

Effects of Corrective Exercises Training for Improving Neuropathic Pain and Function in Knee Osteoarthritis

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Abstract

Objectives: To find out the effects of corrective exercise training for improving neuropathic pain and function in knee OA patients. **Material & Methods:** This study was a quasi-experimental study. It was conducted at horizon hospital Johar Town Lahore. The study was completed in six months. Consecutive sampling technique was used to collect the data. The sample size of 16 patients was taken in this study to find out the effects of corrective exercises training for improving neuropathic pain and function in patients with knee osteoarthritis. For descriptive analysis we used frequency, percentages and charts. For quantitative measure, repeated measured ANOVA was used. **Results:** The mean age of patients was 71.56 years \pm 4.55 years. There were 7(43.8%) males and 9(57.2%) females participated in this study. The mean and standard deviation of numeric pain rating scale at baseline, at week 4 and at post treatment were, 4.31 \pm 0.71, 3.31 \pm 0.70 and 2.44 \pm 0.73 (p=0.0001) respectively. The mean and standard deviation of DN4-questionnaire at baseline, at week 4 and at post treatment were, 6.38 \pm 1.67, 4.06 \pm 1.29 and 1.81 \pm 1.33 (p=0.0001) respectively. The mean and standard deviation of WOMAC scale at baseline, at week 4 and at post treatment were, 58.13 \pm 9.37, 48.75 \pm 7.81 and 39.25 \pm 7.90 (p=0.0001) respectively. **Conclusion:** Corrective exercises significantly reduced knee osteoarthritis neuropathic pain and improved functional capacity. The corrective exercises appear to be a safe and effective treatment for neuropathic knee pain.

Keywords: Osteoarthritis; Knee; Neuropathic pain; Therapeutic exercises

Introduction

Osteoarthritis (OA) is one of the most common deterioration of joint and usually begins by gradual deprivation of intra-articular cartilage or by disappearance of synovial fluid in joint spaces. It leads to mild to moderate rigidity in joint and cause pain which is a main and considerable element of knee osteoarthritis. [1]

Osteoarthritis (OA) is the notable disorder of knee joint and a major cause in limitation of daily life activity that ultimately affects standard of life and develops more stress in quality of life. By the year 2020 it was observed that knee OA is the prime source of disability over the total population in the United States which affects nearly 27 million people or many are anticipated to be affected by knee OA. Those who are older than 50 years are more at risk for having knee OA that will gradually raises to almost 55% in those greater than 70 years of age. [2] Most of the knee OA patients describe their neuropathic pain as a general characteristic of numbness tingling and burning sensation they also complain of emotional instability, depression due to pain, sleep disturbance or laziness occur in chronic pain. [3,4] OA pain or its symptoms can be managed with significant number of choice. Change in life style or daily activities modification, weight reduction, exercise, physical therapy, hydrotherapy etc. sss some analgesics like paracetamol, opioids, NSAIDS or topical gels can be suggested or some injection therapy can also plays an important role in pain relief in individuals with mild to moderate level of pain [5] For the conservative management

of knee OA therapeutic exercises are frequently suggested as a favorite plan of treatment and present studies suggests or prove exercises as an important and effectual pain soothing treatment. We investigate modern situation of proof for therapeutic exercises as a pain diminishing management for knee OA. [6] Exercise therapy decrease pain and patient-described dysfunction in knee Osteoarthritis (OA), now the ideal exercise administration has not been recognized. As this disorder has a great effect on person's life style so exercise plays a major role in prevention and care of disabling disorder. Exercise is a wide opinion which includes muscle strengthening, range of movement exercises and aerobic exercises, however patient education and home plan is also a part of therapy intervention. [7] A 3 times per week exercise intervention protocol will help the patients to increase their functional status or help in maintaining achieved level. For the affected individuals monitored exercise therapy program will help in prevention of further damage or prevent from additional mobility loss, Exercise plan not only improves range of motion it also protects from atrophy of quadriceps muscles and reduces overall pain. Decrease in pain level is beneficial for victims of osteoarthritis. As the level

