRAINING AND CERVICAL FLEXOR TRAINING ON SITTING NECK POSTURE IN PATIENTS WITH CHRONIC NECK PAIN; COMPARATIVE STUDY

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ABSTRACT

BACKGROUND & INTRODUCTION: *Poor sitting posture has been implicated in the development and perpetuation of neck pain symptoms. Cervical spine is surrounded by a complex arrangement of muscles that contribute to control of the head & neck. The deep cervical short flexor muscle group(longus colli,longus capitis,rectus capitis anterior & lateralis) is consider to be an important stabilizer of head on neck posture*

SUBJECTS AND METHODOLOGY: *Sixty Nurses with chronic, non severe neck pain were enrolled in this study. These subjects were randomly divided into three groups with twenty in each group and named A, B and C. Group A received craniocervical flexion exercise. Group B received cervico flexion exercise. Group C received both craniocervical flexion exercise and cervical flexion exercise. Neck pain and disability were measured through Numerical Rating Scale (NRS) and Neck Disability Index (NDI). The forward head posture were measured from the Digital Photograph method. The study consisted of exercise session of five weeks with five times in a week.*

RESULTS: *For all groups, Group A (CCF exercise) , Group B (CFexercise) and Group C (CCFexercise and CFexercise) the Mean ±SD values were calculated. Groups were compared Using ANOVA (Analysis of variance).The results of the study suggest that F - values for Craniovertebral angle for Group A , Group B and Group C are 14.54(P<0.001) , 11.073(P<0.001) and 21.15 (P<0.001)respectively. The F- values for NDI for Group A, Group B and Group C are 63.90(P<0.001) , 53.04(P<0.001) and 67.338(P<0.001). At last the F- values for NRS for Group A, Group B and Group C are 145.524(P<0.001), 122.06 (P<0.001)and 152.46(P<0.001) respectively .The result further suggests that Group C is more effective in comparison to the Group A and Group B.*

CONCLUSION: *This study concludes that combination of both craniocervical flexion exercise and cervical flexion exercise improves forward head posture and reduce neck pain and disability significantly than the individual craniocervical flexion exercise and cervical flexion exercise in nurses with chronic nonspecific neck pain.*

KEYWORDS: CCF, CF, DNF, FHP, LC, NDI, NRS, SCM

INTRODUCTION

Cervical spine is surrounded by a complex arrangement of muscles that contribute to control of the head & neck. The deep cervical short flexor muscle group(the longuscolli,longus capitis,rectus capitis anterior & lateralis) is consider to be an important stabilizer of head on neck posture[2,3].

Deep cervical flexor muscles act over anterior aspect of upper & middle section of cervical spine[4]. Deep cervical flexor muscles are small stabilizing muscles located on anterior & anterior-lateral surface of cervical spine & are deep to the sternocleidomastoid muscle[5].Rectus capitis anterior & lateralis course from the atlas to the basilar & jugular part of occiput respectively.Longus capitis attaches below to the transverse process of 3rd to 6th cervical vertebra & above to basilar part of occiput[5].

NEED OF STUDY

The need of present study will be to find the individual effect of craniocervical flexor training & cervical flexor training on forward head posture, and to find the combine effect of both craniocervical flexor exercise & cervical flexor exercise on forward head posture & chronic neck pain.

AIMS AND OBJECTIVES OF THE STUDY:

1) To find the effectiveness of craniocervical flexion exercise as compared to cervical flexion exercise on forward head posture.
2) To find the effectiveness of craniocervical flexion exercise as compared to cervical flexion exercise on chronic neck pain.
3) To find the combine effect of both craniocervical flexion exercise & cervical flexion exercise on forward head posture.
4) To find the combine effect of both craniocervical flexion exercise & cervical flexion exercise on chronic neck pain.

EXPERIMENTAL HYPOTHESIS:

There will be significant differences with combination of both craniocervical flexion exercise and cervical flexion exercise on forward head posture & neck pain and disability as compared to individual craniocervical exercise and cervical flexion exercise.

METHODOLOGY

Research Approach: Experimental approach but comparative in nature is chosen for conducting the present study.

Study Design: Experimental study

INCLUSION CRITERIA

1) Age: 20-30years.
2) Forward head posture
3) History of chronic, non sever neck pain more than 3 months
4) Patients who have mild neck pain & disability scoring 5-15 on Neck Disability Index
5) Poor performance (unable to achieve 24 mm hg) on clinical test of craniocervical flexion.

EXCLUSION CRITERIA

1) People with more severe neck pain (disability scoring more than15 on Neck Disability Index).
2) History of fracture or trauma around cervical spine
3) History of surgery around cervical spine
4) Patient suffering from vertigo and dizziness
5) Patients having congenital disorders cervical rib, torticollis, thoracic outlet syndrome
6) Any neurological disorder

DEPENDENT VARIABLES

1) Forward head posture
2) Neck pain

INDEPENENT VARIABLES

1) Craniocervical flexor exercise
2) Cervical flexor exercise

PROCEDURE

The subjects were randomized into 3 exercise groups.

GROUP A: Craniocervical flexor training intervention.

GROUP B: Cervical flexor training intervention.

GROUP C: Both craniocervical flexor training and cervical flexor training intervention.

Postural analysis was performed before the intervention, after 2 weeks of intervention and after 5-week intervention for the three groups.

The exercise regimens were conducted over a 5-week period, 5 times in a week and none of the exercise sessions were longer than 30 minutes. The exercises were performed without any provocation of neck pain.

GROUP A:

The exercise was performed in supine position. The sphygmomanometer was used for exercise, the cuff of it placed sub-occipitally to monitor the flattening of cervical lordosis that occurs with longus colli's contraction. Subjects were guided by feedback to sequentially reach 5 pressure target in 2 mm Hg increments from a baseline of 20mm Hg to the final level of 30mm Hg. Subjects were instructed to gently nod their head as though they were saying 'yes'. Therapist identified the target level that the subject could hold steadily for 10 sec. For each target level, the contraction duration was increased to 10 sec & subject trained to perform 10 repetitions. At this stage, the exercise was progressed to train at the next target level. The exercise is a low-load exercise in nature to more specifically train the deep cervical flexors, rather than the neck flexors as a whole, which occurs in a head, lift exercise.

GROUP B:

The subjects under this group had been undergone the endurance-strength training. The endurance-strength training regimen consisted of a progressive resistance exercise program for the neck flexors. The exercise was performed in supine position, with the head supported in a comfortable resting position. Subjects were instructed to lift up their head so that cervical flexion occurred while maintaining a neutral upper cervical spine position. The subjects slowly moved the head and neck through as full a range of motion as possible without causing discomfort. This exercise regimen was a 2-stage program.

The first stage was of 2weeks' duration and the second was of 3 weeks' duration for initiating a weight program in previously untrained individuals. In stage 1, the subjects performed 12 to 15 repetitions with a weight that they could lift 12 times (12-repetition maximum [RM]) on the first training session and progressed to 15 repetitions and maintained this level for the remainder of the 2-week period.

In stage 2, the subjects performed 3sets of 15 repetitions of the initial 12-RM load once per day. One minute rest intervals were provided between sets.

GROUP C:

The subjects under this group had been gone for both craniocervical flexor and cervical flexor intervention with the same protocols as above for 5 week.

RESULT

This chapter deals with the results obtained after the statistical analysis. Statistics were performed by using software package SPSS 13 and SIGMASTATE. Results were calculated using 0.05 level of significance ($P<0.05$). Groups were compared by using ANOVA (Analysis of variance).For ANOVA results were concluded using 0.01 of significance ($P<0.01$).

The study consisted of three experimental groups A, B and C. Each group consisted of 20 subjects:

Group A: Craniocervical flexor training intervention.

GROUP B: Cervical flexor training intervention.

GROUP C: Both craniocervical flexor training and cervical flexor training intervention.

