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Research Article

Sacroiliac joint manipulation helps to improve pain pressure threshold in chronic piriformis syndrome: a 6-week randomized controlled trial

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ABSTRACT

Background: Piriformis syndrome (PS) has negative impact on the daily activities of the patients and lead to disability. There is an anatomical association of piriformis muscle with sacroiliac joint (SIJ). So manual therapy including manipulation of SI joint may be the option for relieving the symptoms of PS.

Objective: To investigate the effectiveness of Sacroiliac joint manipulation in improving pain pressure threshold in patients with chronic piriformis syndrome.

Materials and Methods: A randomized clinical trial (NCT04603703) was conducted at Max Rehab and Physical Therapy Centre G8-Markaz, Islamabad, Pakistan. A total of n=30 patients were randomly divided into Experimental group (n=15) and control group (n=15). Both groups received conventional physical therapy including therapeutic ultrasound, moist hot pack, piriformis muscle stretching, myofascial release of paraspinal muscles, gluteal strengthening, sciatic neurodynamics. The experimental group additionally received sacroiliac joint manipulation. The outcome measures were pain, straight leg raise (SLR), pain pressure threshold and piriformis muscle length. The total time frame of the treatment was 3 days per week for 6 weeks and pre and post intervention assessment was done.

Result: The mean age of participants was 40.46 ±10.513 years. Pain, SLR, pain pressure threshold and piriformis length was significantly improved (p<0.001) in both the experimental and control group after 6th week intervention. Between group comparison there was no significant difference between the groups after 6-week intervention regarding the pain, SLR and piriformis muscle length, except pain pressure threshold which was significantly improved in experimental group as compared to control group (67.7±18.42 vs 52.51±15.26, p=0.020).

Conclusion: Addition of the sacroiliac joint thrust manipulation technique and conventional physical therapy alone were equally effective in decreasing pain intensity and normalizing length of Piriformis and Straight leg raise. But SIJ manipulation showed promising results on pain pressure threshold.

Keywords: Articular, physical therapy modalities, piriformis muscle syndrome, pain threshold, range of motion, sacroiliac joint.

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INTRODUCTION

Piriformis syndrome is a chronic mechanical fault which develops whenever the prolonged sitting postures put continuous pressure on the muscle belly resulting in spasm and inflammation of piriformis muscle which ultimately compress the sciatic nerve and gives radiating pains down the leg[1,2]. Tenderness over piriformis muscle and ipsilateral pain in buttock is the most common symptoms of piriformis syndrome with or without sciatica[3,4,5].

The symptoms got worsen with sitting in crossed leg position or by walking[6]. Other etiological factors can also be there involving chronic over load, over work tiredness, radiating pains to limbs and major injuries are that may activate Trigger Points in skeletal muscle[7]. Trigger points in this muscle in the muscle may be further developed by the SIJ malfunction and this can be the factor to worsen the normal function. So, in these conditions, both concerns should must be addressed [8,9].

Diagnosis is made by clinical findings such as MRI but many anatomic variants may have gone undiagnosed in the past due to the lack of or limitations of imaging studies[10,11]. An advanced technique of MR neurography may also be useful in assisting the diagnosis of this condition. MR neurography uses high-resolution sequences that increase the signal of peripheral nerves, which allows for increased accuracy and visualization[12].

Many non-pharmacological management techniques used to treat piriformis syndrome includes diverse manual therapy techniques, Piriformis muscle stretching and Kinesiotaping[13,14,15]. The heat therapy, cold therapy, Ultrasound and electric current have been suggested as additional modalities to reduce pain[16]. Dry needling with minimal invasion is used to deactivate the myofascial trigger point which helps to release the pain [17]. Manipulation Techniques are mostly used in SIJ if the source of pain and dysfunction in SIJ is PS. In early studies it is shown that decreased muscle inactivity, increased efficiency of the muscles around the SIJ, balanced Gait pattern, decrease pain intensity and improved ROM are the physiological and functional outcomes of SIJ Manipulation [14, 18].

