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Research Article

EFFECTS OF MODIFIED GAIT PATTERN WITH ISOMETRIC EXERCISES ON RISK OF FALL IN KNEE OSTEOARTHRITIS PATIENTS

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Abstract:

Background: Osteoarthritis is the most common type of arthritis. Osteoarthritis is a chronic degenerative disorder of the joint that represents one of the most common diseases worldwide. Its prevalence and severity are increasing owing to aging of the population, but treatment options remain largely limited to painkillers and anti-inflammatory drugs, which only provide symptomatic relief. In the late stages of the disease, surgical interventions are often necessary to partial restore joint function. Although the focus of osteoarthritis research has been originally on the articular cartilage, novel findings are now pointing to osteoarthritis as a disease of the whole joint, in which failure of different joint components can occur.

Objective: To check the effects of modified gait pattern with isometric exercises on risk of fall in knee OA patients.

Methodology: A convenient estimated sample of 34 knee osteoarthritis patients with risk of fall was taken from "Allied Hospital" and "Irfan Medical City" Faisalabad, Punjab, Pakistan.

This sample was divided in two treatment groups A and B through randomization. Treatment plan for group A included isometric exercises and group B included modified gait pattern along with isometric exercises. All participants received total 18 treatment sessions over a six-week period time, which consisted of 03 treatment sessions per week. One reading was taken on baseline as pre-treatment reading. After treatment on 1st, 2nd and 3rd week the patient completed a Numeric Pain Rating Scale (NPRS), goniometry measurements form filled by researches and Risk of fall (Desmond scale) after 3 weeks treatment and 9 sessions. Then after the 6 weeks treatment and total 18 sessions completion a Post-treatment reading was taken by NPRS, ROM and risk of fall measurement.

Results: The final assessment of risk of fall in knee OA patients on Desmond scale in A and B groups had shown p values for risk of fall ($p=.003$), RHR ($p=.000$) respectively. These values show significant improvement in both groups but more in group B.

Conclusion: This study showed that there were significant improvements in both groups but there were more improvements in reduction of risk of fall in knee OA patients in group B so, it is proved that gait modification along with isometrics is more beneficial than isolated isometrics in reducing risk of fall.

Key terms: Modified gait pattern, Isometric Exercises, Knee Osteoarthritis.

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INTRODUCTION:

Inflammation of the joint which should involve infiltration of monocytes, synovial hyperplasia, new bone formation and bone erosion and narrowing of spaces of joint is called arthritis (Neugebauer et al., 2007).

It is that disease of the joints which leads to the reduced quality of life. It has been introduced as a risk factor contributing to increase chances of fall and deteriorate standard of life and balance in the elderly people. It induces a highly noticeable economic burden and is related to considerable pain, loss of ability, and a detrimentally affected way of living. The study explained the effectiveness of physical therapies in increasing balance and decreasing chances of patients diagnosed with knee OA falling (Silverwood et al., 2015). Degenerative disease of joints is osteoarthritis which may include marginal and subchondral changes in bone, thickening of capsule, synovitis and articular-cartilage damage which usually affect the joints which bear the weight of hip and knee. Osteoarthritis pain mostly occurs when we bear the weight on the affected joint and when we perform the movement (Neugebauer et al., 2007)

Knee OA distinguished along pathological characteristic that includes osteophytes and space of joints are narrow that is a common issue regarding fitness resulting in persistent pain along with inability to move in the elders. Radiographic knee OA prevalence is common in subjects aged more than 40 years (Muraki et al., 2012).

Many researches show that knee osteoarthritis are also caused by some kind of knee injuries and due to which risk of fall in knee osteoarthritis is also increased e.g meniscal injury increase production of this and also increase risk of fall in knee OA patients (Lohmander et al., 2004). Gait modification is an alternative of high osteotomy of tibia and it is a noninvasive treatment. In Knee osteoarthritis gait modification is an effective technique which affects speed of walk, position of foot (toe-in and out) trunk sway mediolateral direction which affect the kinetics of knee joint. In KAM the main effect is observed (Van den Noort et al., 2013). The outward knee adduction movement in standing phase is discrete in knee movements while walking, for patients of knee OA and healthy people. Extreme movement in adduction strongly predicts medial knee OA severity, presence and progress (Asthen et al., 2008).

