

Role of Isometric Exercises in Reducing Fall Risk in Elderly Knee Osteoarthritis Patients and its Effects on Adl's

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ABSTRACT

Objectives: The objectives of this study were to find out the effects of isometric exercises in reducing fall risk in knee OA in the elderly population and also to find the effectiveness of exercises in improving the quality of life of patients suffering from osteoarthritis.

Methodology: This study was conducted at Shafi Medical Complex Rawalpindi. The study design was a Randomized Controlled Trial with 2 groups. The sample size of 60 patients was taken with 30 patients in each experimental group and controlled group). The sampling technique was non-probability Convenience Sampling and the duration of the study was 06 months. This study was initiated after approval from the Advanced Study and Research Committee (ASRC) of Isra Institute of Rehabilitation Sciences, Isra University, Islamabad. The data was collected through the questionnaire/forms as Demographic Form, Knee Injury and Osteoarthritis Outcome Score (KOOS), Falls Risk Assessment Tool (FRAT), and Short Form 36 (SF-36). **Results:** In this study, Group B is an experimental group and was given isometric exercises and Range of Motion (ROM) and stretching of the knee, and in Group A was given only ROM and stretching exercises of the knee. Group B showed more significant results as compared to Group A with a significant p-value <0.05. In KOOS pain Group B showed more significant results as compared to Group B with a significant p-value <0.05. The Activity of Daily Living (ADL's Group B more significant results as compared to Group B with a significant p-value <0.05. In KOOS Sports/Rec Group B shows more significant results as compared to Group B with a significant p-value<0.05.

Conclusion: This study concluded that isometric exercises reduce the fall risk of knee Osteoarthritis (OA) in an elderly population. It also shows that isometric exercises improve the quality of life in patients suffering from osteoarthritis.

Keywords: Knee pain; Fall of risk in OA; Osteoarthritis

INTRODUCTION

Osteoarthritis is a degenerative joint disease that elicits side effects of joints and signs related are the defective joining of articular cartilage, changes to joint edges, hidden bones, and pain [1]. The improvement of osteoarthritis is reliant on age, sex, hereditary inclination and past injury to the joint and irregular mechanical powers caused principally by heftiness [2]. It affects people of 65 years or more mostly [3]. OA is the leading cause of disability in the world. Most patients cannot perform daily activities [4]. The prevalence of knee OA is increasing every year. It could be related to obesity. An increase in the obesity rate may also increase the risk of knee OA [5]. According to a survey conducted in the Asian countries of the world, the prevalence of knee OA in China is 13.6%, India is 5.78%, and Bangladesh is 10.20% [6]. The prevalence of knee OA is greater in south Pakistan as compared to East Pakistan. The increase in the age of females is highly related

to the prevalence of knee OA. 74% of females and 26% males of Pakistan are affected with knee OA. The risk of knee OA in people of 60 years or more would be greater in 2025 [7]. The main and dominant symptom of knee OA is pain. Pain and stiffness lead to disability and functional limitations [8]. Falls in knee OA patient is common that leads to many injuries. And those injuries disturb the daily routine of a person and quality of life [9]. There is larger postural instability in a patient with knee OA that may also lead to balance problems and falls [10]. Isometric exercises have beneficial effects for patients with knee OA [11]. Isometric exercises strengthen the quadriceps muscle, increase joint stability and strength, reduce pain and increase mobility. Thus with isometric exercises patient disability decrease and risk of falls reduce or diminish eventually [12]. The objectives of this study were to find out the effects of isometric exercises in reducing fall risk in knee OA in the elderly population and also to find the effectiveness of

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exercises in improving the quality of life of patients suffering from osteoarthritis. This study will help elder osteoarthritis patients to minimize the reduction of fall risk through proper exercise plans so they can improve their quality of life.