Several research were done to measure the effectiveness of sacroiliac joint thrust manipulation technique in the treatment of sacroiliac joint

dysfunction, Sacroiliitis, symptoms associated with low back pain or in any other hip pathology, but no research was done to measure the effectiveness of sacroiliac joint thrust manipulation in patients with chronic piriformis syndrome. As there is a strong anatomical relation between piriformis muscle and sacroiliac joint so, the main aim of this study was to measure the effectiveness of HVLT on SIJ in those patients who are suffering from chronic piriformis or piriformis non traumatic dysfunction to reduce pain intensity, pain pressure threshold and to improve straight leg raise and piriformis length.

METHODOLOGY

A single blinded randomized control trial (NCT04603703) with parallel design at Max Rehab and Physical Therapy Centre G8-Markaz, Islamabad, Pakistan after the approval from research and ethical committee (REC) of faculty of rehabilitation and allied health sciences Riphah International University. The participants were recruited using nonprobability purposive sampling technique from May2020, to September 2020.

Both genders were eligible for the study with age between 30 to 60 years having at least 3 months old chronic piriformis syndrome as well as with positive Flexion Adduction Internal rotation test (FAIR) and unilateral or bilateral piriformis syndrome. Participants were excluded if they had Lumbar Prolapsed Intervertebral Disc (PVD), Hip Osteoarthritis, Sacroiliitis, Lumbosacral instability, any joint replacements in lumbosacral and hip region.

A total n=30 participants fulfilled the inclusion criteria were randomly divided into control (n=15) and experimental group (n=15). The randomization was done using toss and coin method. The random allocation sequence was generated by primary investigator (physical therapist), who enrolled participants, as well as assigned participants to interventions. (Figure 1) The participants were assessed before the treatment and after last session at 6th week (18th session). The Numerical Pain Rating Scale (NPRS) used to measure the pain threshold in patients [19]. The Digital Goniometer (Digital Angle Ruler) used to measure the piriformis muscle length and joint range of motion [20]. Algometer/Dolorimeter was used measures the pressure threshold in patients with myofascial trigger points [21]. Inclinator was used to measure the Straight Leg Raise (SLR).