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of pain decreases joint movement and function increases as well as exercise observance, exercise is the best and hugely suggested intervention for OA with its effective and proven advantages on pain and dysfunction. However it is more useful and cost effective than any incision protocol like surgery but at the same time moderate effect size and criteria for exercise is required. Therapeutic exercise protocol usually pay attention to strengthening of muscle or stretching exercises, or on aerobic exercises which may be land-based or water based. A group of muscle assists knee joint among all quadriceps and hamstring are the two major muscles that helps knee in its movement or stability. Both these muscle have ability to provide knee stability just because of their abduction and adduction movements. [8]

These literatures show the effective results of different combined treatments but did not consider neuropathic pain in knee osteoarthritis now this study was conducted to find out the effective results of corrective exercise training for improving neuropathic pain and function in knee OA management.

The rationale of this study was to determine the effects of corrective exercises training for improving neuropathic pain and function in knee OA arthritis because before no study has been shown the effects of corrective exercises in patients with neuropathic pain.

Materials and Methods

The Quasi experimental study was conducted at the Rehabilitation department of Horizon Hospital Johar Town Lahore. The study was completed within duration of six months.(July 2020 to December 2020) After taking permission from the Institutional Review Board of Riphah International University Lahore Campus and Hospital Ethical Committee, Sample size was 16 patients of OA and was calculated through Epitool took 95% confidence interval and 5% margin of error. [9] Patients were recruited using consecutive sampling technique. The included patients were according to ACR Criteria for neuropathic pain osteoarthritis Age over 65, less than 30 minutes of morning stiffness, grade I and II OA, crepitus on active motion, bony tenderness, bony enlargement, no palpable warmth of synovium. Those excluded were knee complain that require urgent medical attention (fracture and infection), diabetes mellitus, patients with malignancies, any neurological disorders, systematic musculoskeletal diseases (parkinson's, rheumatoid arthritis etc.), incapability of understanding implication of participants. After informed written consent, all patients were recruited in this study with neuropathic pain in knee OA. Douleur Neuropathique4 (DN4) questionnaire, Western Ontario and McMaster Osteoarthritis Index (WOMAC), Numeric Pain Rating Scale (NPR) were used to collect data. All patients received 12 weeks (3 days per week) physiotherapy sessions with hot pack, TENS and Ultrasound session for 10 mints and knee isometric, quad strengthening, adductor and abductor strengthening, calf stretch, hamstring stretch, mait land mobilization, Unconventional Corrective knee exercise protocol treatment: Standing on one extremity, up and down on balance board, walking to lateral direction, walking to antero-posterior direction, walking to antero-posterior and lateral for 20 mints the duration of each session was 45 minutes. Data were collected at baseline, at week 4 and at post treatment (week 12).

Data was entered and analyzed through SPSS version 21; all calculated value was depicted in mean and SD along its range maximum to minimum. Repeated measure ANOVA was applied for comparing the mean difference of quantitative variables. A p value ≤ 0.05 was considered significant.

Results

In this study 16 patients with neuropathic pain osteoarthritis were assessed. Numeric Pain Rating Scale (NPRS), DN4-questionnaire and WOMAC score were assessed to measure the effects of treatment. The demographic details of patients, ages, gender, weight, height and BMI were also measured. Out of 16 patients, 7(43.8%) were males and 9(56.2%) were females. The mean and standard deviation of all patient were 71.56 ± 4.55 with minimum age was 65 years and maximum age was 82 years. The mean and standard deviation of height, weight and BMI were, 1.34 ± 0.36 (range 5-5.9), 67.69 ± 5.25 (range 60-75) and 23.28 ± 1.86 (range 20.1-26.2) respectively. The mean and standard deviation of numeric pain rating scale at baseline 4.31 ± 0.71 at week 4 3.31 ± 0.70 and at post treatment were, 2.44 ± 0.73 respectively. The statistical test (repeated measure-ANOVA) within subject effects was applied. The sum of squares and mean square (28.13), F value=482.14 and the p value=0.0001 which is significant within subject effects at post treatment. Repeated Measured ANOVA was used to determine the effect size between subject effects of treatment. The sum of square and mean square was 540.02, the F=374.22 (the F value is the statistical test value of analysis of variance, which we derived in statistically) and p value=0.0001, which showed the highly significant between subject effects at post treatment.