METHODS

After the Ethical Approval from Institutional Review Board, this randomized control trial was conducted from January 2020 to August 2020. Through a non-probability convenient sampling technique, a total of 60 patients were included in the study. The sample size was calculated by an online calculator open Epitool and a previous study mean was used as a reference study [13]. Data collection was initiated after written informed consent. Patients included were both male and female above 50 years of age with a diagnosis of Osteoarthritis. Patients with traumatic fracture, ligamentous injury, or knee pain other than osteoarthritis were excluded from the study. Randomization was performed at an external site and the method was computerized with concealed allocation sequence. Group B (Experimental) received Isometric exercises with routine physical therapy treatment. While Group A (Control) was treated with routine physical therapy treatment which consisted of Manual therapy, ultrasound, TENS, and hot pack (Table 1). The duration of the session was 60 minutes with 2 sessions a week for 6 weeks. Patients were assessed three times, baseline assessment at 0 week, 2nd assessment after 3 weeks, and final assessment after 6 weeks. All the assessments were performed

by an independent assessor who was blind about the procedure and patients allocation. Data were analyzed by SPSS 20. An independent t-test was used for between-group comparisons. Fall Risk Assessment Tool (FRAT) and short-form 36 were used as outcome measures. p<.05 was considered significant (Figure 1).

RESULTS

This study was conducted to determine the effectiveness of isometric exercises in reducing fall risk of knee OA in the elderly population and also its effects on quality of life. Out of the total of 60 subjects, 32 were female while 28 were male. The mean age was 65.28 ± 7.8. The BMI categories showed that 48 individuals were with normal BMI, 2 were underweight, 8 were overweight, while 2 were obese (Figure 2). Fall risk at tool scores with mean ± SD is presented in Table 2. The results showed significant differences between the experimental and control group as p<0.05 General health of both groups according to short-form 36 scales is shown in Table 3. Group-B showed significant results for general health with the p-value of 0.001 when comparing the outcomes of treatment after the 1st, 3rd and 6th week. And within group-A scores also showed significant results with a p-value of 0.001 (Table 4).

DISCUSSION

This study included a total of 60 patients. The mean age of participants was 65.28 ± 7.8. Group B was an experimental group and was treated with Isometric Exercises with ROM and stretching

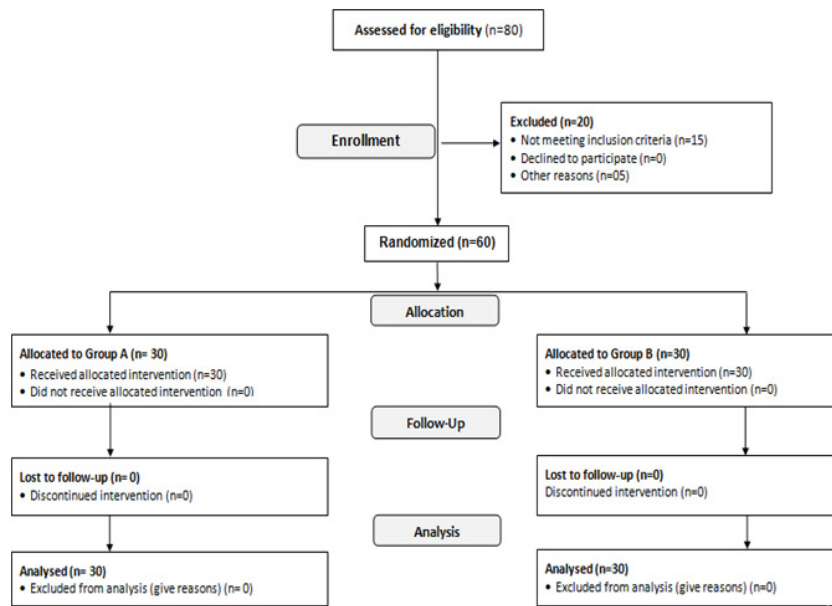


Figure 1: Consort diagram for RCT.

Table 1: Showing treatment protocol for both groups.

