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INFLUENCE OF SPINAL EXERCISES AS AN ADJUNCT TO CONVENTIONAL PHYSIOTHERAPY ON PAIN AND FUNCTIONAL MOBILITY IN CHRONIC KNEE OSTEOARTHRITIS

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ABSTRACT

BACKGROUND- *Knee osteoarthritis (OA) is one of the chronic problems affecting older people that causes pain and physical disability that impairs functional impairment of the knee OA patients significantly . As there is interconnection between the spine and knee,most of the patients with knee OA experiences spinal muscle weakness. So the aim of the study is reduce the pain and improve functional mobility of participants using spinal exercises.*

Objectives: *To compare the influence of spinal exercises as an adjunct to conventional physiotherapy on pain and functional mobility in chronic knee osteoarthritis.*

Method: *The study was conducted at physiotherapy outpatient department of Krishna Hospital and MRC, Karad. Sample size was 70 which were further divided into 2 groups each containing 35 participants by simple consecutive sampling method. Group A was given spinal exercises along with SWD and conventional knee exercises. Group B was control group which was given only SWD and conventional knee exercises.*

STATISTICAL ANALYSIS- *Data was analysed using paired and unpaired t test.*

Result: *Paired and unpaired t-test were used for statistical analysis. In pre intervention, there was no statistically significant difference seen in p values for VAS which was 0.7685 ,WOMAC was 0.3924 and SPBFU was 0.7792. On comparing the post intervention score, the results showed extremely significant difference was seen with p-value for VAS, WOMAC and SPBFU which was <0.0001 respectively.*

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Conclusion: *The study concluded that spinal exercises along with SWD and conventional knee exercises was more effective in decreasing the pain and improving functional mobility in subjects with chronic knee osteoarthritis.*

Keywords: *Chronic knee OA, Spinal exercise, SWD, VAS, WOMAC, SPBFU*

I. INTRODUCTION

Knee osteoarthritis (OA) is one of the chronic problems affecting older people [1] that causes pain and physical disability that impairs functional impairment of the knee OA patients significantly [2].

Osteoarthritis of knee is classified as primary osteoarthritis and secondary osteoarthritis. Most cases of OA have an unknown cause which are referred to as primary OA.[3] Primary osteoarthritis is commanly related to aging.[4,5] It is present in the form of localized, generalized, or as erosive OA.[3,6] Secondary osteoarthritis is the one which caused by any another disease or any condition.[6]

OA is characterized by a repetitive inflammatory response of the articular cartilage due to erosion or focal loss of the cartilage and hypertrophy of osteoblastic activity and reparative bone response which is known as osteophytosis[7] which results in a joint space narrowing or subchondral sclerosis which further leads to pain, immobility, and often disability.[8,9]

The initiation and progression of knee OA includes mechanical, structural, genetic and environmental factors. During growth and development, the tibial and femoral cartilage adapt over time to loading cycle during walking. Knee cartilage gets thickend in the areas of greatest loading in both the anterior-to-posterior and medial-to-lateral aspects.[10]

Short wave diathermy (SWD) is a physical therapy modality suggested for the management pain and loss of function due to osteoarthritis.[11]It is being used for its thermal effects to aid in soft tissue healing. Diathermy uses shortwaves of about 1.8 to 30MHz frequency and 3 to 200 meter wavelength to produce deep heat changes within the tissue including vasodilation, elevation of pain threshold, increase tissue extensibility and increase enzymatic activity.[12,13]

Exercise helps in decreasing pain, improving strength and Endurance, improving range of motion and connective tissue elasticity as well as exercise decreases functional limitation by Improving walking speed, gait, physical activity and decreasing Depression and anxiety.[14] Although there are many Conventional Physiotherapy interventions which are successfully incorporated for O.A. knee still there is need to find out newer methods of Physiotherapy treatment approaches which can aid in better outcomes, speedy recovery and reducing rehabilitation time.

factors proximal to the knee joint, such as weakness of muscles around the hip and trunk and abnormal hip and trunk movements, may also play a role in the development of knee pain.[15,16]There is strong evidence that individuals with knee pain have less trunk side-flexion strength.[17,18,19] In addition, individuals with knee pain have demonstrated increased hip adduction[19,20,21] and medial rotation,[20,22] as well as increased ipsilateral trunk inclination excursions,[20,23] during functional tasks. These altered movements have been associated with weakness of the hip and trunk muscles[24,25,26] Finally, it has been suggested that patients with knee pain may

perform weight bearing activities with minimal hip flexion and forward trunk lean,[15]leading to greater demands on the quadriceps muscle[27] and, consequently, greater patellofemoral joint stresses.