TABLE 1: MEAN AND SD OF AGE FOR THE SUBJECTS OF GROUP A, GROUP B AND GROUP C

	GROUP A	GROUP B	GROUP C
	Mean±SD	Mean±SD	Mean±SD
AGE	21.05O±3.236	20.000±0.000	21.150±2.943

TABLE 2: MEAN AND SD OF CRANIOVERTEBRAL ANGLES BEFORE INTERVENTION, AFTER 2 WEEKS AND AFTER 5 WEEKS FOR THE SUBJECTS OF GROUP A, GROUP B AND GROUP C

Session	Group A		Group B		Group C	
	Mean	SD	Mean	SD	Mean	SD
Before Rx	46.75	4.43	43.9	5.14	46.95	4.43
After 2 weeks	49.5	2.83	48.4	5.3	51.6	4.83
After 5 weeks	52.85	2.84	52	5.14	56.25	4.78

TABLE 3: COMPARISON OF MEAN VALUES OF CARNIOVERTEBRAL ANGLE OF GROUP A, GROUP B & GROUP C AT INTERVALS PRE- 2 WEEK, 2 WEEK-5WEEK, PRE- 5 WEEK

Carnivertebral angle	Group A		Group B		Group C	
	t-	P	t	p	t	p
Pre- 2 week	9.28	<0.05	9.52	<0.05	8.47	<0.05
2 week-5week	10.63	<0.05	11.103	<0.05	11.16	<0.05
Pre- 5 week	18.16	<0.05	17.926	<0.05	18.21	<0.05

TABLE 4: MEAN AND SD OF NRS BEFORE INTERVENTION, AFTER 2 WEEKS AND AFTER 5 WEEKS OF INTERVENTION OF GROUP A, GROUP B AND GROUP C

Session	Group A		Group B		Group C	
	Mean	SD	Mean	SD	Mean	SD
Before Rx	3.75	0.44	3	0.47	3.9	0.308
After 2 weeks	2.3	0.57	2.1	0.5	2	0.48
After 5 weeks	0.55	0.605	0.4	0.5	0.80	0.41

TABLE 5: COMPARISON OF MEAN VALUES OF NRS OF GROUP A, GROUP B & GROUP C AT INTERVALS PRE- 2 WEEK, 2 WEEK-5WEEK, PRE- 5 WEEK

NRI	Group A		Group B		Group C	
	t	p	t	p	t	p
Pre- 2 week	12.70	<0.05	12.704	<0.05	12.70	<0.05
2 week-5week	16.05	<0.05	14.24	<0.05	14.24	<0.05
Pre- 5 week	29.0	<0.05	18.006	<0.05	20.56	<0.05

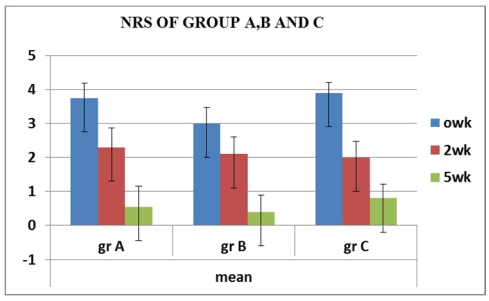

FIGURE 1: NRS OF GROUPS A, B AND C

TABLE 6: MEAN AND SD OF NDI BEFORE INTERVENTION, AFTER 2 WEEKS AND AFTER 5 WEEKS FOR THE SUBJECTS OF GROUP A, GROUP B AND GROUP C

Session	Group A		Group B		Group C	
	Mean	SD	Mean	SD	Mean	SD
Before Rx	6.9	2.4	5.9	1.43	7.3	2.36
After 2 weeks	4.05	1.05	3.9	1.25	4.95	1.84
After 5 weeks	1.45	0.826	1.35	1.04	1.80	0.696

TABLE 7: COMPARISON OF MEAN VALUES OF NDI OF GROUP A, GROUP B & GROUP C AT INTERVALS PRE- 2 WEEK, 2 WEEK-5WEEK, PRE- 5 WEEK

NDI	Group A		Group B		Group C	
	t	p	t	p	t	p
Pre- 2 week	8.14	<0.05	8.34	<0.05	7.85	<0.05
2 week-5week	17.08	<0.05	9.57	<0.05	9.87	<0.05
Pre- 5 week	18.16	<0.05	10.06	<0.05	12.27	<0.05

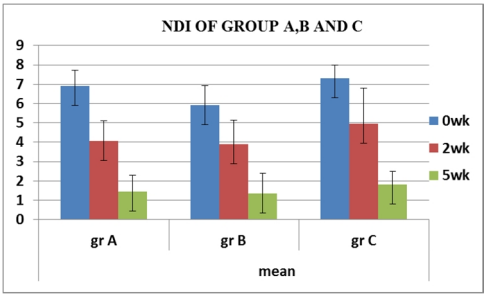

FIGURE 2: NDI OF GROUP A, B AND C

TABLE 8: COMPARISON OF F-VALUE FOR CRANIOVERTEBRAL ANGELE, NRS, NDI BETWEEN GROUP A, GROUP B AND GROUP C

Variable	Group A		Group B		Group C	
	F	P	F	P	F	P
Craniovertebral angle	14.546	0.0067	11.073	0.0073	21.155	0.0064
NRS	145.524	0.0053	122.03	0.0071	152.465	0.0043
NDI	63.903	0.0081	32.208	0.0082	67.338	0.0077

DISCUSSION

The present study was performed on 60 subjects of age group 20-40 years to know the individual effectiveness of craniocervical flexion exercise, cervical flexion exercise and combine effect of both craniocervical exercise and cervical flexion exercise on forward head posture, pain and disability in subjects with chronic nonspecific neck pain.

Subjects were divided into 3 groups with 20subjects in each group. Subjects in Group A were treated with Craniocervical flexion exercise. Subjects with Group B were treated with cervical flexion exercise and subjects in group C were treated with both craniocervical flexion exercise and cervical flexion exercise.

Results showed that combination of both craniocervical flexion exercise and cervical

flexion exercises is highly effective in improving forward head posture, pain and disability in Nurses with neck pain than the individual craniocervical flexion exercise and cervical flexion exercise with respective F-values 11.073(P=0.0064),152.46(P=0.0043),88.03(0.0077) in Group C.

Group A which underwent CCFE also showed highly significant improvement in FHP, decrease pain and decrease disability than Group B which undergone CFE with F value of craniovertebral angle of Group A and Group B 14.546(P=0.0053) & 11.073(P=0.0071), F value of NRS of Group A and Group B 14.524(P=0.0081) &122.06(P=0.0082) and F value of NDI 63.90 & 32.208 respectively.

Result shows that Group C showed better improvement than the Group A and Group B. Thus result support our experimental hypothesis- There will be significant differences with combination of both craniocervical flexion exercise and cervical flexion exercise on forward head posture & neck pain and disability as compared to individual craniocervical exercise and cervical flexion exercise.

Group C showed significant reduction in pain on NRS with F value 152.465 compared to Group A and Group B which having F values145.524, 122.03 for NRS respectively. There is significant reduction in pain intensity but Group C showed greater reduction than the Group A and Group B. In Group C subjects underwent both CCF exercise and CF exercise, in which CF exercise concentrated on both deep and superficial neck muscles and CCF exercise concentrate on DCF muscles.

In this study, CCF exercise was done by using sphygmomanometer as feedback for retraining the DCF muscles and it showed significant improvement in the performance of the DCF muscle, thus this study is supported by the above researches for the use of CCF action for retraining the DCF muscles.

Group A, Group B and Group C showed significant improvement in FHP.F values for craniovertebral angle of Group A, Group B and Group C are 14.546, 11.073, 21.155 respectively. This showed that subjects in group C who underwent combination of both CCF exercise and CF exercise showed significant improvement in FHP compared to the Group A and Group B.

Patients with chronic neck pain may tend to develop an increased cervical lordotic posture associated with a forward head posture, and had less cervical backward bending. A sustained forward flexion posture of spine has been associated with increased cervical compressive loading and creep response in the connective tissue. Poor isometric performance of the cervical short flexor muscle has been observed in females with chronic cervical origin headache and forward resting head posture.

In this study CCF exercise, CFT exercise and combination of both CCF exercise and CF exercise are used as the intervention. Previous research proved that CCF exercise and CF exercise individually effective in reducing chronic neck pain by improving performance of DNF muscles. Previous study showed that anterior head weight bearing reduce the forward head posture, which is shown in this study also in Group B. CF exercise is effective in reducing myoelectrical manifestation of superficial cervical flexor muscle fatigue as well as increasing cervical flexion strength in a group of patients with chronic non sever neck pain[5].

In this study we also found that CCF exercise is significant than the CF exercise to improve forward head posture and to reduce neck pain and disability. Previous study showed the effect of CCF exercise and CF exercise individually and found CCF exercise better than the CF exercise to reduce neck pain and disability. But none of the study has been shown the combine effect of both CCF and CF exercises on neck pain and forward head posture. This study used the combination of both CCF and CF exercise and showed that combination of both exercises is more effective than the individual CCF exercise and CF exercise and also showed that CCF exercise is effective than the CF exercise to improve FHP and to reduce the neck pain and disability.

Combination of both CCF exercise and CF exercise strengthen the DCF mainly and also superficial neck flexors, improved the endurance of DCF, retrained the DCF.CCF exercise mainly strengthen the DCF muscles only and CF exercise improve the endurance of deep and superficial neck muscles. Due to this reason combination of both exercise showed the highest significant improvement in FHP and neck pain and disability compared to the individual CCF exercise and CF exercise.