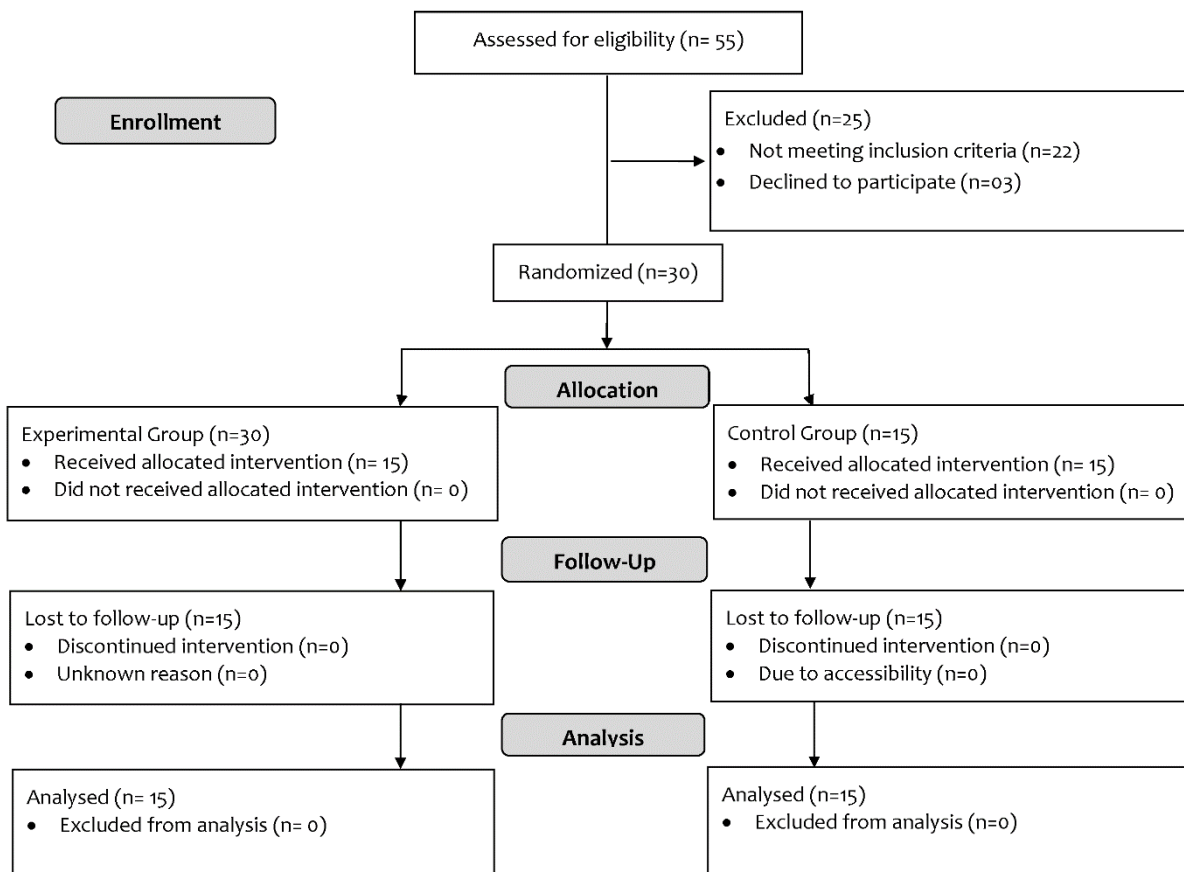


Figure 1: CONSORT diagram

Both groups received a treatment protocol of therapeutic ultrasound and moist hot pack was applied directly over the piriformis muscle for 10mins/1set in prone. The Piriformis muscle stretching for 7sec hold-7reps/1set in supine lying position, Myofascial release of lumbar paraspinal muscles for 3mins/1set in prone lying, gluteal muscles strengthening for 10sec hold-5 reps/1set in sitting as well as standing and sciatic neurodynamic was applied in supine lying position with 10 oscillations/3set. The experimental group additionally received the high velocity low amplitude thrust in downward direction at sacroiliac joint which resulted in popping sound or cavitation. Both treatment protocols were given 3 days per week for 6 weeks.

The results were presented as mean \pm SD, median, IQR and frequency. The Pain on numeric pain rating scale was not normally distributed so for pre-post analysis Wilcoxon sign rank test and for comparison Mann Whitney U test was applied. While all other variables including SLR, pain pressure threshold and piriformis muscle length was normally distributed, so paired sample test used for pre-post analysis and independent t-test for group comparison. The SPSS ver 22 was used for data analysis while keeping the significance level at $p < 0.05$.

RESULTS

The age range of $n=30$ participants was from 30-60 years. The mean age of the participants was 40.46 ± 10.51 years. A total of $n=22$ participants were female and remaining $n=8$ were male in the study. Majority of the participants were having right piriformis syndrome $n=17(56.67\%)$ as compared to left piriformis syndrome $n=13(43.33\%)$. A total of $n=10(33.3\%)$ were house wives, $n=8(26.67\%)$ were doctors, $n=8(26.67\%)$ were office workers and remaining $n=4(13.33\%)$ were teachers. 13.35% reported that their onset of pain was 3 months before, 20% had 6 months before and 66.65% reported pain from more than a year.

It was observed that pain, SLR, pain pressure threshold and piriformis length was significantly improved ($p < 0.001$) in both the experimental and control group after 6th week intervention. (Table 1) All variables were comparable at the baseline. But the result showed that there is no significant difference between the groups after 6-week intervention regarding the pain, SLR and piriformis muscle length, except pain pressure threshold which was significantly improved in experimental group as compared to control group (67.7 ± 18.42 vs 52.51 ± 15.26 , $p = 0.020$). (Table 2)

Table 1: Pre-Post analysis (Pain, SLR, Pian Threshold and Piriformis muscle length)

		Experimental Group (n=15)			Control Group (n=15)		
		Mean±SD/M(IQR)	MR/MD	p-value	Mean±SD/M(IQR)	MR/MD	p-value
Pain (NPRS)	Pre	6(1)	8	0.00***	6(2)	7.5	0.00***
	Post	2(2)			3(1)		
Straight Leg Raise (inclinometer)	Pre	40.93±9.72	29.11	0.00***	40.86±10.37	32.26	0.00***
	Post	70.04±17.69			73.13±13.60		
Pain Pressure threshold (Algometer)	Pre	40.75±15.89	27.01	0.00***	32.8±13.34	19.63	0.00***
	Post	67.7±18.42			52.51±15.26		
Piriformis length (Digital goniometer)	Pre	49.4±10.22	25.04	0.00***	51.38±12.70	16.73	0.00***
	Post	74.4±9.30			68.12±11.74		