As spinal exercises are having many biomechanical role as mentioned above present study is been carried out in order to find out the additional benefits of these relatively newer treatment approaches for Chronic OA knee. And also there is paucity of literature when it comes to find the comparative influence of spinal exercises along with conventional physiotherapy on pain and functional mobility for Chronic OA knee.

II. METHODS:

It was an comparative study in the physiotherapy department of Krishna institute of medical sciences. Ethical permission was obtained from institutional ethical committee,KIMSDU,Karad. 70 participants were equally divided into 2 groups using consequtive sampling method. Participants were selected according to inclusion and exclusion criteria. written informed consent form was taken,and the whole study was explained to them. A detailed musculoskeletal evaluation was done to screen the participants. Inclusion criteria was as follows: Both male and female participants willing to participate in study,Participants aged between 45-65 years,Participants with clinical diagnosis and radiographic evidence of OA knee,Kellgren-lawrence radiographic grade 2,Participants who can perform spinal exercises without any discomfort,Participants will be screened as per the American Rheumatologic Criteria for knee osteoarthritis.

Exclusion criteria was as follows: Grade 3 obese individuals with deformed knees, Systemic arthritis,Soft tissue injuries around the knee joint,Recent surgeries around the knee joint,Elderly participants with balance deficits,All knee deformities.

Group A: Spinal exercises along with SWD and conventional knee exercises

Group B: Short Wave Diathermy along with conventional knee exercises.

GROUP A

In this group participants received spinal exercises along with SWD and conventional knee exercises.

Spinal exercises

1. Supine abdominal bracing
2. Supine abdominal bracing with heel slide
3. Supine abdominal bracing with leg lift
4. Prone lying lift both the legs through cross extension without knee flexion
5. Bridge in neutral supine.
6. Unilateral bridge exercise with on knee extended and opposite hip extended.
7. Quadruped arm and lower extremity lift with trunk in neutral alingnment.

GROUP B

In this group the participants received short wave diathermy and conventional exercises.

Frequency - 27.12 MHz

Wavelength- 11 meters

Type of electrode- pad electrodes.

Positioning method- cross fire method to the knee joint (antero-posteriorly and medio-laterally)

Intensity of application- as participants comfort.

Treatment time- 20 minutes/session

Conventional knee exercises for both thegroup includes:

- Quadriceps isometric strengthening exercises.
- High sitting knee extension
- Isometric quadriceps with plantar and dorsiflexion
- Straight leg raising
- Side lying Hip abduction
- Prone knee bending
- Prone hip extension

Progression of exercises

- I week: 3 sets, 15 repetitions in each set.
- II week:4 sets, 15 repetitions in each set
- III week:4 sets, 20 repetitions in each set
- IV week:4 sets, 20 repetitions in each set
- V week:4 sets, 25 repetitions in each set
- VI week:4 sets, 25 repetitions in each set

Participants were assessed by VAS (Visual Analog Scale), WOMAC(Western Ontario and McMaster Universities Arthritis Index) and Stabilizer Pressure Biofeedback Unit (SPBFU). Pre treatment and post treatment scores were made on the participants on the first day before intervention and after 18 days of intervention.

III. RESULT

OUTCOME MEASURE

VAS - Intra Group comparison (within Group) using Paired t test.

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Groups	Pre-interventional Mean ± SD	Post-interventional Mean ± SD	P Value	Inference
Group (A)	6.07 ± 0.70	3.00 ± 0.56	<0.0001	Extremely significant
Group (B)	6.026 ± 0.66	3.95 ± 0.72	<0.0001	Extremely significant

Table 1: **Comparison of pre and post VAS score within group**

The table shows the comparison of mean and standard deviation of pre and post values of Group A and B.

In Group A, the mean VAS score on pre intervention was 6.07 ± 0.70 which was reduced to a mean 3.00 ± 0.56 of post intervention. The P value by Paired t test was <0.0001which is extremely significant.

In Group B, the mean VAS score on pre intervention was 6.026 ± 0.66 which was reduced to a mean of 3.95 ± 0.72 post intervention. The P value by Paired t test was <0.0001 which is extremely significant.