According to the result of this study if the combination of both CCF exercise and CF exercise is used in chronic nonspecific neck pain patient then it will be so beneficial to improve FHP and reduce neck pain and disability.

CONCLUSION

The study concluded that both combine CCF and CF exercises are better in improving forward head posture and reducing neck pain and disability in Nurses having neck pain than the individual CCFE and CFE .The Craniocervical flexion exercise is more effective than Cervical flexion exercises.

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EFFECT OF BALANCE EXERCISES ON BALANCE, PAIN AND FUNCTIONAL PERFORMANCE IN OSTEOARTHRITIS KNEE

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ABSTRACT

BACKGROUND AND PURPOSE: *Traditionally, rehabilitation programs Improves muscle strength and proprioception which may reduce the progression of knee OA. The purpose of the study to evaluate the effect of balance exercises in improving balance, functional performances and decreasing pain in osteoarthritis knee.*

METHODS: *30 patients meeting the inclusion criteria was randomly divided into groups. Subjects received one hour individualized training sessions. Group A received quads. Sets, SLR, Flexion-extension and 20 mins short wave diathermy. Exercises are performed 30 repetitions of each exercise (3 sets of 10 repetitions). Group B received strengthening exercises as well as balance exercises which includes Side stepping, Front and backward, crossover steps during forward ambulation, Retrowalking etc. Exercises were performed 5 days in a week for 4 weeks. Step Test, Functional Reach Test, WOMAC Questionnaire, Visual Analogue Scale were the outcome measure and their scores for all groups were taken prior and after the training.*

RESULTS: *Pre test and post test outcome measures (VAS, WOMAC, Step test and FRT) of two independent groups were compared by repeated measures analysis of variance (RM ANOVA) using general linear models (GLM) and the significance of mean difference within and between the groups was done by Newman-Keuls post hoc test. And the results revealed that post intervention scores were highly significant (p 0.05) in group B and performed better than group A.*

CONCLUSION: *In conclusion, Study found both the balance exercises effective in improving balance, functional performance and decreasing pain in osteoarthritis knee but Group B was found to be significantly more effective than Group A.*

KEYWORDS: Osteoarthritis, Balance, step test, WOMAC, Functional reach test, visual analogue scale

INTRODUCTION

Knee osteoarthritis (OA) is one of the most prevalent musculoskeletal complaints worldwide, affecting 30–40% of the population by the age of 65 yr[28,50]. Osteoarthritis is the common form of arthritis, with an associated risk of mobility and disability[12]. The knee is the most frequently involved joint of the lower limb in OA. The prevalence of knee OA increases with age because aged cartilage is more vulnerable to physiologic load, and the resulting load across the articular surface changes mechanical, neural and surrounding muscles of the knee[18].

In people at risk, local mechanical factors such as misalignment, muscle weakness, or alterations in the structural integrity of the joint environment (such as meniscal damage) facilitate the progression of the disease[12]. Knee pain could influence balance control via effects on proprioceptive input, central processing of information and efferent output to activate appropriate limb and trunk muscles[6,30,33,50]. Control of balance is dependent upon sensory input from the vestibular, visual and somatosensory systems. Central processing of this information results in coordinated neuromuscular responses that ensure the centre of mass remains within the base of support in situations when balance is disturbed[18,30,45]

Hassan B, Mockett S et al in 2001, Hinman R, Bennell K et al in 2002, Jadelis K, Miller M et al in 2001 and K.L. Bennell, R.S.Hinman in 2004 have demonstrated a relationship between the severity of knee pain and balance whereby greater knee pain is associated with poorer balance[30,33,45]. The term proprioception encompasses both the sensations of the joint movement (kinesthesia) and the joint position sense (JPS). Both components of lower limb proprioception seem integral for the regulation of balance and postural control[48].

Lack of proprioceptive sensation causes altered gait and unphysiological joint loading; slowly progressive joint degeneration may follow[10]. Improvement in muscle strength and proprioception gained from exercise may reduce the progression of knee OA[16]. Purpose of the study is to evaluate the effect of balance exercises in improving balance, functional performances and decreasing pain in osteoarthritis knee.

Four scale are used to assess the outcomes of both interventions. They are Step Test, Functional Reach Test, WOMAC Questionnaire, Visual Analogue Scale, These

scales have good reliability and validity. These scales have been selected for study because

1.They are very simple to administer

2.They are quick and practical.

3.They are easy to be conducted in Indian clinical setting

METHODS

Selection and description of participation:

Total 30 patients out of 35 patients meeting the inclusion criteria were selected. 30 subjects were selected on the basis of inclusion criteria from Modern physiotherapy centre and Shanti Gopal Hospital, Ghaziabad.

To participate subjects had to meet the inclusion criteria: (i) Primary osteoarthritis on bilateral knee joint of age > 50 yrs. (ii) Knee pain on most of the previous month. [Average pain > 3 cm on a 10-cm Visual Analogue Scale (VAS)] (iii) Experience pain and / or difficulty when getting up from sitting or climbing stairs. (iv) Demonstrated osteophytes on X-RAY. [Grade II or greater kellgren and Lawrence grading system].

Exclusion criteria for the patients were- (i) Reported a cold or ear infection within previous month. (ii)History of dizzy spells, fainting episodes. (iii) Light headaches. (iv)Secondary osteoarthritis. (v) Past history of lower limb joint replacement. (vi) Neurological disorder.

Procedure

30 patients meeting the inclusion criteria was randomly divided into two groups (Group A and B) each consisting of 15 subjects.

Group A: Received strengthening exercises and SWD.

Group B: Received strengthening and balance exercises.

Before starting the exercises, patients were given hot pack for 20 min.

Group (A) protocol consists of strengthening exercises which includes [46]:

1)Quads Sets.

2)SLR.

3)Knee flexion, Extension.

Exercises are performed 30 repetitions of each exercise (3 sets of 10 repetitions).

Patients were also given SWD for 20 min by placing malleable electrodes around the affected knee.

Group (B) protocol consists of strengthening exercises as well as balance exercises which includes [15, 32]:

1)Side stepping

2)Front and backward crossover steps during forward ambulation

3)Retrowalking

4)Multiple change in direction during walking on physiotherapist command

5)Tilt board balance training

6)Sitting down and standing up from high chair

7)Sitting down and standing up form low chair.

Exercises were performed 5 days in a week for 4 weeks.

STATISTICS

Data were summarized as Mean ± SD. Demographic continuous variable (age) of two independent groups (Group A: Control, Group B: Intervention) were compared by Student's t test while discrete data (sex) were analyzed with Fisher's exact test. The pre test and post test outcome measures (VAS, WOMAC, Step test and FRT) of two independent groups were compared by repeated measures analysis of variance (RM ANOVA) using general linear models (GLM) and the significance of mean difference within and between the groups was done by Newman-Keuls post hoc test. A two-tailed (α=2) probability $p<0.05$ was considered statistically significant. All analyses were performed on SPSS (version 15.0).

RESULT

Demographic characteristics-

All the two groups were matched in terms of age and gender.

Sex

The sex proportions (M/F) of two groups (Group A: Control and Group B: Intervention) were shown graphically in figure 1. In both the groups, the proportions of females were higher than males, but their proportions did not differed between the two groups i.e. found to be statistically the same (M/F: 5/10 vs. 4/11, p=1.0000). In other words, the subjects of two groups were sex matched.

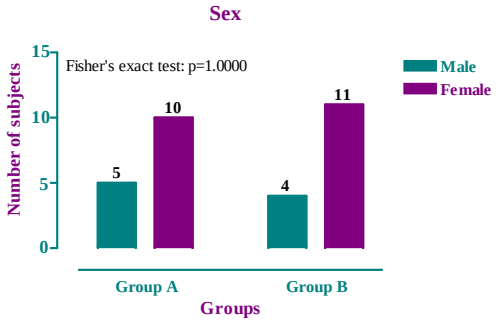

FIGURE 1: FREQUENCY DISTRIBUTION OF SEX IN TWO GROUPS

Age

The age of two groups were A ranged from 50-70 yrs with mean (± SD) 58.40 ± 5.82 yrs while of Group B it ranged from 50-69 yrs with mean (± SD) 58.87 ± 5.80 yrs. The mean age of Group A and Group B did not differed significantly (p>0.05) i.e. found to be statistically the same (58.40 ± 5.82 vs. 58.87 ± 5.80, p=0.8275). In other words, the subjects of two groups were age matched.