The mean and standard deviation of DN4-questionnaire at baseline 6.38 ± 1.67 , at week 4 were 4.06 ± 1.29 and at post treatment were 1.81 ± 1.33 respectively. The statistical (Repeated Measure-ANOVA) were used within subject effects. That showed a sum of squares and mean square (166.53), F value=166.88 and the p value=0.0001 which is significant within subject effects at post treatment. Repeated Measured ANOVA was used to determine the effect size between subject effects of treatment. The sum of square and mean square was 800.33, the F=162.96 (the F value is the statistical test value of analysis of variance, which we derived in statistically) and p value=0.0001, which showed the highly significant between subject effects at post treatment. The mean and standard deviation of WOMAC scale at baseline 58.13 ± 9.37 , at week 4 48.75 ± 7.81 and at post treatment were 39.25 ± 7.90 respectively. Repeated Measure ANOVA was applied as a statistical test within subject effects. That showed sum of squares and mean square (2850.13), F value=269.09 and the p value=0.0001 which is significant within subject effects at post treatment. Repeated Measured ANOVA was used to determine the effect size between subject effects of treatment. The sum of square and mean square was 113880.08, the F=575.69 (the F value is the statistical test value of analysis of variance, which we derived in statistically) and p value=0.0001, which showed the highly significant between subject effects at post treatment [Table 1 and Figure 1].

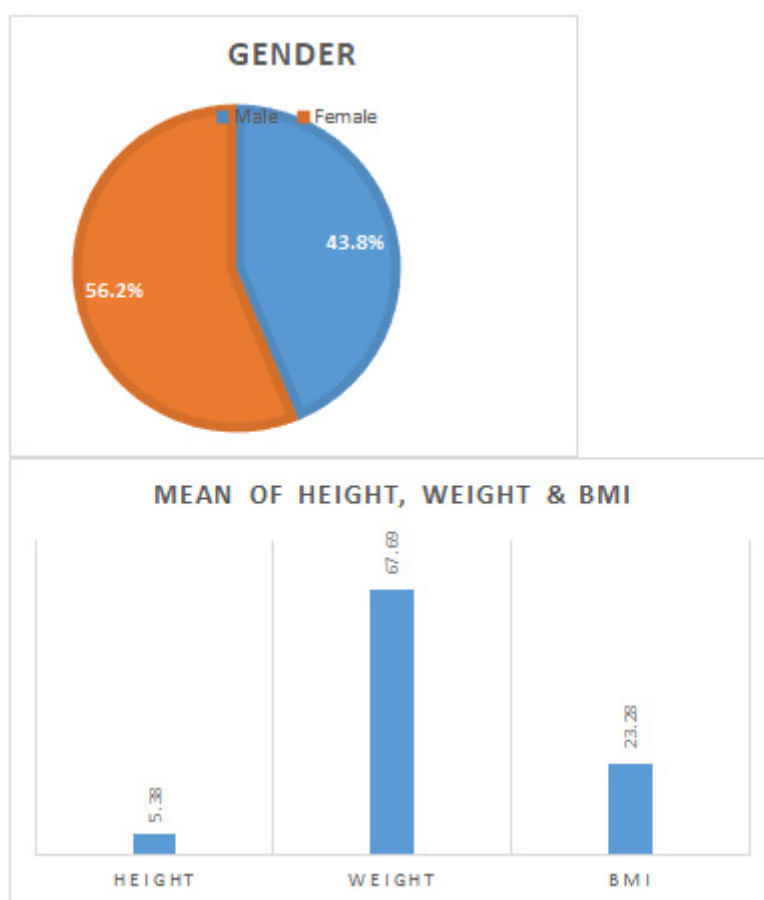
Discussion

The outcome measures of this study suggests that corrective

Table 1: Repeated measure Anova test within the group.

