EFFECT OF PELVIC BRIDGING AND PELVIC CONTROL EXERCISES ON CHRONIC OA KNEE

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***Abstract*- The aim of the study is to find out the pain and functional improvement using pelvic bridging and pelvic control exercises on OA knee by assessing the patient using the KOOS scale, the study was carried out as an Comparative study with convenient sampling methods with the population of 30 subjects with the inclusion critetria of People aged between 40 – 60 years are included in the study,both males and females are included. And exclusion criteria of patients with Skin disease bone tumor around knee complex Amputation total knee replacement. The subjects were selected based on inclusion and exclusion criteria, subjects were requested to participate in the study and the subjects were explained briefly about the study and the intervention. A comparative study is conducted which includes 30 patients suffering from OA knee. The Demographic Data was obtained. The pre-test value was measured with the KOOS scale (Knee injury and Osteoarthritis Outcome Score) to assess the pain. Post-test value was taken at the end of the 4th week of intervention.There was a statistically significant in the improvement of quality of life and decrease in pain with the significant value of p <0.001 In this study, pelvic bridging exercises yields greater improvements in the quality of life and reducing the pain in OA patients**

***Keywords*: Osteoarthritis, Pelvic bridging, Pelvic control exercises, OA knee, KOOS scale**

INTRODUCTION

An osteoarthritis is a progressive form of arthritis characterized by the breakdown of the cartilage in joints. Knee Osteoarthritis is of two types – primary and secondary. Primary osteoarthritis is articular degeneration that has no apparent underlying cause. Secondary osteoarthritis is caused by an inappropriate force distribution over the joint.[1] The knee joint is a weight-bearing joint that comprises 3 compartments – the patellofemoral compartment, and the medial and lateral tibiofemoral compartment. The main function of the knee joint is to help in weight transmission and acts as a shock absorber during knee joint movements.[2] Among people over the age of 60, 13% of women and 10% of men have symptomatic OA knee. Aging and obesity are the most common causes. The prevalence of OA knee is more in women than men. Because of menopause, women are more likely to develop OA knee. [3] Age is a predisposing factor that causes degenerative changes in the synovial joint. Sex is also an endogenous factor that contributes to females having a higher prevalence of OA knee than males as estrogen levels decline throughout menopause. Secondary osteoarthritis may be caused due to direct trauma to the joint, disrupted nutrition due to primary osteoarthritis, and dislocations, underlying pathological diseases. Biomechanical changes in the articular cartilage might also result in OA knee.[4] The pathological response of the tissues and underlying structures is influenced by biomechanical stresses on joint structures, resulting in joint degradation and a restricted range of motion.[2]OA knee is characterized by atrophy and reduced muscle power of quadriceps muscle. Pelvic bridging helps tostrengthen and improve the musculature of hip, knee, and ankle structures.[5] Pelvic bridging is typically performed by those who have weak hip extensors and trunk muscles.[6] Pelvic bridging is a strengthening exercise that enhances physical function and range of motion in knee osteoarthritis knees.[7] The gluteus maximus, gluteus medius, hamstrings, and erector spinae muscles are worked on during the bridge exercise.[8] Bridging exercise will help reduce pressure over the joint, articular cartilage tension, and balance problems. The quadriceps muscle acts as a shock absorber and helps to reduce load bearing on the knee joint by strengthening it. This exercise influences the femur in the knee joint, which in turn affects other bones in the joint, resulting in a synergistic effect.[9] This exercise helps to improve coordination and strengthen the muscles of the lumbopelvic complex.

Bridging is a core stability exercise that stimulates the lumbopelvic-hip complex and the periarticular muscles of the knee to improve trunk, pelvis, hip, and knee coordination and stability.

This minimizes intradiscal pressure and therefore the strain on the lumbar muscles and lower extremities.[10]

Pelvic Control refers to the ability of the lower trunk and proximal hip muscles to work in a coordinated manner in order to perform mobility activities and maintain functional balance in which the pelvis acts as a dynamic stabilizer that promotes effective lower limb movements. Pelvic malalignment results in altered biomechanics and symmetry of the knee joint. Pelvic Control helps in improving the gait of the affected individual by strengthening the hip and knee muscle groups.[11] The straight leg raise exercise was one of the pelvic control exercises which is used to target and strengthen terminal knee extension. Straight leg raise specifically focuses and strengthens the knee flexors as the flexor muscle group contract eccentrically against the gravity.[12]