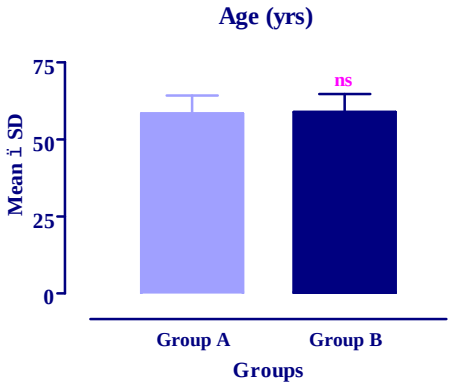

FIGURE 2: BAR GRAPH SHOWS MEAN (± SD) AGE OF TWO GROUPS AND ALSO COMPARES THE AGE BETWEEN THE GROUPS

Outcome measures

VAS

Comparing (figure 3) the mean VAS scores within the groups (i.e. between periods or pre test vs. post test), the VAS scores decreased significantly (p<0.001) in Group A (7.93 ± 0.70 vs. 3.40 ± 0.99, p=0.0001) and Group B (7.53 ± 0.74 vs. 1.67 ± 0.90, p=0.0001) at post test as compared to pre test.

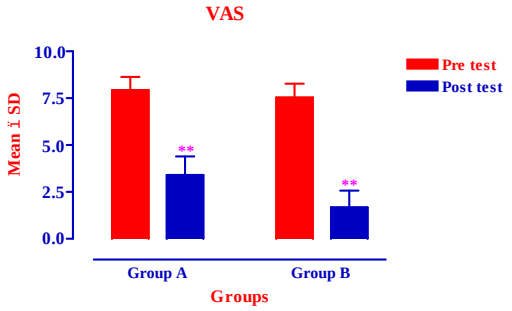

FIGURE 3: BAR GRAPH SHOWS MEAN (± SD) VAS SCORES OF TWO GROUPS AT PRE TEST AND POST TEST AND ALSO COMPARES THE SCORES BETWEEN THE PERIODS (WITHIN GROUPS). **- P<0.001

Similarly, comparing (figure 4) the mean VAS scores between the groups (Group A vs. Group B), the VAS scores did not differed between the two groups at pre test (7.93 ± 0.70 vs. 7.53 ± 0.74, p=0.1982) while differed significantly at post test (3.40 ± 0.99 vs. 1.67 ± 0.90, p=0.0001). In other words, VAS scores were comparable at baseline (pre test) and at post test (at the end of 4 wk or after 4 wks of treatment), the VAS decreased significantly more in Group B than group A.

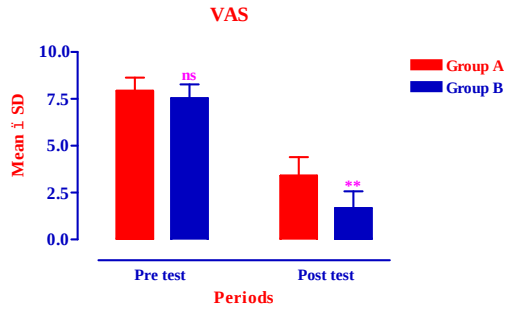

FIGURE 4: BAR GRAPH SHOWS MEAN (± SD) VAS SCORES OF TWO GROUPS AT PRE TEST AND POST TEST AND ALSO COMPARES THE SCORES BETWEEN THE GROUPS (WITHIN PERIODS). NS- P>0.05, **- P<0.001

WOMAC

Comparing (figure 5) the mean WOMAC scores within the groups, the WOMAC scores decreased significantly (p<0.001) in Group A (58.40 ± 3.14 vs. 34.20 ± 1.42, p=0.0001) and Group B (59.67 ± 3.60 vs. 25.67 ± 2.02, p=0.0002) at post test as compared to pre test.

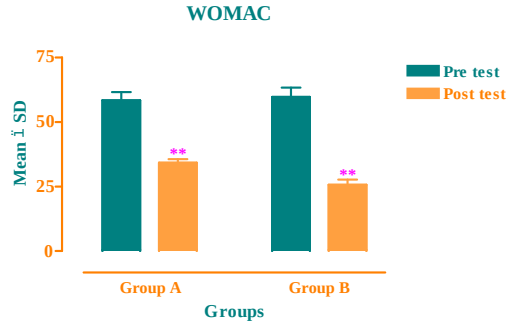

FIGURE 5: BAR GRAPH SHOWS MEAN (± SD) WOMAC SCORES OF TWO GROUPS AT PRE TEST AND POST TEST AND ALSO COMPARES THE SCORES BETWEEN THE PERIODS (WITHIN GROUPS). **- P<0.001

Similarly, comparing (figure 6) the mean WOMAC scores between the groups, the WOMAC scores did not differed between the two groups at pre test (58.40 ± 3.14 vs. 59.67 ± 3.60, p=0.2028) while differed significantly at post test (34.20 ± 1.42 vs. 25.67 ± 2.02, p=0.0001). In other words, WOMAC scores were comparable at baseline (pre test) and at post test (at the end of 4 wk or after 4 wks of treatment), the WOMAC decreased significantly more in Group B than group A.

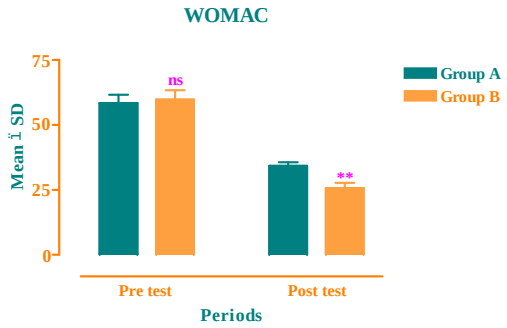

FIGURE 6: BAR GRAPH SHOWS MEAN (± SD) WOMAC SCORES OF TWO GROUPS AT PRE TEST AND POST TEST AND ALSO COMPARES THE SCORES BETWEEN THE GROUPS (WITHIN PERIODS). NS- P>0.05, **- P<0.001

Step test

Comparing (figure 7) the mean step test scores within the groups, the step test scores increased significantly (p<0.001) in Group A (7.20 ± 0.86 vs. 10.33 ± 0.98, p=0.0001) and Group B (7.67 ± 1.05 vs. 13.07 ± 1.22, p=0.0001) at post test as compared to pre test

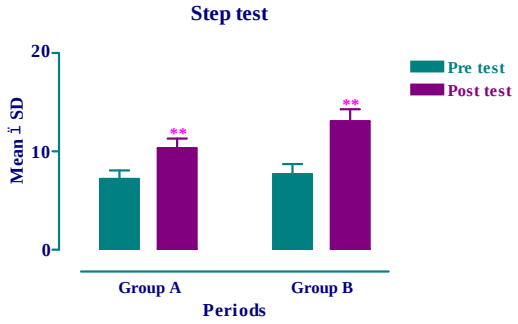

FIGURE 7: BAR GRAPH SHOWS MEAN (± SD) STEP TEST SCORES OF TWO GROUPS AT PRE TEST AND POST TEST AND ALSO COMPARES THE SCORES BETWEEN THE PERIODS (WITHIN GROUPS). **- P<0.001

Similarly, comparing (figure 8) the mean step test scores between the groups, the step test scores did not differed between the two groups at pre test (7.20 ± 0.86 vs. 7.67 ± 1.05, p=0.2226) while differed significantly at post test (10.33 ± 0.98 vs. 13.07 ± 1.22, p=0.0001). In other words, step test scores were comparable at baseline (pre test) and at post test (at the end of 4 wk or after 4 wks of treatment), the step test increased significantly more in Group B than group A.

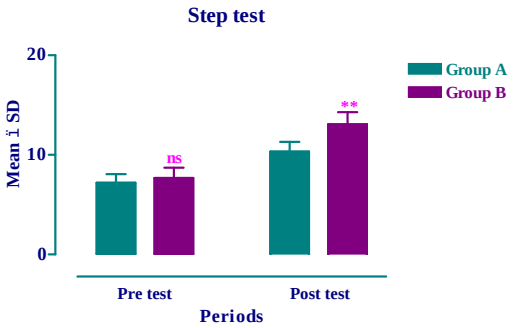

FIGURE 8: BAR GRAPH SHOWS MEAN (± SD) STEP TEST SCORES OF TWO GROUPS AT PRE TEST AND POST TEST AND ALSO COMPARES THE SCORES BETWEEN THE GROUPS (WITHIN PERIODS). NS- P>0.05, **- P<0.001

FRT

Comparing (figure 9) the mean FRT scores within the groups, the FRT scores increased significantly (p<0.001) in Group A (4.53 ± 0.86 vs. 6.91 ± 1.03, p=0.0001) and Group B (4.84 ± 0.87 vs. 7.56 ± 0.62, p=0.0001) at post test as compared to pre test.