Group A (Control group)		Group B (Experimental group)	
History	05 Mins	History	05 Mins
Assessment	10 Mins	Assessment	10 Mins
Treatment			
Hot pack	10 Mins	Hot Pack	10 Mins
TENS	10 Mins	TENS	10 Mins
ROM and flexibility exercises	10 Mins	Isometric exercises ROM and flexibility exercises	10 Mins
Manual therapy	10 Mins	Manual therapy	10 Mins
Ultrasound therapy	5 Mins	Ultrasound therapy	5 Mins

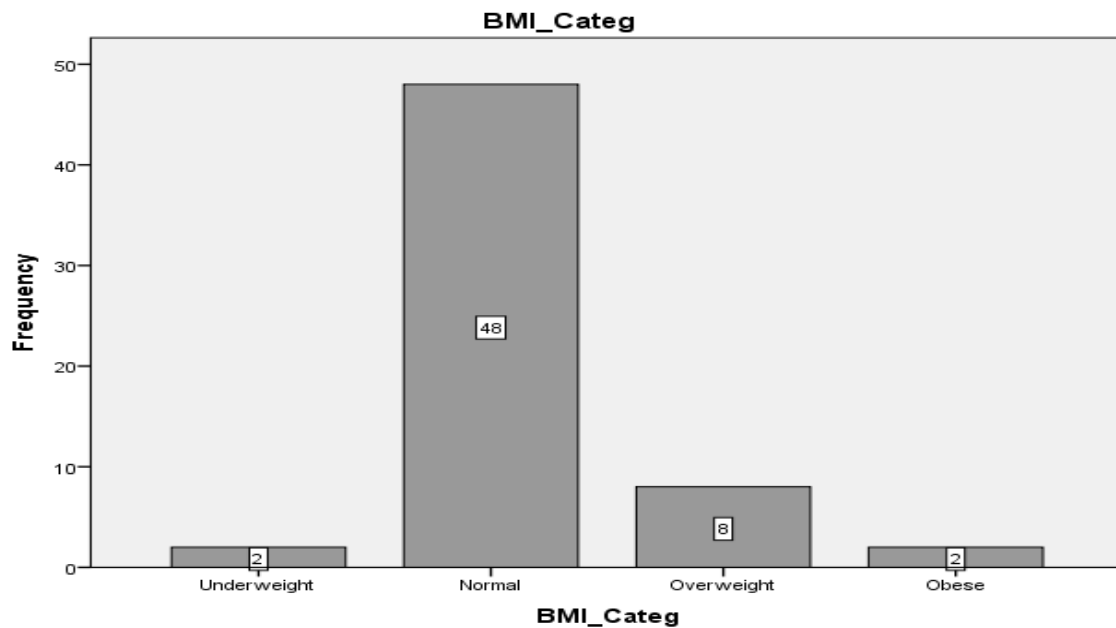


Figure 2: Showing BMI categories of participants.

Table 2: Showing fall risk assessment tool score.

Assessments	Control group (Mean ± SD)	Experimental group (Mean± SD)	P-value
0 week	12.53 ± 0.15	12.37 ± 1.2	.653
3 rd week	13.90 ± 0.41	14.10 ± 0.00	.009
6 th week	13.90 ± 0.41	14.10 ± 0.00	.009

Table 3: Showing within-group comparison of short form 36.

Parameters	Groups	Pre (0 Week) Mean ± SD	Post (4 Week) Mean ± SD	p-value
Physical function	Group 1	40.33 ± 25.56	83.50 ± 19.87	.000
	Group 2	43.50 ± 23.60	100.0 ± 0.00	
Role limitation due to physical health	Group 1	42.00 ± 45.26	98.33 ± 9.12	.000
	Group 2	55.00 ± 42.24	100.0 ± 0.00	
Role limitation due to emotional problem	Group 1	42.22 ± 47.89	100.0 ± 0.00	.000
	Group 2	54.44 ± 42.42	100.0 ± 0.00	
Energy fatigue	Group 1	43.72 ± 15.54	61.77 ± 16.41	.000
	Group 2	41.66 ± 21.94	75.77 ± 19.84	
Emotional well being	Group 1	42.66 ± 14.83	62.40 ± 14.57	.000
	Group 2	38.40 ± 22.93	75.33 ± 19.71	
Social functioning	Group 1	57.50 ± 12.54	64.16 ± 15.65	.000
	Group 2	52.08 ± 16.44	85.83 ± 16.97	
Pain	Group 1	57.91 ± 21.39	80.83 ± 18.19	.000
	Group 2	53.75 ± 25.24	95.41 ± 8.97	
General health	Group 1	50.20 ± 6.56	73.90 ± 6.99	.000
	Group 2	52.06 ± 6.59	91.23 ± 6.87	

Table 4: Showing between-group analysis of short form 36.