The main aim of the physical therapy management for OA knee is to reduce pain, improve muscle power to improve range of motion and restore the patient's ability to perform functional tasks, and improve the quality of life. Electrotherapeutic modalities like ultrasound, TENS, and electrical stimulation also can be used to relieve the patient from pain and discomfort but previous studies have shown that these had a moderate effect on pain.[13] The current study focuses on emphasizing the effectiveness of pelvic bridging and pelvic control exercises in reducing pain and improving the quality of life in patients with OA knee. Osteoarthritis was a progressive disease characterized by degeneration of articular cartilage. This results in pain , swelling and reduced range of motion, and altered gait pattern in the OA knee. In order to restore functional activity, Pelvic bridging exercises help in strengthening the quadriceps and hamstrings muscles. Performing these exercises alters the biomechanics and helps in reducing pressure over the joint and articular cartilage and increases the stability of the knee joint in its position and facilitates the associated bones and the joint to work in synergy. Strengthening of the quadriceps muscle and hamstrings muscle helps to reduce pain and functional disability. Hence, a comparative study will be conducted to assess the effect of pelvic bridging exercises and pelvic control on the OA knee.

METHODOLOGY

Subjects with pre diagnosed OA knee grade I and II are selected for the study, the study was carried out as an comparative study between two groups in order to visualize the effectiveness of the exercises prescribed for OA knee, Convenient sampling technique was used to segregate the population, the sample size was finalized as 30 participants with the inclusion criteria of People aged between 40 – 60 years are included in the study; both males and females are included and with the exclusion criteria of Skin disease at the affected leg, bone tumor around knee complex at the affected leg, amputation, and total knee replacement at the affected leg.The subjects were selected based on inclusion and exclusion criteria. The subjects were requested to participate in the study and were briefly explained about the study and intervention after which their written consent was taken.A comparative study was conducted on 30 patients aged between 40-60 years and who were selected based on convenience sampling and suffering from OA knee pain. The patients were split into 2 groups; Group – A (15 subjects) is given Pelvic control exercises and Group – B (15 subjects) is given Pelvic Bridging exercises. Their medical and musculoskeletal factors were evaluated before and after the treatment protocol which include pelvic bridging exercise and pelvic control exercise program for patients with OA knee pain. Demographic details were obtained. Pre-test value was measured with Knee injury and Osteoarthritis Outcome Score to assess pain and functional improvement. The post-test value was taken at the end of 4^{th} week of intervention. The patients were instructed to persist from other adjunct treatments for OA knee pain.

The Patients of Group – A received Pelvic Control exercise for 1 session/day; 2 days/week for 4 weeks. The patients were reassessed by the physiotherapist after the end of the 4^{th} week to assess pain and functional improvement. The Patients of Group – B received Pelvic Bridging exercise for 1 session/day; 2 days/week for 4 weeks. The patients were reassessed by the physiotherapist after the end of the 4^{th} week to assess pain and functional improvement.

Group – A: 15 subjects were instructed to perform pelvic control exercise

Group – B: 15 subjects were instructed to perform pelvic bridging exercise

The treatment protocol includes:

exercises to be included for Group A – Pelvic Control Exercises: (Straight Leg Raise, Plank,Crunches)

- **Straight leg raise**

Lie down on back with arms placed on sides and feet flat on the floor. Slowly raise one leg in L shape and slowly bring to normal position.

- **Plank**

Obtain a push-up position with elbows under the shoulders and toes pointed towards the floor, now tighten the core abdominal muscles and hold this position for 15 – 30 seconds and revert to the normal position.

Exercises to be included for Group B – Pelvic Bridging (single bridging, double leg bridging)

- **Single leg bridging**

Lie down on back, arms placed on sides, knees bent, and feet flat on the floor. Raise one foot, completely extending the leg at a 45^0. Hold the position for 5 seconds and return to the normal position.

- **Double leg bridging**

Lie down on the back with the entire back flat on the floor and the knees bent at a 90^0.Lift the pelvis and hold the position for 5 seconds and slowly revert to the normal position.

- Number of repetitions: 10 - 15 repetitions
- Number of sets: 2-3 sets
- Frequency: 2 days/week