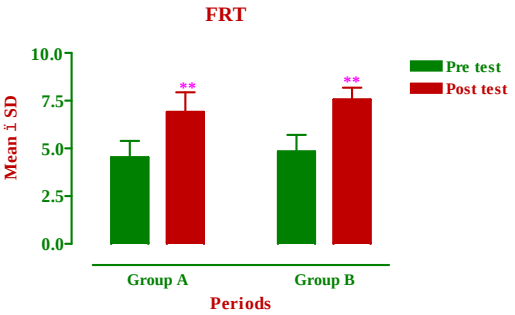

FIGURE 9: BAR GRAPH SHOWS MEAN (± SD) FRT SCORES OF TWO GROUPS AT PRE TEST AND POST TEST AND ALSO COMPARES THE SCORES BETWEEN THE PERIODS (WITHIN GROUPS). **- P<0.001

Similarly, comparing (figure 10) the mean FRT scores between the groups, the FRT scores did not differed between the two groups at pre test (4.53 ± 0.86 vs. 4.84 ± 0.87, p=0.3257) while differed significantly at post test (6.91 ± 1.03 vs. 7.56 ± 0.62, p=0.0411). In other words, FRT scores were comparable at baseline (pre test) and at post test (at the end of 4 wk or after 4 wks of treatment), the FRT increased significantly more in Group B than group A.

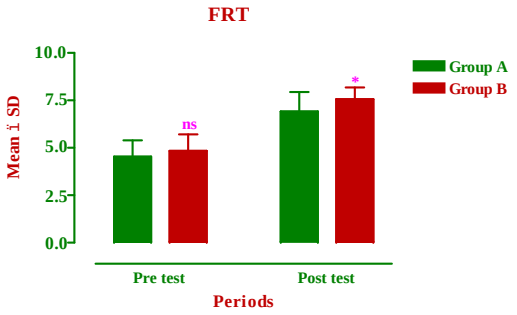

FIGURE 10: BAR GRAPH SHOWS MEAN (± SD) FRT SCORES OF TWO GROUPS AT PRE TEST AND POST TEST AND ALSO COMPARES THE SCORES BETWEEN THE GROUPS (WITHIN PERIODS). NS- P>0.05, *- P<0.05

DISCUSSION

This study consisted of two groups- group A (control) and group B (Experimental). The subjects of group A were given Strengthening exercises and SWD and group B were given Strengthening exercises as well as balance exercises. The main findings were that both the group shown significant improvement in VAS, WOMAC, Step test and FRT.

Demirhan Diracoglu, Resa Aydin et al in 2005 studied the effect of kinesthesia and balance exercises in knee osteoarthritis. They measure change in functional status, isokinetic muscle strength and proprioceptive sense accuracy. Significant changes were detected in the kinesthesia group. They conclude that addition of kinesthesia and balance exercises that help neuromuscular restoration to standard strengthening exercises provides dynamic muscle strength increase with significant recoveries in the functional status of the patients[15].

There is also improvement in group A (control) that may be because of previous study by Kristen Jadelis, Michael E. Miller et al in 2001 concluded that strength also appears to play a significant role in maintaining balance in an older, osteoarthritic population. They showed that quadriceps weakness in older adults with knee OA plays an important role in physical function[33].

R. S. Hinamn, K.L. Bennell et al in 2002 showed that deficits in lower limb proprioception and muscle strength are associated with knee OA and thus may be postulated as a cause of impaired balance. Pain associated with the osteoarthritis knee may play a role in balance impairments[50].

Volga Bayracki Tunay et al, given strengthening exercises and proprioceptive training in order to improve proprioceptive sense which is part of balance during functional activities. They show improvement in pain and proprioception[59].

Strengthening exercises were given because of previous study that shows the importance of these exercises in knee OA. Robert Topp et al, exercises can reduce pain and increase the perceived and actual functional abilities of OA patients[53].

Hu and Woollacott suggested that general exercise programs are less effective than programs that target a specific system (e.g. visual, vestibular, somatosensory) that functions to maintain balance. Ufuk sekir et al concludes that short term proprioceptive/ balance training improves balance and proprioception in older OA patients[59].

VAS is used in this study for pain assessment. VAS is regarded as a valid and reliable tool for pain measurement[49].

WOMAC questionnaire is commonly used in evaluating physical function and is often used in knee osteoarthritis. Evcik et al evaluated the functional capacity and pain by using VAS and WOMAC in patients with knee OA. There is moderate relationship between the WOMAC scores and pain levels[59].

Step test is used for balance assessment and it is an easy to use and well known reliability and validity. Step test is a functional and dynamic test of standing balance[6].

FUTURE RESEARCH

Future research could be done by comparing various balance exercise in different grades of osteoarthritis. Assessment of static balance in knee OA are also need consideration in future studies.

RELEVANCE TO CLINICAL PRACTICES

This study shows that patient with knee OA shows improvement in balance and functional performance and decrease pain by performing strengthening and balance exercises as compare to those who are performing only strengthening exercises. Thus, balance exercises should be incorporated along with strengthening exercises in Knee OA patients to improve balance, functional performance and decreasing pain.

Conclusion

Study found both the balance exercises effective in improving balance, functional performance and decreasing pain in osteoarthritis knee but Group B was found to be significantly more effective than Group A. The VAS, WOMAC, step test and FRT improved 1.36, 1.38, 1.62 and 1.07 times more respectively in patients those who received the Group B than those who received the Group A.

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EFFECTIVENESS OF SCAPULAR STABILITY EXERCISES IN THE PATIENT WITH THE SHOULDER IMPINGEMENT SYNDROME

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ABSTRACT

BACKGROUND AND OBJECTIVES: *The scapular musculature is often neglected in the evaluation and treatment of shoulder injuries lead to scapular dysfunction which results in altered biomechanics of the shoulder girdle. Therefore this study was designed to compare the effectiveness of Conventional Physiotherapy plus scapular stability exercises and Conventional Physiotherapy alone on pain and functional status of the patients with shoulder impingement syndrome.*

MATERIALS AND METHOD: *Samples of 60 subjects with Shoulder Impingement Syndrome were divided randomly into two groups, control group and clinical trial group. Each subject was treated for a period of 4 weeks, 6 days a week, one session per day. Pre treatment and post treatment assessment was done using visual analogue scale (VAS), shoulder pain and disability index(SPADI) and lateral scapular slide test(LSST).*

RESULT: *Paired and Unpaired t-tests were used for comparing control and clinical trial groups for post-treatment effects. Both the groups shows improvement but Clinical Trial group showed extremely significant improvement in VAS, SPADI and LSST score as compared to Control group.*

INTERPRETATION AND CONCLUSION: *Conventional exercise therapy plus scapular stability exercises is more effective than Conventional exercise therapy alone in improving pain and functional disability in Shoulder Impingement Syndrome patients.*

KEYWORDS: scapular stability exercise, shoulder impingement syndrome, shoulder pain and disability index, Lateral Scapular Slide Test

INTRODUCTION

Shoulder disorders are the most common among all peripheral joint disorders[1]. The term "Shoulder Impingement Syndrome (SIS)" was 1st introduced by Neer in 1972. Shoulder impingement syndrome is a slowly progressive disease. It describes symptoms and signs that results from compression of the rotator cuff tendons and the subacromial bursa between the greater tubercle of humeral head and the antero lateral edge of the acromion process[2]. Shoulder impairments, such as SIS has been associated with abnormal movement of the scapula during elevation of arm[3-8]. In addition, if an injury and/or biomechanical changes occur, it would lead to impulsive or shear stress on distal part of the Supraspinatus tendon, which may induce progressive changes associated with shoulder impingement syndrome. Weakness of the posterior scapular stabilizers can also be seen as a contributing factor to impingement syndrome by altering the mechanics of the Glenohumeral joint. SIS has a detrimental effect on quality of life with shoulder elevation, sleeping, throwing, and working activities being most affected[9]. Pain and dysfunction occur when the shoulder is placed in positions of elevation, an activity that is common during many vocational pursuits, ADL and sporting. Ultimately these limitations lead to a loss of functional independence and reduced quality of life. The disability and pain associated with SIS correlate with weakness of the scapula thoracic muscles (lower stabilizers of the scapula (Serratus anterior, rhomboids, middle and lower trapezii)) potentially leads to abnormal positioning of the scapula, disturbances in scapula humeral rhythm and generalized shoulder dysfunction[10,11]. A well-coordinated synergistic co-contraction of Rotator cuff muscles & Scapular Stabilizers is very necessary to anchor the scapula and guide movement, thereby maintaining scapula humeral rhythm. The scapula moves through a gliding mechanism in which the concave anterior surface of the scapula moves on the convex poster lateral surface of the thoracic cage. Cross sectional studies demonstrate that when the muscles are weak or fatigued, scapula humeral rhythm is compromised and shoulder dysfunction results[11,12]. This dysfunction can cause micro trauma in the shoulder muscles, capsule, and Ligamentous tissue and lead to impingement[11,13,14,15]. Biomechanical studies show that scapular stability exercises promotes posterior tilting, upward rotation and external rotation of the scapula. This normal biomechanics of the scapula along with surrounding musculature is very vital to the overall normal function of the shoulder. Rotator cuff strengthening is the obvious treatment for the treatment of the shoulder impingement syndrome but as the origin of the rotator cuff muscle arise from the scapula, an effective exercise regime for rehabilitation should include improving the strength and function of muscles that control the