Parameters	Group 1 (Mean ± SD)	Group 2 (Mean ± SD)	p-Value
Physical functioning	83.50 ± 19.87	100.0 ± 0.00	.433
Role limitation due to physical health	98.33 ± 9.12	100.0 ± 0.00	.338
Role limitation due to emotional problem	100.0 ± 0.00	100.0 ± 0.00	.050
Energy fatigue	61.77 ± 16.41	75.77 ± 19.84	.039
Emotional well being	62.40 ± 14.57	75.33 ± 19.71	.005
Social functioning	64.16 ± 15.65	85.83 ± 16.97	.426
Pain	80.83 ± 18.19	95.41 ± 8.97	.251
General health	73.90 ± 6.99	91.23 ± 6.87	1.000

of the knee and in Group A only ROM and stretching exercises of the knee were given. Fall Risk Assessment tool mean scores for the experimental and control group were 14.10 ± 0.00 vs. 13.90 ± 0.41 which were significant with a p-value of .009.

The comparison of short-form 36 scores in Group A and Group B showed that during treatment both groups A and B showed significant improvement. While comparing both groups participants of group-B had exhibited more improvement in daily life activities, social attractions, and increased overall general health status.

The results of a previous study support the results of our study. That study aimed to evaluate the consequences of isometrics in decreasing the risk of falls in an elderly population suffering from knee osteoarthritis. A total of 60 patients were included in the study that was divided into two groups. The Control group was receiving traditional physiotherapy treatment while the experimental group was receiving an isometric exercise plan. According to that study isometric plan for 6 weeks minimizes the risk of falls in patients with knee osteoarthritis [14]. The results of our study are also supported by another study that was conducted in 2015. The sample size was 55 with an age above 65. Physically active and participants with insufficient physical activity were included in the study. The results of that study showed that high levels of physical activity enhance the quality of life in an elderly population with knee osteoarthritis [15]. The results of this study are also supported by another study that was conducted by Hongbo Chen and colleagues. A total of 171 elderly participants with knee osteoarthritis and age 60 or above were included in the study. They concluded that physical activity plays important role in improving the quality of life in the geriatric population suffering from knee osteoarthritis [16]. Fatih Toket all conducted a study to analyze the effects of electrical stimulation combined with Continuous Passive Motion (CPM-ES) versus isometric exercise on muscle strength and quality of life in patients with knee Osteoarthritis (OA). Results of this study showed that knee isometrics can decrease the pain in patients with knee osteoarthritis and also ameliorates the strength of muscles. This is also according to the results of our study [17].

A study conducted by Lucie Brosseau et al aimed to assess the effects of knee isometrics in patients with knee osteoarthritis. Results of the study showed that knee isometrics and strengthening exercises aid to overcome the pain in patients suffering from knee osteoarthritis, p-value <0.05. This study supports the results of the current study [18].

Riann M. Palmieri-Smith et al conducted a study to determine that quadriceps strength decreases as osteoarthritis severity increases. Results showed that quadriceps strength (Nm/kg) was 22% greater in women without radiographic osteoarthritis than in women with osteoarthritis (p<0.05). Quadriceps strength was also greater in women with Noyes' medial tibial and femoral cartilage scores of 0 when compared in women with Noyes' grades 2 and 3-5 (p ≤ 0.05). This study supports the results of our study that knee isometrics reduce the complications of knee osteoarthritis [19].

A study conducted by Rana S Hinman et al aimed to evaluate the effects of strengthening exercise in knee OA. The intervention resulted in less pain and joint stiffness and greater physical function, quality of life, and hip muscle strength. Totals of 72% and 75% of participants reported improvements in pain and function, respectively, compared with only 17% (each) of control participants. Benefits were maintained 6 weeks after the completion of physical

therapy, with 84% of participants continuing independently. This study also complies with the results of our study [20].

CONCLUSION

This study concluded that isometric exercises reduce the fall risk of knee OA in an elderly population. It also shows that isometric exercises improve the quality of life in patients suffering from osteoarthritis.