SUBJECT AND METHOD:

A Quantitative research with a randomized clinical trial was performed. The subjects were knee osteoarthritis patients with grade 3 & 4 of Kellgren-Lawrence scale who were at greater risk of falling due to osteoarthritis. The half of patients received modified gait pattern along with isometric exercises and other half received isometric exercises. Government setting was Allied Hospital, Faisalabad. Private setting was Irfan medical city, Faisalabad. Estimated sample of 34 knee osteoarthritis patients, 17 of which were in group A and 17 of them were in group B selected from government and private setting of Faisalabad. Non-probability purposive sampling technique was used to collect sample. Screening of population was done by using inclusion and exclusion criteria. A signed consent form was obtained from the participant before inclusion into the study. After that only 30 participants were agree to participate so divided accordingly as 15 in each group.

The inclusion criteria was Age between 45-65 years. Knee OA patients with risk of fall of moderate and severe grade. Patients whose activity level was limited due to pain and Bilateral involvement of knees. The participants who were fallen in Grade 3 & 4 of Kellgren Lawrence scale were also included in study.

Exclusion criteria included Lower limb neurological warning sign and/or signals. Any surgical procedure involving knee replacement, arthroplasty. Patients diagnosed with psoriatic arthritis. Patient with any systemic disease (hypotension). Any medication in which exercise was contraindicated (sedative).

A Kellgren Lawrence scale was used to identify the grades of osteoarthritis in patients and also to collect data. A questionnaire designed in USA by Blue Ridge et al called Desmond scale for risk of fall. NPRS 5 point morning stiffness scale. Goniometry for ROM. Group A receiving Isometric exercises with knee dorsiflexion, Resisted knee extension in sitting, knee isometric in long sitting (Towel press) as 45 minutes duration, 2-3 sets per exercise and 8-15 repetitions for each (Vincent et al., 2013). By the baseline treatment of 2-5 minutes baseline walk for group B and ultrasonic waves for 10 minutes was applied on each knee joint before each treatment session.

Group B receiving isometrics with gait modification in Increase toe out angle, lateral trunk lean, medial insoles for the whole 6 week duration and isometrics as same protocol in the group A. The informed consent was taken from the patients of knee OA. Before the informed consent given to the PTs, they were fully educated about the purpose of study, method and

measures and only then they were asked to join the study if they are willing. Then we were given the Desmond risk of fall questionnaire by Blue Ridge et al and ask them to fill the questionnaire. The duration of data collection was 1-2 months. Overall study duration was 4 months after the approval of synopsis.

Data analysis:

The collected data was analyzed by using the following statistical package of social sciences SPSS version 20. Statistical significance was set at $P = 0.05$. Following tests was used

Descriptive and Inferential Statistics: Frequency tables, pie charts, bar charts, were used to show summary of the results and independent sample t-test was used. This non-parametric test was used to compare two populations at different intervals. Repeated Measure ANOVA was used to check the effects within groups.

RESULTS:

Thirty four knee osteoarthritis patients both men and women with risk of fall age ranges from 45-65 years were included in to the study and were divided into two groups 17 participants in each group.

Table 1: Analysis of Risk of fall (Desmond scale) through the duration of 6 weeks in Group A : Repeated Measure ANOVA

	Mean	Std. Deviation	N	Sig.
Risk of fall pre-treatment	11.93	1.792	15	.003
Risk of fall after three weeks	10.27	2.576	15	
Risk of fall post-treatment	10.00	1.813	15	

Above table shows that the value of p is less than 0.05 which means it is statistically significant while the mean changes from 11.93 ± 1.792 at baseline to 10.27 ± 2.576 at 3rd week to 10.00 ± 1.813 at the end of treatment of participants of group A.

Table 2: Analysis of Risk of fall (Desmond scale) through the duration of 6 weeks in Group B : Repeated Measure ANOVA

	Mean	Std. Deviation	N	Sig.
Risk of fall pre-treatment	11.80	1.821	15	.000
Risk of fall after three weeks	8.13	1.407	15	
Risk of fall post-treatment	2.93	1.792	15	

Above table shows that the value of p is less than 0.05 which means it is statistically significant while the mean changes from 11.80 ± 1.821 at baseline to 8.13 ± 1.407 at 3rd week to 2.93 ± 1.792 at the end of treatment of participants of group B.