VAS -Inter group (between groups) comparison using ANOVA test

Groups	Pre-interventional Mean ± SD	Post-interventional Mean ± SD
Group (A)	6.07 ± 0.70	3.00 ± 0.56
Group (B)	6.02± 0.66	3.95 ± 0.72
P Value	0.7685	<0.0001
Inference	Not significant	Extremely Significant

Table 2: Comparison of pre-pre and post-post VAS score between group

The table shows the comparison of mean and standard deviation of pre and post values of Group A, B and C.

On comparing the pre intervention values, the results between the three groups using unpaired t test revealed that there was no statistically significant difference seen with P values of 0.7685. While on comparing the post intervention values, the results between the three groups using unpaired t test revealed that there was extremely significant difference seen with P values of <0.0001.

WOMAC - Intra Group comparison (within Group) using Paired t test.

Groups	Pre-interventional Mean ± SD	Post-interventional Mean ± SD	P Value	Inference
Group (A)	58.62 ± 7.71	30.77 ± 6.20	<0.0001	Extremely significant
Group (B)	60.05 ± 6.20	41.20± 7.23	<0.0001	Extremely significant

Table 3: Comparison of pre and post WOMAC score within group

The table also shows the comparison of mean and standard deviation of pre and post values of Group A and B.

In Group A, the mean WOMAC score on pre intervention was 70.95±7.71 which was reduced to mean of 30.77± 6.20 on post intervention. The p value by Paired t test was found to be <0.0001 which is extremely significant.

In Group B, the mean WOMAC score on pre intervention was 60.05±6.07 which was reduced to a mean of 41.20±7.23 post intervention. The p value by Paired t test found to be <0.0001 which is extremely significant.

WOMAC -Inter group (between groups) comparison using ANOVA test

Groups	Pre-interventional Mean ± SD	Post-interventional Mean ± SD
Group (A)	58.62 ± 7.71	30.77 ± 6.20
Group (B)	60.05 ± 6.07	41.20 ± 7.23

P Value	0.3924	<0.0001
Inference	Not significant	Extremely significant

Table 4: Comparison of pre-pre and post-post WOMAC score between group

The table shows the comparison of mean and standard deviation of pre and post values of Group A and B.

On comparing the pre intervention values, the results between the two groups using unpaired test revealed that there was statistically no significant difference seen with P values of 0.7685. While on comparing the post intervention values, the results between the two groups using unpaired t test revealed that there was extremely significant difference seen with P values of <0.0001.

SPBFU-Intra Group comparison (within Group) using Paired t test

Groups	**Pre-interventional Mean ± SD**	**Post-interventional Mean ± SD**	**P Value**	**Inference**
Group (A)	9.34 ± 2.16	18.45 ± 2.17	<0.0001	Extremely significant
Group (B)	9.48 ± 2.07	11.42 ± 2.76	<0.0001	Extremely significant

Table 5: Comparison of pre and post PBFU score within group

The table also shows the comparison of mean and standard deviation of pre and post values of Group A and B.

In Group A, the mean PBFU score on pre intervention was 9.34 ± 2.16 which was increased 18.45 ± 2.17 to a mean of post intervention. The p value by Paired t test was found to be <0.0001 which is extremely significant.

In Group B, the mean PBFU score on pre intervention was 9.48 ± 2.07 which was increased to 11.42 ± 2.76 a mean of post intervention. The p value by Paired t test was found to be <0.0001 which is extremely significant.

PBFU-Inter group (between groups) comparison using Unpaired t test

Groups	Pre-interventional Mean ± SD	Post-interventional Mean ± SD
Group (A)	9.343 ± 2.16	18.45 ± 2.17
Group (B)	9.48 ± 2.07	11.42 ± 2.76
P Value	0.7792	<0.0001
Inference	Not significant	Extremely significant

Table 6: Comparison of pre-pre and post-post PBFU between group

The table shows the comparison of mean and standard deviation of pre and post values of Group A and B.

On comparing the pre interventional values, the results between the three groups using unpaired t test revealed that there was statistically not significant difference seen with P values of, 0.7792 while on comparing the post intervention values, the results between the three groups using unpaired t test revealed that there was extremely significant difference seen with P values of <0.0001.

IV. DISCUSSION:

Knee osteoarthritis (OA) is one of the chronic problems affecting older people [1] that causes pain and physical disability that impairs functional impairment of the knee OA patients significantly [2].

This study was undertaken considering all the mentioned points and the aim of this study was to evaluate the influence of spinal exercises as an adjunct to conventional physiotherapy on pain and functional mobility in chronic osteoarthritis.