Significance level: $p<0.05^*$, $p<0.01^{**}$, $p<0.001^{***}$ **Table 2: Comparison between Experimental and control group (Pain, SLR, Pian Threshold and Piriformis muscle length)**

		Experimental Group (n=15)		Control Group (n=15)		p-value
		Mean±SD/M(IQR)	MR/MD	Mean±SD/M(IQR)	MR/MD	
Pain (NPRS)	Pre	6(1)	1.14	6(2)	-5.06	0.714
	Post	2(2)		3(1)		
Straight Leg Raise (inclinometer)	Pre	40.93±9.72	0.66	40.86±10.37	-3.08	0.986
	Post	70.04±17.69		73.13±13.60		
Pain Pressure threshold (Algometer)	Pre	40.75±15.89	7.87	32.8±13.34	15.26	0.153
	Post	67.7±18.42		52.51±15.26		
Piriformis length (Digital goniometer)	Pre	49.4±10.22	-1.94	51.38±12.70	6.36	0.647
	Post	74.4±9.30		68.12±11.74		

Significance level: $p<0.05^*$, $p<0.01^{**}$, $p<0.001^{***}$

DISCUSSION

The main objective of this study was to find out the effectiveness of thrust joint manipulation of sacroiliac joint on pain pressure threshold in patients with chronic piriformis syndrome. Both treatments i.e. conventional physical therapy and thrust joint manipulation of sacroiliac joint have shown positive effects on pain intensity, piriformis muscle length and straight leg raise. When between group analysis was done except pain pressure threshold which was significantly improved with sacroiliac joint thrust manipulation.

The results of current study confirmed that high velocity low amplitude thrust manipulation group showed better improvement in term of improving pain pressure threshold for piriformis syndrome patients. A systematic review was conducted to measure the effectiveness of different physical therapy treatments. The study concluded that high velocity low amplitude thrust technique was proved to be more effective as compare to rest of the interventions in managing the pain associated with piriformis syndrome supporting the results of current study [22].

A study at the college of chiropractors in Chicago was carried out where they presented a case with piriformis anomaly resulted into piriformis syndrome and compression of sciatic nerve causing pain down the legs and numbness as well. They treated the related symptoms with high velocity low

amplitude thrust manipulation on sacroiliac joint and this technique have shown significant changes in patient's symptoms i.e. pain intensity was improved on visual analogue scale and overall functional performance as well after treating the patient for 2 weeks on alternative days[23].

In a randomized controlled trial, participants were divided into three groups i.e. group A, B and C and administered with Sacroiliac joint manipulation, lumbar spine manipulation with ischemic compression and ischemic compression alone for 5 days respectively. This study has summarized that over all the three interventions, sacroiliac joint manipulation was proved to be more effectiveness as compare to the remaining treatment options in alleviating pain and improving pain pressure threshold for patients diagnosed with chronic piriformis syndrome [24]. The results of this study strongly support the current study where sacroiliac joint manipulation was proved to be more effective in improving the overall pain.

In the current study, subjects in the experimental group were intervened with conventional physical therapy including stretching exercises too with the addition of sacroiliac joint thrust manipulation technique and this treatment protocol resulted into greater improvement. A study to compare the two physical therapy treatment techniques in postpartum females suffering from symptoms associated with piriformis syndrome to improve pain and pain pressure threshold. The included treatments were manipulation of sacroiliac

joint with ice and stretch with the sacroiliac joint manipulation alone. The study concluded that both interventions are equally effective and has shown significant effects on pain improvement and pressure algometry[25]. This study favours the current study results. Another study compares two physical therapy treatment techniques, cross friction massage and stretching exercise in patients with piriformis syndrome. They reported that cross friction massage is more effective in reducing pain and improving functional abilities in patients with piriformis syndrome as compare to stretching exercises [14].