position of scapula. Weakness of these muscles may lead to altered biomechanics of the Glenohumeral joint with resultant excessive stress imparted to the rotator cuff and anterior capsule[16]. Hence, primary aim of this study is to determine the effectiveness of the scapular stability exercises in patients with shoulder impingement syndrome to improve pain and physical function.

MATERIALS AND METHODOLOGY

An interventional study was conducted to study the effectiveness of scapular stability exercises in the patient with the shoulder impingement syndrome at Physiotherapy Department, Civil Hospital, Ahmedabad. Convenient Random Sampling Method is used for sample selection and duration of present study was 4 weeks. The sample size of 60 (Sixty) patients were divided into two groups each consisting of 30 (Thirty) subjects: Control Group & Clinical Trial Group.

Inclusion Criteria: Age group: 20-60 years, Genders: Male & females, Pain with resisted isometric abduction, Painful arc of movement between 600-1200, Pain with palpation of the rotator cuff tendons, Positive Neer sign, Positive Hawkins test, Patients who are able to comprehend commands and Willingness to participate in the study.

Exclusion Criteria: History of cervical and/or thoracic pathology, Previous neck or shoulder surgery, Previous shoulder injury in the past 6 months, Reproduction of shoulder symptoms during active cervical movements, Systemic illness, Presence of shoulder instability based on a positive sulcus test, anterior or posterior apprehension tests, History of spinal or upper limb fracture and Pregnancy.

Materials : Consent Form, Assessment Form, Examination Table, Scale, marker, measuring tape, Standard Goniometer, Dumbbell, Therabend, Ball for stabilizing exercise, Towel, Wand and Kodak 3x Zoom 13 megapixel Digital Camera.

A written informed consent of all the subjects was taken prior to the study. Pre-participation evaluation form consisted of shoulder pain and disability index, descriptive data for age, sex, height, weight, duration of symptoms in affected shoulder joint, previous surgery, medications, exercise frequency, history, chief complaints, Visual Analogue Scale (VAS) score for pain, active and passive ROM, manual muscle testing, palpation of shoulder girdle with surrounding musculature, etc.

Methodology

60 (Sixty) subjects were taken for the study those fulfils inclusion criteria. They were randomly divided into two groups, in control group only conventional treatment and in clinical trial group, conventional treatment as well as scapular stability exercises were given. In conventional treatment, progressive muscular strengthening rehabilitation program was given for Shoulder Flexors, Shoulder Adductors, Shoulder Horizontal Adductors, Shoulder Extensors, Side lying External Rotators, stretching of Pectoralis Major Muscles, Levator Scapulae Muscle, Cross-Chest Stretch, Wand Exercises and Pendulum Exercises with Frequency: 3 sets of 8 repetitions, daily. In scapular stability exercise, Scapular clock exercise, Towel sliding exercise, The lawnmower exercise, Prone Horizontal Abduction, Press up plus exercise, Wall push up exercise and Scapular PNF with Alternative weight Shifting. Each subject of the study was treated for a period of 4 weeks, 6 days a week, one session per day. An assessment was done prior to starting of treatment and after 4 weeks of treatment, again assessment was taken for these subjects.

RESULTS

TABLE 1: GENDER DISTRIBUTIONS OF THE SUBJECTS

Gender	Control Group	Clinical Trial Group
Male count (%)	12 (40%)	19 (63.33%)
Female count (%)	18 (60%)	11 (36.66%)
Total	30 (100%)	30 (100%)

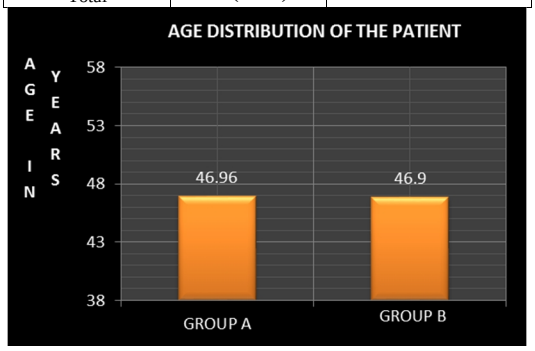

FIGURE 1: AGE DISTRIBUTION OF THE SUBJECTS

TABLE 2: MEAN CHANGES IN SPADI BEFORE AND AFTER INTERVENTION

Groups	Pre treatment		Post treatment		t value	p value
	Mean	±SD	Mean	±SD		
Group A	73.26	7.679	46.06	6.080	36.589	< 0.0001
Group B	74.53	12.403	31.8	6.19	30.39	< 0.0001

TABLE 3: MEAN CHANGES IN SPADI (RESULTS OF UNPAIRED T-TEST)

	t value	P value
SPADI	9.470	P< 0.0001

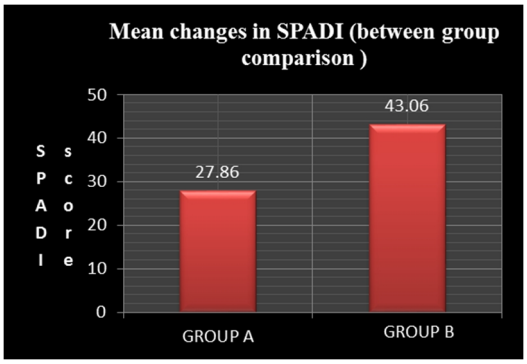

FIGURE 2: MEAN CHANGES IN SPADI (BETWEEN GROUP COMPARISON)

TABLE 4: MEAN CHANGES IN VAS BEFORE AND AFTER INTERVENTION

Groups	Pre treatment		Post treatment		t value	p value
	Mean	±SD	Mean	±SD		
Group A	8.30	0.73	4.78	0.76	29.42	< 0.0001
Group B	8.78	0.73	4.01	0.65	30.75	< 0.0001

TABLE 5: MEAN CHANGES IN VAS (RESULTS OF UNPAIRED T-TEST)

	t value	P value
VAS	6.77	P< 0.0001

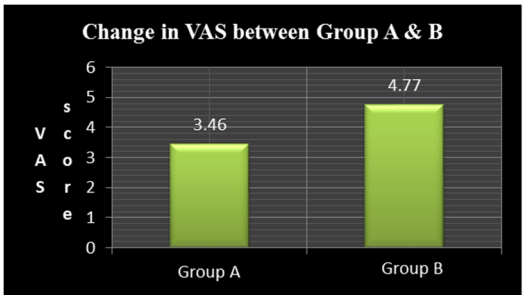

FIGURE 3: CHANGE IN VAS BETWEEN GROUPS A AND B

TABLE 6: MEAN CHANGES IN LSST BEFORE AND AFTER INTERVENTION

Groups	Pre treatment (mm)		Post treatment (mm)		t value	p value
	Mean	±SD	Mean	±SD		
Group A	109.23	16.25	101.13	13.94	6.76	< 0.0001
Group B	115.86	22.49	96.1	18.85	9.77	< 0.0001

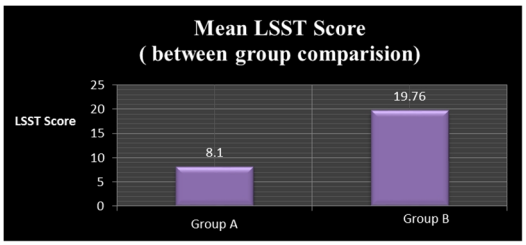

FIGURE 4: MEAN LSST SCORE (BETWEEN GROUP COMPARISON)

TABLE 7: MEAN CHANGES IN LSST (RESULTS OF UNPAIRED T-TEST)

	t value	P value
LSST	4.965	P< 0.0001

DISCUSSION

Shoulder impingement syndrome is one of the most common conditions that affect the shoulder and accounts for 44-65% of all cases of shoulder pain. The symptoms affect the activities of daily living which consequently deteriorate quality of life. To date, there have been several studies investigating biomechanics or Pathomechanics in patients with Shoulder impingement syndrome. This study investigates the association between scapular stability exercises and symptomatic relief in patients with Shoulder impingement syndrome.