- Duration of study: 4 weeks

OUTCOME MEASURES

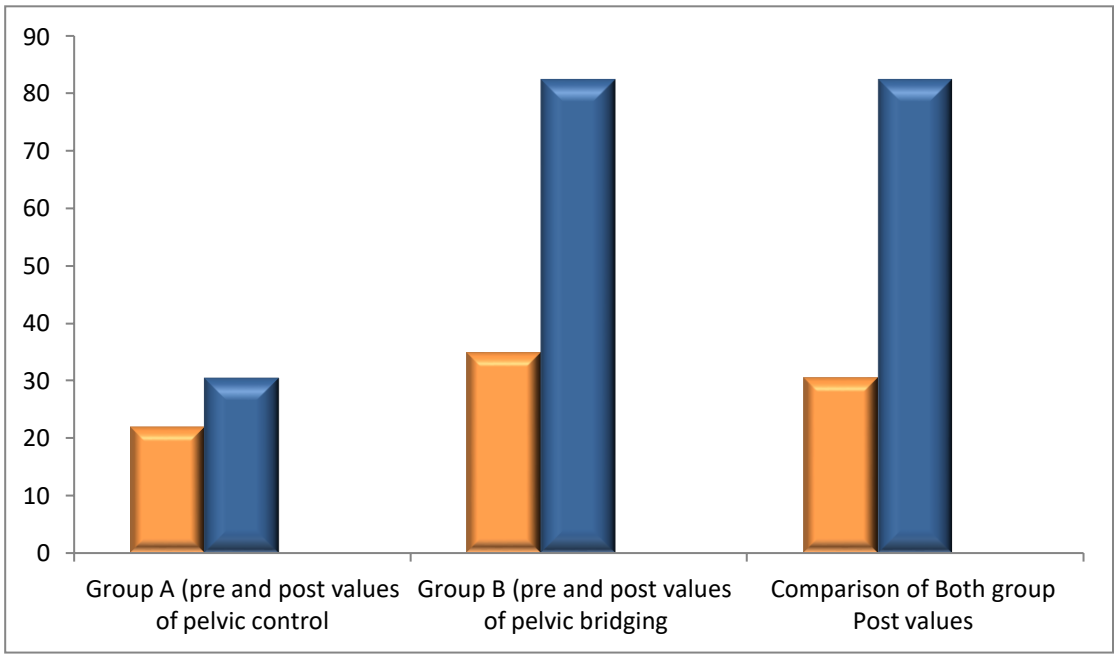
Knee injury and Osteoarthritis Outcome Score is a screening tool that is used to assess the level of pain experienced by the patients based on their understanding and expression of the pain. The KOOS scale consists of 42 questionnaires grouped into 5 categories. –

- Pain – 9 components
- Symptoms – 7 components
- Activities of Daily Living – 17 components
- Sport and Recreation Function – 5 components
- Quality of Life – 4 components

The total score ranges from 0 – 100. Each component is graded on a scale of 0 to 4. 0 represents no problems or complaints by the patient, and 4 represents extreme problems or complaints by the patient.

STATISTICAL ANALYSIS

To see if there was a difference between pre and post-experiment, paired t-test and unpaired t-tests were performed. The collected data were tabulated and analyzed. Statistical values represent there was a significant improvement in functional activity and decreased pain.



RESULTS

The statistical analysis made with the quantitative data obtained from the Knee injury and Osteoarthritis Outcome Score questionnaire revealed that there are statistically significant differences between Group A and Group B. The mean and the standard deviation for pelvic bridging and pelvic control exercises were calculated. The pre-test mean value of pelvic bridging exercise is 21.87 and 30.40. The pre-test and post-test mean values of pelvic control exercise. The post-test mean value of Group A is 30.40 and Group B is 82.20. This shows that Group B was improving than Group A ($p<0.0001$).

DISCUSSION:

The iliopsoas, pelvic floor, and quadriceps muscles are in charge of stabilization, which reduces pain and maintains posture, preventing overall lumbosacral damage. and the knee region The subjects' abdomen, waist, and thigh circumferences were the most different. According to Dr. ShamlaPazare et al., this could be due to stronger abdominal muscles. have tightened the waist, improved posture, and resulted in a trimmer appearance Because of gravity. There is anterior pelvic tilt, so abdominal strength is required to keep the spine neutral. as well as abdominal muscle toning So, after abdominal muscle toning, the pelvic position is amended [14]. The purpose of this study was to look at the effect of bridging exercise on pain in elderly people with knee OA.

The results showed that giving bridging exercises for 8 weeks reduced pain by 24% in the treatment group, from an average score of 8.29 to 6.29. The control group, however, showed no noticeable change. The hip bridge and single leg bridge bridging exercise Leg bridge ups were a quadriceps and hamstring muscle-strengthening movement that resulted in

biomechanical optimization. Which reduces joint pressure, articular cartilage local stress, orbalance disorders.