	Variables	Treatment group	P-value
NPRS	Pre-treatment (at baseline) (Mean ± SD)	4.31 ± 0.71	
	Post-treatment (at 4 week) (Mean ± SD)	3.31 ± 0.70	0.0001
	Post-treatment (at follow-up) (Mean ± SD)	2.44 ± 0.73	0.0001
DN4	Pre-treatment (at baseline) (Mean ± SD)	6.38 ± 1.67	
	Post-treatment (at 4 week) (Mean ± SD)	4.06 ± 1.29	0.0001
	Post-treatment (at follow-up) (Mean ± SD)	1.81 ± 1.33	0.0001
WOMAC	Pre-treatment (at baseline) (Mean ± SD)	58.13 ± 9.37	
	Post-treatment (at 4 week) (Mean ± SD)	48.75 ± 7.81	0.0001
	Post-treatment (at follow-up) (Mean ± SD)	39.25 ± 7.90	0.0001

*SD: Standard Deviation; **NPRS**: Numeric Pain Rating Scale; **WOMAC**: Western Ontario and McMaster Osteoarthritis Index; **DN4**: Douleur Neuropathique 4

**Figure 1:** The demographic details of patients, ages, gender, weight, height and BMI were also measured.

exercise of 12 weeks helped in improvement of neuropathic pain and functionality in older patients with knee OA, due to the marked reduction of pain, DN4 variables and the WOMAC Questionnaire score. These changes were observed within 12 weeks of management and sustained their effects 12 weeks after the end of protocol. In comparison of both genders male and female women of aged 50 years had a high prevalence of knee OA whereas men of this age group are usually not at risk of having knee OA; so it has been proved at age and gender are the major risk factors of knee OA. According to the survey women of age 50 are highly at risk than men. While considering a male gender of 60 years or above are more at risk of having knee OA.^[8,10]Evidence present on the effects of corrective exercise for the correction of posture and reduction in pain is very limited. All the previous conducted studies worked on region of spine

and shoulder. For example, two studies shows that neck pain significantly decreases by a corrective exercise treatment^[11,12] corrective exercises also helps to reduce forward head angle as well as forward shoulder angle^[13] One more study shows that standing and sitting sagittal posture may be corrected by Pilates exercise protocol.^[14] The goal of using corrective exercises, Egoscue method to make a change in body position and decrease in pain. Positional misalignment of specified joints causes pain on the alike or on different joint is a characteristic feature of Egoscue Method. That's why overall body posture symmetry should be ponder when treating pain. The exercises are planned to effects all the important body joints whereas statistics of our study shows that Egoscue Method of corrective exercises can beneficially help to manage knee pain and improves physical functions as well.

Our analysis suggests a remarkable reduction in pain in the treatment group, as described in individual's routine record, over the period 12 week study. This recommends that Egoscue corrective exercises exerts an immediate effect and reduce knee pain. It has been evaluated that corrective exercise training technique gives a rapid benefits in pain. ^[15]

Other studies assists that improper posture puts negative effects on other body parts. ^[16]

Literatures show the effective results of different combined treatments but did not consider neuropathic pain in knee osteoarthritis now this study was conducted to find out the effective results of corrective exercise training for improving neuropathic pain and function in knee OA management.

Conclusion

This study concluded that corrective exercise training was effective in reducing neuropathic pain and was also effective in improving functional outcomes in knee OA

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