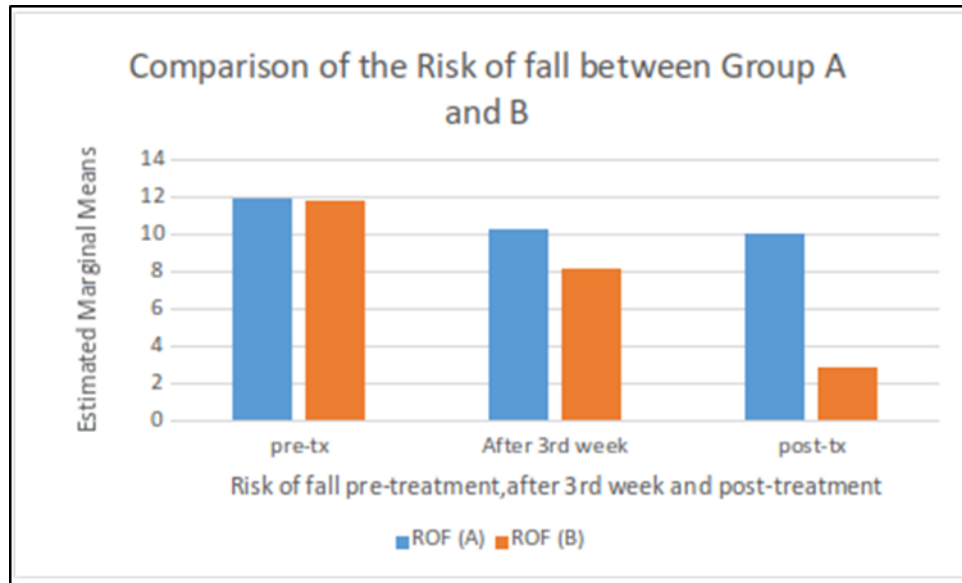
Table 3: Analysis of Risk of fall (Desmond scale) through the duration of 6 weeks between Groups A and B : Independent Sample T-test

	Patients group based on intervention	N	Mean	Std. Deviation	Sig. (2-tailed)
Risk of fall pre-treatment	Treatment group A	15	11.93	1.792	.841
	Treatment group B	15	11.80	1.821	.841
Risk of fall after three weeks	Treatment group A	15	10.27	2.576	.009
	Treatment group B	15	8.13	1.407	.010
Risk of fall post-treatment	Treatment group A	15	10.00	1.813	.000
	Treatment group B	15	2.93	1.792	.000

There were 30 subjects taken totally into the study (Group A=15 and Group B=15) in all of them Risk of fall (Desmond scale) was taken and statistically compared between both groups at baseline, after 3rd week and at 6th week

(Post-treatment). Table of group statistics is showing the comparison of mean values of Risk of fall (Desmond scale) between both groups. Independent sample t-test shows there was no significant difference of Risk of fall (Desmond scale) at baseline between both groups as the (p-value >0.05) but at the last of treatment the results became statistically significant.

Graph 1: Comparison of Risk of fall between groups A and B



This graph shows the changes in the risk of fall of both groups A and B. According to above figure there is significant decrease in the risk of fall in group B as compare to group A.

DISCUSSION:

The present study is on risk of fall in knee OA patients to check the effectiveness of gait pattern modification along with isometrics. The aim of our study was to find best possible treatment for the knee OA patients who are at high risk of falling due to degenerative changes so that a preventive measure or early step should be taken to reduce the risk of fall.

In 2016 gale conducted a study in which osteoarthritis rate of prevalence is depends the joint involved, the knee Osteoarthritis Prevalence In adults above the age of 45 is 19.2% Age was the common risk factor of prevalence of the osteoarthritis. The prevalence of OA in older adults is due to several biological changes and various risk factors such as weak muscle strength, cartilage thinning. Women were more prone to OA than men. Gender and hormones are also involved in the arthritis of the knee joint. On the onset of time of menopause and in the hormonal changes in women lead to knee OA. (Gale et al., 2016)

In 2010 Henriksen conducted a investigate on bearing and on the patients which are suffering from arthritis of the knee- On the inspection of the joint of knee pain notice out that in well subjects, which gives better

results in knee osteoarthritis patients. The Study Experiment was be old to revise progress of arthritis of the knee (Henriksen et al., 2010).

Therapeutic exercises are divided in three groups' isokinetic, isometric and isotonic exercises. Isometric exercises are performed in knee osteoarthritis patients which reduce pain of knee, increase strength of quadriceps and reduce disability. Isometric quadriceps exercises for 5 weeks have better effect on muscle strength of quadriceps relief pain, reducing functional disability in the patients who are suffering from knee osteoarthritis. A simple home plan for quadriceps exercises has a beneficial effect on function of knee joint and pain of the knee (O'Reilly et al., 1999).