In a study carried out by Wang et al., the success rate of conservative management in patients with SIS was 73.8% regardless the morphology of acromion. If the patient remain significantly disabled and has no improvement after conservative treatment, surgical treatment may be considered.

While considering conservative treatment for SIS, emphasis should be on tight anterior chest wall muscles & weak Scapular stabilizers. The main stabilizers are the Levator Scapulae, Rhomboids Major & Minor, Serratus Anterior & Trapezzi. The Glenohumeral protectors include the muscles of the rotator cuff: the Supraspinatus, Infraspinatus, and Teres Minor & Subscapularis. Synergistic co contraction of these muscles is necessary to anchor the scapula & guide the movement of the shoulder girdle. Fatigue or weakness of the Scapular stabilizers lead to compromised scapula humeral Rhythm and resultant Shoulder dysfunction that further leads to micro trauma in shoulder muscles, capsule & Ligamentous tissue and leads to impingement.

During overhead activities, Scapula must rotate upwards, tilted posteriorly & rotated externally. Weakness of the Scapular stabilizers leads to imbalance of the force couples between the Trapezzi, Serratus Anterior & Rhomboids that

may result in to downward rotation, anterior tilting & internal rotation of the scapula during the abduction of the arm resulting into narrowing of the Subacromial space with the compression of the underlying structures. This fatigue induced strength deficit may result into the adverse effect on scapular position & allowing more lateral gliding of the scapula during functional activities.

Every exercise programme should be begin with stretching exercises. Weak muscles cannot be strengthened if their antagonistic counter parts are not stretched. So stretching of the Pectoralis Major, Pectoralis Minor, Levator Scapulae is very necessary for the prevention of rounded shoulder posture which inhibits scapula humeral rhythm.

Strengthening of the rotator cuff muscles are very necessary for the prevention of the upward translation of the head of humerus during abduction that is caused by pull of deltoid. Since the attachment of the Rotator Cuff muscle is on Scapula, a stable base is very necessary for the proper functioning of the Rotator cuff.

The scapular stability exercises include core exercises that include Scapular clock exercise, Towel sliding exercise, alternate weight shifting exercise, Scapular PNF patterns, Lawnmower exercise, that improves the force couples between Lower Trapezius & Serratus anterior, both the Trapezzi & Rhomboids, thus maintaining the proper posterior tilting, upward rotation and internal rotation during functional & overhead activities. These improved scapular position decreases impingement and increase rotator cuff efficiency.

Impingement and injury to the Rotator cuff muscle could result into damage to the neural mechanoreceptors that mediate normal Proprioceptive sensation of the shoulder. This deficit could lead to slow protective reflexes, where contraction of the muscles occurs too late to protect the joint. Thus the resultant proprioception deficit could contribute to further deterioration of the condition. Lawnmower exercise, alternative weight shifting & Scapular PNF are responsible for improved proprioception & better strength of scapular stabilizers with improved efficiency of the Rotator cuffs in elevating the arm.

Of the 60 subjects, 30 subjects were kept in Control group with conventional exercise therapy alone and the remaining 30 in the Clinical trial group were given additional scapular stability exercises. Lateral Scapular Slide Test, Shoulder Pain and Disability Index & Visual Analogue Scale were taken before and after the treatment of 4 weeks.

The gender distribution of the subjects who participated in the study (Table 1) shows that there is no significant sex preponderance in both the groups. In Control Group, there were 12 males and 18 females where as in Clinical Trial Group; there were 19 males and 11 females.

There was no significant difference in the age distribution of both the groups (Table 2). The mean age of Control Group was 46.96 and for Clinical Trial Group it was 46.9.

In a series of 30 subjects with Shoulder impingement syndrome in Control Group, an improvement in pain and physical function was observed after 4 weeks of treatment with Conventional physiotherapy. There was also a significant improvement in VAS, SPADI & LATERAL SCAPULAR SLIDE TEST in all the subjects in Control Group.

In a series of 30 subjects with Shoulder impingement syndrome in Clinical Trial Group, there was extremely significant improvement in pain and physical function after 4 weeks of Conventional physiotherapy and scapular stability exercises. There was extremely significant improvement in VAS, SPADI & LATERAL SCAPULAR SLIDE TEST in all the subjects in Clinical Trial Group.

Both treatment groups obtained successful outcomes as measured by considerable reduction in VAS scores, improvement of SPADI & improvement in LSST at the end of 4 weeks but the improvement is much better in the clinical trial group which receives Scapular stability exercises along with strengthening of the Rotator cuff muscles.

Some people with shoulder impingement syndrome avoid exercise because of joint pain. However, a group of exercises called "isometrics" will help strengthen muscles without moving painful joints. Isometrics involve no joint movement but rather strengthen muscle groups by using an alternating series of isolated muscle contraction and periods of relaxation. “Isotonic” is another group of exercises that involve joint mobility. However, this group of exercises is more intensive, achieving strength development through increased repetitions or by introducing resistance.

Application of High TENS will result into Relief of the pain and assosiciated Spasm of the Shoulder girdle muscles. This relief of pain & spasm is associated with the peripheral blocking of nociception by high frequency of the TENS that blocks the traffic in both A delta (fast) and C (slow) pain fibers in the posterior horn due to stimulation of mechanoreceptors (A beta) fibers by high frequency, low intensity electric pulses. Results indicate that there is extremely significant improvement in Pain and Functional Status in patients with Shoulder impingement syndrome at the end of 4 weeks after giving conventional exercise therapy and scapular stability exercises in the Clinical trial group than control group.

These findings support the idea that indeed, strengthening programs for rotator cuff muscles & muscles of the Glenohumeral joints along with short anterior chest wall muscles are beneficial for shoulder impingement syndrome subjects but additional scapular stability exercises undoubtedly increases the relief score.

LIMITATIONS

- The study consisted of only a small quantity of subjects; which should be revised to a large number of subjects and for a longer duration of period.
- This was a short term study of 4 (four) weeks and no further follow up of subjects were carried out.
- Home programme taught to the patients was not supervised.
- Follow up was done at each week, but could not be described here as the significant result need duration of at least 4 weeks.

CONCLUSION

The results of this study on 60 patients with shoulder impingement syndrome has supported hypothesis of this study that There will be significant relief with the use of the scapular stability exercises in the patient with the shoulder impingement syndrome. Hence, it was concluded that there is significant difference between Conventional exercise alone and Conventional exercise therapy along with scapular stability exercises in relieving pain and improving physical function in shoulder impingement syndrome as seen with Visual Analogue Scale, Shoulder Pain And Disability Index and Lateral Scapular Stability Test.

After 4 weeks of treatment, the significant improvement in pain and functional status was observed in patients performing Conventional exercise therapy as well as scapular stability exercises rather than performing Conventional exercise therapy alone.

On assessing few patients who came for follow up, it was found that subjects in both groups appeared less likely to be taking medications for their symptoms of the shoulder impingement syndrome and were satisfied with the overall outcome of their rehabilitative programme.

Thus, it can be concluded that Conventional exercise therapy along with scapular stability exercises is effective than Conventional exercise therapy alone in improving pain and functional disability in patients with the shoulder impingement syndrome.

CLINICAL APPLICATION:

While treating any patient with shoulder pain and dysfunction, Emphasis Should be on scapular stability exercises. Though the Rotator cuff muscles are chief stabilizers for Gleno humeral joint, but their origin is from the scapula. So until they have a very stable base, they cannot work effectively. So each treatment protocol for any patient with shoulder dysfunction must contain exercises to strengthen the scapula.