REFERENCES

1. Iqbal MN, Haidri FR, Motiani B, Mannan A. Frequency of factors associated with knee osteoarthritis. JPMA- J Pak Med Assoc. 2011;61(8):786.
2. Ker RG, Al Kawan RH. A Primary care approach for physicians in 2000 and beyond. Saudi Med J 2001;22(5):403-406.
3. Lindh M. Increase of muscle strength from isometric quadriceps exercises at different knee angles. Scand J Rehabil Med. 1979;11(1):33-36.
4. Ringdahl E, Pandit S. Treatment of knee osteoarthritis. American family physician. 2011;83(11).
5. Lee R, Kean WF. Obesity and knee osteoarthritis. Inflammopharmacology. 2012;20(2):53-58
6. Fransen M, Bridgett L, March L, Hoy D, Penserga E, Brooks P. The epidemiology of osteoarthritis in Asia. Int J Rheum Dis. 2011;14(2):113-121.
7. Ali SS, Ahmed SI, Khan M, Soomro RR. Comparing the effects of manual therapy versus electrophysical agents in the management of knee osteoarthritis. Pak J Pharm Sci. 2014;27(4 Suppl):1103-1106.
8. Arendt Nielsen L, Nie H, Laursen MB, Laursen BS, Madeleine P, Simonsen OH, et al. Sensitization in patients with painful knee osteoarthritis. Pain. 2010;149(3):573-581.
9. Levinger P, Menz HB, Wee E, Feller JA, Bartlett JR, Bergman NR. Physiological risk factors for falls in people with knee osteoarthritis before and early after knee replacement surgery. Knee Surg Sports Traumatol Arthrosc. 2011;19(7):1082-1089.
10. Kim HS, Yun DH, Yoo SD, Kim DH, Jeong YS, Yun JS et al. Balance control and knee osteoarthritis severity, Ann Rehabil Med. 2011; 35(5): 701.
11. Anwer S, Alghadir A. Effect of isometric quadriceps exercise on muscle strength, pain, and function in patients with knee osteoarthritis: a randomized controlled study. J Phys Ther Sci. 2014;26(5):745-748.
12. Shakoor MA, Rahman MS, Azad AK, Islam MS. Effects of isometric quadriceps muscle strengthening exercise on chronic osteoarthritis of the knee. Bangladesh Med Res Counc Bull. 2010;36(1):20-22.
13. Masud T, Morris RO. Epidemiology of falls. Age Ageing. 2001;1:30 (suppl 4):3-7.
14. Aamir M, Rashad A, Suleman TA, Uddin S, Intikhab R, Memon AG, et al. Effects of isometric exercises in reducing fall risk in elderly knee osteoarthritis patients. J Orthop Trauma Surg Relat Res. 2021;16(4).
15. Mesci E, Icagasioglu A, Mesci N, Turgut ST. Relation of physical activity level with the quality of life, sleep and depression in patients with knee osteoarthritis. North Clin Istanbul 2015;2(3):215.
16. Chen H, Zheng X, Huang H, Liu C, Wan Q, Shang S. The effects of a home-based exercise intervention on elderly patients with knee osteoarthritis: a quasi-experimental study. BMC Musculoskelet Disord. 2019;20(1):1-1.
17. Tok F, Aydemir K, Peker F, Safazı, Taşkınat MA, Özgül A. The effects of electrical stimulation combined with continuous passive motion versus isometric exercise on symptoms, functional capacity, quality of life and balance in knee osteoarthritis: randomized clinical

- trial. *Rheumatol Int.* 2011;31(2):177-181.
18. Brosseau L, Taki J, Desjardins B, Thevenot O, Fransen M, Wells GA, et al. The Ottawa panel clinical practice guidelines for the management of knee osteoarthritis. Part two: strengthening exercise programs. *Clin Rehabil.* 2017;(5):596-611.
 19. Palmieri Smith RM, Thomas AC, Karvonen Gutierrez C, Sowers MF. Isometric quadriceps strength in women with mild, moderate, and severe knee osteoarthritis. *Int J Rheum Dis./Assoc Acad Physiatr.* 2010;89(7):541.
 20. Hinman RS, Heywood SE, Day AR. Aquatic physical therapy for hip and knee osteoarthritis: results of a single-blind randomized controlled trial. *Phys Ther.* 2007;87(1):32-43.