The results of current study showed that strengthening exercises have effective results in improving hip muscle strength and coordination for both conventional and experimental group. A study to measure the effectiveness of hip muscle strengthening exercises along with conventional physical therapy approach in improving gluteal muscles strength hence improving overall musculoskeletal discomfort and pain associated with chronic piriformis syndrome. The study showed better compliance and effectiveness with strengthening exercises in improving muscle strength, coordination hence reducing weakness and overall musculoskeletal discomfort resulted from piriformis syndrome [26].

In this study, neural mobilization combined with conventional physical therapy showed improvement in reducing pain, improving piriformis length and straight leg raise in patients with chronic piriformis syndrome. According to Mulla AA. neural mobilization and piriformis muscle stretching were more effective in lowering the pain related to sciatic nerve compression beneath the piriformis muscle, improving efficiency of gluteal muscles majorly the piriformis muscle and gait pattern [6]. A study was conducted on patients with Piriformis syndrome to determine the effectiveness of passive mobilization of sciatic nerve versus self-mobilization. They reported that both techniques were effective in reduction of pain and improving hip functions but passive mobilization was more effective in the management of piriformis syndrome compared to the self-mobilization for improving pain and hip functions [27].

The current study reported that myofascial release technique as a part of conventional physical therapy showed improvement in reducing pain, improving piriformis length and functional mobility in patients with chronic piriformis syndrome. A study to compare the effectiveness of myofascial release technique with conventional physical therapy in patients with chronic piriformis syndrome to improve total piriformis muscle length, pain intensity and functional mobility. The results of the study concluded that myofascial release technique

resulted in to restore piriformis muscle length, improving pain intensity and functional outcomes and has significant effects as compare to conventional physical therapy [28]. Another study reported that soft tissue mobilization including myofascial release with the addition of piriformis stretching exercises along with sacroiliac joint manipulation are of better treatment in patients with pain due to piriformis syndrome [29].

The study is limited because most of the participants in the study were females. This gender heterogeneity may be confounding effect on the results. The sensitivity of body because of piriformis muscle trigger point should be differentiated from the pain caused by repetitive placement of Algometer's tip over the targeted area on every step of data collection. Algometer measurements were taken by pressing the tip of the Algometer directly over the area where piriformis muscle stiffness was maximum. This method is just as same the ischemic compression method so outcome measures can have fluctuating results.

CONCLUSION

The conventional physical therapy with and without sacroiliac joint manipulation were equally effective in treating chronic piriformis syndrome to improve the pain intensity, piriformis muscle length and straight leg raise. But addition of sacroiliac joint manipulation may improve pain pressure threshold of the Piriformis muscle. The future studies are recommended with more accurate method to measure the pain pressure threshold should be added in future studies. An equal gender and race distribution in future studies would make it more relevant to the population affected.

Author's Contribution

BS and ST: substantial contributions to the conception and design of the study.

SN and IH: Data Processing, Collection, Perform Experiment.

MAHT and SAH: Analysis and interpretation of data for the study.

AGS: revised it critically for important intellectual content.

BS, ST, SN, IH, MAHT, SAH, AGS and MMK: final approval of the version to be published and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted at Max Rehab and Physical Therapy Centre G-8 Markaz, Islamabad, Pakistan after the approval from research and ethical committee of faculty of rehabilitation and allied health sciences Riphah International University (REC/00693).

Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgments

Non to declare.

Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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Research Article

Correlation of kinesiophobia with postpartum depression in females with lumbo-pelvic pain

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ABSTRACT

Background: Lumbopelvic pain (LPP) is common during pregnancy associated with postpartum depressive symptoms. These negatively affect maternal health and behavior, such as exercise and physical activity ultimately leads to kinesiophobia.

Objective: To determine the association of kinesiophobia with postpartum depression in females with lumbo-pelvic pain.

Methods: A cross-sectional study was conducted on 89 postpartum women with lumbo-pelvic pain within six months of delivery in Jinnah Hospital, Lahore. Nonprobability convenience sampling was used to collect the data. Females presenting with lumbo-pelvic pain were selected based on inclusion and exclusion criteria. Lumbo-pelvic pain severity, kinesiophobia and depression were measured by Visual Analogue Scale, Tampa Scale and Zung Self Rating Depression Scale, respectively. Pearson correlation was used to determine the correlation between kinesiophobia and depression.