The study was carried out and the result was drawn by using VAS , WOMAC and stabilizer pressure biofeedback unit score as the outcome measures. 70 patients (38 Males and 32 Females)out of which 46 were Right and 24 were Left side affected, diagnosed as Osteoarthritis Knee. The present study contradicts finding the previous literature that females are more affected than males in OA knee,this may be because of smaller sample size,smaller area of sample collection and specific inclusion criterias.

For pain assesement VAS was used. Within group comparison which was done by paired t test in which group A and B the P value was <0.0001 which was extremely significant. In group A the pre mean value was 6.074 and post treatment it decreased to 3.006. In group B,the pre mean value was 6.026 in post treatment it was decreased to 3.954.Between group comparison was done using unpaired t test in which pre treatment p value was 0.768 which was not significant whereas post treatment value was <0.0001 which was extremely significant. The probable reasons for decrease in pain with SWD may be due to mild degree of

heating removal of noxious chemical which are the waste products of metabolism due to increased blood flow or counter irritation effect due to strong heating which blocks the pain transmission at the pain gate. Similarly the spinal exercises will provide a colander rigidity to support the trunk.it will also help to reduce the work load of lumbar muscles and lower extremity such as hip and knee further leading to relaxation by the supply of nutrition and oxygen in the muscle tissue which will help to reduce pain and spasm.

For functional disability assessment WOMAC was used. Within group comparison which was done by paired t test in which group A and B p value was <0.0001 which was extremely significant. In group A the pre mean value was 58.629 and post treatment it decreased to 30.771 whereas in group B,the pre mean value was 60.057 in post treatment it was decreased to 41.200 .Between group comparison was done using unpaired t test in which pre WOMAC p value was 0.768 which was not significant where as post treatment WOMAC was <0.0001 which was extremely significant. These findings supports the literature of Bennell et al., (2012), which suggested that possible mechanism for core mucle weakness can be similar to the quadriceps weakness which is associated with the inhibition of muscle activation and degenaration of muscle fiber [28]. Knee OA diseases cause patients to gradually withdraw from any physical activity due to chronic pain and structural problem. Reduction in physical activity will potentially also lead to core muscles weakness over time due to muscles disuse [29]. This research output supports the inclusion of core muscles strengthening into rehabilitation programs for knee OA. Future research should study the efficacy of core muscles strengthening in reducing the load of the knee joint, as well as improving the knee joint space. This either slows down or stops the narrowing process on the knee joint space. It may even increase the joint space by improving the knee joint space, which will slow down the onset and progression of knee OA[30]

For assesement of core stability stabilizer pressure biofeedback unit was used. Within group comparison which was done by paired t test in which group A and group B the P value was <0.0001 which was extremely significant. In group A the pre mean value was 9.343 and post treatment it increased to 18.457. whereas in group B,the pre mean value was 9.486 in post treatment it was increased to 11.429. Between group comparison was done using unpaired t test in which pre SPBU P value was 0.7792 which was not significant where as post treatment SPBU P value was <0.0001 which was extremely significant. The pre test mean was 9.343 which further increased to 9.486 whereas the post treatment mean was 18.4577 which was decreased to 11.429. This research output supports the inclusion of core muscles strengthening into rehabilitation programs for knee OA. Possible reasoning for above findings can be that core muscles strengthening helps in reducing the load of the knee joint, as well as improving the knee joint space. This either slows down or stops the narrowing process on the knee joint space further damaging the articular cartilage. It may also help increase the joint space by improving the knee joint space, which will slow down the onset and progression of knee OA [17].

In this study an attempt was made to analyze the influence of spinal exercises as an adjunct to conventional physiotherapy on pain and functional mobility in chronic knee osteoarthristis participants in reducing pain and improving functional mobility in Osteoarthritis Knee patients. Although the result shows extremely significant improvement in both groups (P<0.0001) group A which included spinal exercises along with with SWD and conventional knee exercises showed the maximum improvement by reduced mean values of VAS and WOMAC and increased mean value of SPBU as compared to group B.

V. CONCLUSION:

Spinal exercises along with SWD and conventional knee exercises was more effective in decreasing the pain and improving functional mobility in participants with chronic knee osteoarthritis as compared to control group.

CONFLICT OF INTREST:- Nil

ETHICAL CLEARANCE- Institutional Ethical Committee Of Krishna Institute Of Medical Sciences Deemed To Be University, Karad.

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