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PREVALENCE OF LOW BACK PAIN DUE TO ABDOMINAL WEAKNESS IN COLLEGIATE YOUNG FEMALES

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ABSTRACT
Aims and Objectives: *To find out that abdominal muscle weakness is one of the causes of low back in girls between the age group of 18-25 years.*
Methodology: *400 assessment forms were distributed among the female subjects of Mata Gujri Girls Hostel, Dehradun. 362 filled forms were received from the subjects. The subjects falling in the age group 18-25 years were looked for presence of low back pain and the strength of their abdominal muscles were assessed by Daniel & Worthingham's Manual muscle testing. The data was analyzed using percentage method.*
Results: *76 (21%) out of 359 subjects were suffering from low back pain. Out of 76 subjects 47.3% i.e. 36 subjects were suffering from weakness of trunk flexors and 52.6% i.e. 40 subjects were suffering from weakness of trunk rotators.*
Conclusion: *After analysis, the result shows that low back pain is related to abdominal weakness.*

KEYWORDS: Abdominal weakness, low back pain

INTRODUCTION

Low back pain is usually defined as pain, muscle tension, or stiffness localized below the costal margin and above the inferior gluteal folds, with or without leg pain (sciatica). Low back pain is typically classified as being 'specific' or 'non-specific'. Specific low back pain is defined as symptoms caused by a specific patho-physiological mechanism, such as hernia, infection, inflammation osteoporosis, rheumatoid arthritis, fracture or tumour. Non-specific low back pain is defined as symptoms without clear specific cause, i.e. low back pain of unknown origin[15]. Few cases of back pain are due to specific causes; most cases are non-specific. Acute back pain is the most common presentation and is usually self-limiting, lasting less than three months regardless of treatment. Chronic back pain is a more difficult problem, which often has strong psychological overlay: work dissatisfaction, boredom, and a generous compensation system contribute to it[4].

Back pain is a common problem and was recently thought to affect 17.3 million people in the UK. Up to 10% of sufferers have chronic back pain6. In the United States, the National Arthritis Data Workgroup reviewed national survey data showing that each year some 15% of adults report frequent back pain or pain lasting more than two weeks[13]. LBP in children and adolescents, as in adults, is a common condition: some have shown lifetime prevalence as high as 70–80% by 20 years of age. In addition, several studies have calculated new onset rates of around 20% over a1–2 year period. Pain prevalence increases with age and is higher in girls than boys[10].

Core strengthening has become a major trend in rehabilitation. The term has been used to connote lumbar stabilization, motor control training and other regimens. Core strengthening is, in essence, a description of the muscular control required around the lumbar spine to maintain functional stability. Despite its widespread use, core strengthening has had meager research. Core strengthening has been promoted as a preventive regimen, as a form of rehabilitation, and as a performance enhancing program for various lumbar spine and musculoskeletal injuries[5].

We could not find any literature on the prevalence of low back pain due to abdominal muscle weakness in females between the age group of 18-25 years. Therefore the present study is a search to find out whether the abdominal weakness is one of the reasons for low back pain.

METHODS

Total 400 assessment forms were distributed. Only 362 filled up forms were received from the subjects. Out of 362, 79 subjects were suffering from low back pain. 3 subjects were excluded due to age limit and abdominal muscle strength was assessed of the 76 subjects. 40 subjects were suffering from trunk flexors and 36 from trunk rotators weakness. 36 subjects were not suffering from any muscle weakness. Data was analyzed using percentage method and results were calculated.

RESULTS

The results were analyzed using the percentage method. The results showed that out of the 359 subjects about 22% i.e. 76 were suffering from non specified low back pain, and out of that about 47% i.e. 36 subjects were suffering from weakness of trunk flexors (rectus abdominis, obliquus externus & obliquus internus) and 51% i.e. 39 subjects were suffering from weakness of trunk rotators (obliquus externus & obliquus internus). (Refer figure 1, 2 and 3)

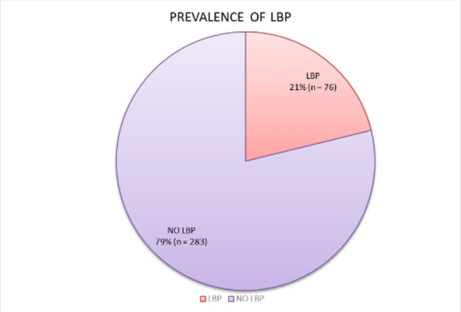

FIGURE 1: PREVALENCE OF LOW BACK PAIN

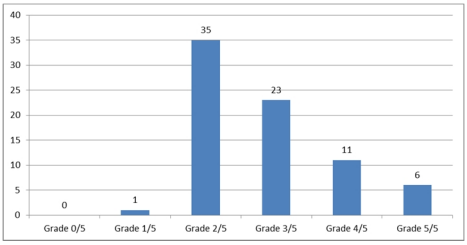

FIGURE 2: GRADES OBTAINED IN MMT OF TRUNK

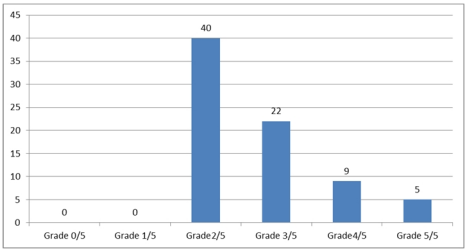

FIGURE 3: GRADES OBTAINED IN MMT OF TRUNK ROTATORS

DISCUSSION

The present survey was designed to analyze the prevalence of low back pain due to abdominal weakness in collegiate females within the age group 18-25 years. A total 362 female subjects with mean age 21.5±1.15 were surveyed and the result was obtained using the percentage method. The analysis indicated that the prevalence of low back pain in the given population was 21.1%. Out of the total population suffering from low back pain 47.3% of the subjects were suffering weakness of trunk flexors (internal oblique, external oblique & rectus abdominis) and 52.6% subjects were suffering from weakness of trunk rotators (internal oblique & external oblique). Keeping in mind the results of our study we can say that abdominal weakness has a major role in low back pain.

Asfour & Ayoub (1984) have suggested that back and abdominal muscle strength may protect against back injuries, as strong muscles may alleviate part of the mechanical stresses on the spine. Findings have been inconclusive and it has been suggested that back pain also leads to muscle weakness, therefore this weakness may be the result of back pain rather than its cause[1]. Hodges & Richardson, (1996) stated that the delay in onset of contraction of trunk muscles associated with movement of the upper limb in patients with low back pain indicates a significant deficit in the automatic motor command for control of disturbance to the spine[8]. Also Selen et al (2003) proposed that the alterations in trunk muscle recruitment in patients with low back pain are functional in that they reduce the probability of noxious tissue stresses by limiting range of motion and providing stabilization of the spine[14].

Ferguson et al (2004) found that the normalized time of muscle activation was longer in the low back pain symptomatic patients than in the asymptomatic participants. The increased time of muscle activation has a ‘‘cost’’ in terms of spine loading. The cost is that the low back pain group would be exposed to increased spine loading due to muscle activation for a longer period of time when performing the same task as an asymptomatic control5. Norbaksh & Arab (2002) stated that Electromyographic (EMG) studies, indicate that the paraspinal muscles in patients with low back pain have a faster fatigue rate compared with those in asymptomatic subjects[12].

On contrary, Lederman (2007) stated that weak trunk muscles, weak abdominals and imbalances between trunk muscles groups are not pathological, just a normal variation. Weak or dysfunctional abdominal muscles will not lead to back pain. Tensing the trunk muscles is unlikely to provide any protection against back pain or reduce the recurrence of back pain[11]. Also Helewa et al (1999) suggested that more frequent exercise reviews and a more intensive exercise programme could have yielded better results but at a considerably higher costs[7].

Some of the other causes of low back pain have been identified in different studies on different populations, e.g. emotional problems; conduct problems, and other common childhood complaints[17], occupation[13], dynamic sacro-iliac

joint instability from mal-recruitment of gluteus maximus and biceps femoris muscles[9], sprains, strains, or degenerative changes in the muscles, disks, and connective tissues of the back itself[3].

As the prevalence rates of low back pain are high in any population, it is important to prevent first time occurrence of low back pain as well as to prevent acute low back pain from becoming chronic and recurrent. This is possible by identifying the commonest cause of low back pain in each age group and alleviating those causes in the corresponding age group. Thus there are evidences that low back pain is related to abdominal muscle weakness. The mechanism may be that muscle weakness results in muscle imbalance and compensatory movements both of which or anyone of these two factors may lead to pain, the same will be applicable to abdominal muscle weakness and low back pain. The other possible mechanism may be the deconditioning theory. Most people with ordinary backache have much less extreme degrees of deconditioning but the general principle is the same. Reduced activity of any degree causes loss of functional capacity. The effects are reduced and guarded movements, loss of muscle strength and endurance & stiffness[16].

Limitations of this study were that the results of MMT were solely dependent on the basis of observation of the examiner so they are not free from errors and no data could be obtained about whether abdominal weakness was present before the onset of low back pain or not. The study can be carried out on male subjects or on a different age group, relation of isolated muscles with low back pain can be examined.

CONCLUSION

The present study shows that low back pain is related to abdominal weakness.

CLINICAL APPLICATION

This study will help in the establishment of a relation between low back pain and abdominal weakness.

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