Results: The mean age of participants was 29.14 ± 3.28 years. The mean pain score of lumbosacral pain was 1.989, Kinesiophobia was 47.5169 and depression was 60.2247. There was significant strong positive correlation ($r=0.786$, $p<0.001$) between Kinesiophobia and postpartum depression among female having lumbosacral pain.

Conclusion: There was strong association of kinesiophobia with postpartum depression in females with lumbo-pelvic pain.

Key words: Depression, kinesiophobia, lumbo-pelvic pain, pregnancy

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INTRODUCTION

Pregnancy can have profound physiologic effects on a female's body affecting but not limited to musculoskeletal system particularly the axial system [1]. It brings about several musculoskeletal changes including changes in posture and subsequent musculoskeletal discomfort in the lower back, pelvic girdle or both causing a reduction in the quality of life of the young mothers by limiting or disturbing their sleep and activities of daily living [2, 3].

Over half of pregnant females experience lumbo-pelvic pain [3, 4] while about 5% to 40% experience it even after six months of delivery [5] and 20% are known to have painful episodes to as long as 3 years post-delivery[6]. Furthermore, the predominance of depressive symptoms being multiple times higher in females experiencing lumbo-pelvic pain for 3 months postpartum than those without lumbo-pelvic pain is backed by evidence[7].

Chronic pain often results in further limitation of daily activities due to anticipation of pain which aggravates depressive symptoms, immobility or misuse [8]. The fear of pain leads to a fear of movement termed as Kinesiophobia [9] which has a strong positive correlation with pain of lumbopelvic origin[10]. Kinesiophobia has shown to significantly reduce physical activity thus not only negatively impacting the overall the functional performance [11] but particularly the mental state of an individual as well due to being relatively dependent on others for routine activities[12]. The fear of physical activity causing pain increases immobility in postpartum females and eventually leads to deterioration of mental health[13].

Due to such negative consequences of chronic pain, there needs to be found evidence regarding association of kinesiophobia and depression in postpartum females with lumbo-pelvic pain as it is affecting a substantial population of young mothers. The study aims to determine the association of kinesiophobia with postpartum depression in females with lumbo-pelvic pain.

METHODOLOGY

It was a cross-sectional study conducted in the Gynecology and Obstetrics department of Jinnah Hospital, Lahore from July to December 2021 after taking approval from the Research & Ethics Committee of Riphah College of Rehabilitation Sciences (REC/RCR & AHS/21/-529) The females between age of 20 to 40 years having delivery within last six months, having lumbo-pelvic pain and being able to carry out activities of daily life independently were included. Those with a history of neoplasm, spinal fracture or systemic locomotor

disease as well as any previous spinal, femur or pelvic surgery were excluded. The sample size was calculated to be 81 using Epitool with 5% margin of error and confidence interval of 90% while after addition of 10% attrition rate, a sample size of n=89 was used [6]. Non-probability convenience sampling technique was used to collect data.

Informed consent was taken before data collection and confidentiality of the participants was maintained. The outcome measure tools used included Visual Analog Scale (VAS) for severity of pain with a score between 1 to 3 denoting mild pain, 4 – 6 moderate pain and 7 to 10 severe pain [10]. Tampa Scale of Kinesiophobia (TSK) to evaluate fear of movement, fear of work-related activities, fear of avoidance and fear of re-injury with a total score of the scale range from 17- 68, where 17 means no kinesiophobia, 68 means severe kinesiophobia, and score 18–67 indicates kinesiophobia [11,12] in addition Zung Self-Rating Depression Scale which is short-self-administered survey to quantify the depressed status of a patient. Each question is scored on a scale of 1-4 (a little of the time, some of the time, good part of the time, most of the time). The scores range from 25-100 with 25-49 representing normal state, 50-59 mild depression, 60-69 moderate depression while 70 and above denoting severe depression[14].