For many decades, OA was also called the wear and tear disease, which can lead to deterioration and immobility of the joint. That is because of increasing pressure on the weight bearing joint (Musumeci et al., 2015).

Belongings of quadriceps muscle isometrics amplification task in frequent Knee joint arthritis. They concluded that here was considerable progress after dealing in in cooperation the groups. In

association between two groups, it was initiate that in attendance was no large change in pre-treatment between the different two groups no alteration Betterment. added enhancement was institute in problem put together than merely NSAIDs company after 4th week. subsequently it was set up that the upgrading was steadily increased. Finally, it was set up that nearby was large advance in keep fit assembly thanonly NSAIDs cluster after 6th week. concerning breadth of motion, in judgment between two groups, at hand was no consequence modification in change for the better of ROM between two faction after management for six weeks (Shakoor et al., 2010).

The modification on the walk of the patient includes the non invasive treatment in ehich we perform and decrease the load onhe medial side of the patient and reduce addction movement on the knee joint there is not any model which reduces the adduction on the knee joint (Fregly et al., 2009).

In our study we modify the gait pattern of knee osteoarthritis patients and reduce the adduction movement of the knee OA patient we guide the participants of our research about the proper usage of insoles and after 4 weeks the results of our study is beneficial for our patients. the group which received the insoles and isometrics both have better reslt then only isometric exercise the result and outcomes of Group B is better than Group A.

In 2012 John conducted a research in which yoga therapy has better effects as compared to physiotherapy exercises in which he used TENS and ultrasound as a baseline treatment to reduce morning stiffness, pain and pulse rate in patients with knee osteoarthritis (John et al., 2012).

In our research there is a clear decreased in the morning stiffness of participants receiving isometrics with gait modification.

In 2006 Burks conducted a research in which he included 29 participants variability for calculated stiffness within participants was low. Whereas variability of stiffness between the participants was high (Burks et al., 2006).

In our study group B receiving gait modification along with isometrics has decreased in morning stiffness as compared to group A which is receiving isometric exercises.

In 2011 J biomech conducted a research in which he included 8 subjects, in 1 month treatment session the

subjects knee adduction movement decrease 20 percent as compared to pretreatment reading (J biomech et al., 2011).

There were 30 subjects taken totally into the study their ROM of knee flexion and knee adduction movement was taken and statistically compared between both groups. Independent sample t-test which we applied shows there was a significant difference of ROM of knee flexion and knee adduction movement. Our results are statistically significant.

Current studies shows that mean pain level is reducing by each session ranging from 7.87 ± 0.990 at baseline to 6.80 ± 0.862 after the 3rd week of treatment then to 5.67 ± 0.617 after 6 weeks among the subjects of group A. The p value of the test within the subject effect was (0.000) which is less than selected alpha (0.05). This shows that there is significant improvement in Group A participants.

In group B mean pain level is reducing rapidly by each session ranging from 7.47 ± 0.834 at baseline to 5.20 ± 0.884 after the 3rd week of treatment then to 2.53 ± 0.834 after 6 weeks among the subjects of group B. The p value of the test within the subject effect was (0.000) which is less than selected alpha (0.05). This shows that there is significant improvement in Group B participants.

CONCLUSION:

Gait modification along with isometrics is effective for treatment of risk of fall in knee osteoarthritis patients. It is concluded that gait modification along with isometrics is more effective as compared to group receiving only isometrics. Group A receiving isometrics only has shown less decline in pain, risk of fall as compare to the group B who were receiving both the isometrics and the gait modification.

ROM of knee and hip flexion improved/increased drastically in group B as compare to group A. By the reference of statistics, we conclude that our alternative hypothesis is true which stated that there is a significant effect of modified gait pattern along with isometrics exercises in knee OA patients.

Limitations of study:

This study is only limited to the only two hospitals of a city allied hospital Faisalabad and Irfan medical city. This was conducted in very short duration and lack of long term follow up. Due to time shortage, it was not checked that how many sessions required for checking the isometrics effects it was only limited to 6 weeks.

Because isometrics takes a long time to represent there result. There is a lack of blindness for the researcher.

Recommendations:

Further New and advance studies must be conducted on broad level. Newer technologies used to measure the balance of subjects. And also need to improve the subjects reflexes. Longterm follow-up sessions required for patient, to estimate the exact number of total sessions needed for complete restoration.

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