Quadriceps power Muscles increase the stability of the knee joint in the proper position, dampen the shock transmitted to the joint, and reduce its impact on a larger scale. (Mahmoud et al12-week.)'s quadriceps isometric exercise intervention was successful in reducing knee pain and increasing quadriceps muscle strength in obese women with knee OA [15]. Anwer and Alghadir found an increase in quadriceps muscle strength, functional disability, and pain reduction after a similar 8-week intervention. In research, pain reduction may be due to psychological factors as well as central nervous system adaptation as well as muscle strengthening. Bridging exercise performed by the elderly may influence the cerebral cortex's work in cognitive and emotional aspects, resulting in positive perception and relaxation. Bridging exercise may help maintain body homeostasis indirectly by stimulating the hypothalamic–pituitary–adrenal (HPA) axis, which produces corticotrophin releasing factor (CRF). Furthermore, CRF stimulates the pituitary gland to decrease adrenocorticotropin hormone (ACTH) production, resulting in an increase in endorphin production, which then decreases cortisol production and other stress hormones, resulting inpain reduction. [16,17]. Bridging exercises given for 8 weeks can reduce pain levels in elderly people with knee OA. This exercise can be used in addition to the OA management exercise.

To achieve the best results, different types of exercises can be combined. Furthermore, functional measurements and muscle strength could be performed in addition to the impact of training, rather than just pain.[18]. These findings revealed that the weight-shifting bridge exercise increased lower extremity muscle activity more than the general bridge exercise. As the moment arm length of the knee joint angle increased, so did muscle activity, which played an important role in optimising muscle activation. Hirose and Tsuruike proposed that as the horizontal distance from the knee (leverage) to the foot (effort point) increased, so should the knee flexion force.[19]. Given the change in difficulty caused by weight-shifting ofthe sole, this study can be used as an application of muscle strengthening exercise using the increase in activity of the biceps femoris and the learning process for the vastus medialis andlateralis muscles. They discovered that as the quadriceps femoris knee joint angle decreased to 120°, 90°, 60°, and 45°, the biceps femoris muscle activity increased. The muscle activity increased with increasing angle for the opposite activity. During the selective ground pressing bridge exercise, quadriceps muscle activity was higher at 90° than at 60° knee flexion angle, and knee flexor activity was higher at 60° than at 90° knee flexion angle, similar to previous studies. The quadriceps femoris is the most important of the muscles surrounding the knee joint, and it is an agonist of the knee joint extension action. It provides stability to the lower extremity, particularly the stability of the ankle.[20] Weight shifting during the bridge exercise may be more effective than general bridge exercises in increasing lower extremity muscle activation.[21] Gmax activity was significantly higher in 135 degrees of knee flexion than in 90 degrees of knee flexion. However, HAM and ES activity were significantly lower in 135 degrees of knee flexion than in 90 degrees of knee flexion. According to Lehecka et al. (2017), the knee extensor moment was reduced at 135 degrees ofknee flexion during the unilateral bridge exercise, resulting in a decrease in HAM activity from maintaining the knee flexion angle. Our outcomes are comparable. Furthermore, ES activity was significantly reduced when the knee was flexed at 135 degrees compared to 90 degrees during the bridge exercise. The ES muscle and HAM muscles produce nutation torque in the sacroiliac joint by rotating the sacrum anteriorly while the biceps femoris, which is one of the HAM muscles, rotates posteriorly. The Gmax, Gmed, HAM, and ES muscles were studied during bridge exercises with and without hip external rotation and with varying degrees of knee flexion. The Gmax and Gmed were activated preferentially over theHAM and ES during the bridge exercise with hip external rotation and 135° of knee flexion. As a result, it is possible that this exercise is more effective than the traditional bridge exercise in increasing gluteal muscle activity while decreasing overcompensation with the HAM and ES muscles.[22] Poor core muscle endurance indicates a weak core muscle that bears the body's weight. A lack of core muscle endurance can result in an increase in knee loading as well as knee joint contact force during dynamic movement. Because of chronic pain and structural issues, OA patients gradually withdraw from any physical activity. Reduced physical activity may result in core muscle weakness over time due to muscle disuse. Having adequate proximal stability reduces the stress load on the patellofemoral joint. Individuals with good proximal trunk postural control will reduce knee joint loading automatically. As a result, the core musculature maintains a smooth and stable movement of the lower extremities.[23]

CONCLUSION:

This study concludes by saying that Pelvic bridging exercise is more effective in reducing OA knee pain. There has been a significant difference in the pre-test and post-test values of outcome measures like Knee Injury and Osteoarthritis Outcome score. The pelvic bridging improves the pain and overall functioning of an individual.

FUNDING AGENCIES:

There was no specific grant for this research from any funding source in the public, private,or non-profit sectors.

AUTHORS AND CONTRIBUTION STATEMENT:

designed the whole studyincluding sample collection, scales prescriptions,, statistical analysis and prepared the part of the manuscript. The author read and approved the final version of the manuscript.

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