The data was analyzed on SPSS software version 25. The data was presented with mean and standard deviation for numerical variables while frequencies and percentages calculated for categorical variables. To determine the correlation between kinesiophobia and depression determined by Pearson product-moment correlation coefficient.

RESULTS

The Mean age was 29.14 ± 3.28 years with minimum age of 25 years and maximum age of 37 years. A total of n36(40%) subjects had parity between 3 to 6 and n=53(59.55%) females had parity between 1 to 3. The overweight subjects with a BMI between 25-30 were n=43(48.31%), n=17(19.1%) were obese with BMI > 30 and n=29(32.58%) were having normal weight falling in range 18-25.

The mean score of lumbosacral pain on VAS was 1.98 ± 0.28 , the majority of participants i.e., 82(92.13%) had moderate pain 4(4.49%) had mild pain and 3(3.47%) had severe pain. As per Tampa scale the mean score was 47.5169 ± 10.243 years with minimum score of 24% and maximum score of 63%. no kinesiophobia was present in n=4(4.5%) of subjects, in n=80(89.9%) of subjects kinesiophobia was present and severe kinesiophobia was present in 5(5.6%) of subjects.

The mean score of depression on the Zung Self Rating Depression Scale was 60.2247. The majority of participants had severe depression i.e. $n=63(70.8\%)$ while $n=13(14.6\%)$ had moderate depression, $n=10(11.2\%)$ had mild depression with only $n=3(3.4\%)$ participants not having any depression at all.

The results showed that there was significant strong positive correlation ($r=0.826$, $p<0.001$) between Kinesiophobia (47.51 ± 10.24) and postpartum depression (60.22 ± 9.56) among female having lumbosacral pain. (Figure 1)

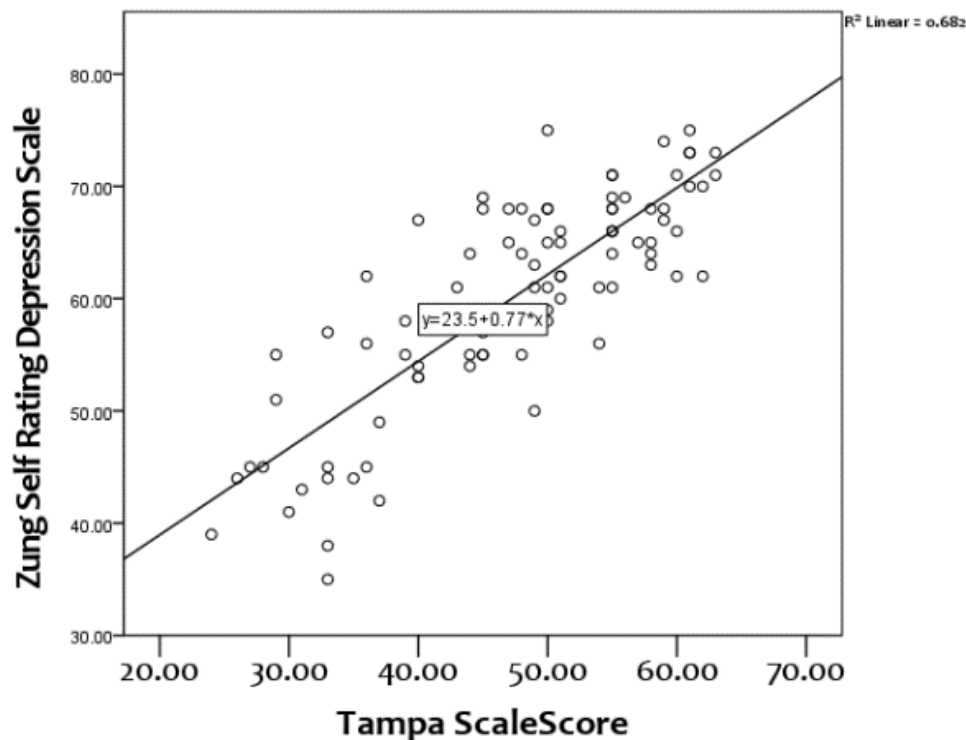


Figure 1: Correlation between the depression and kinesiophobia.

DISCUSSION

In the current study, we investigated the association of kinesiophobia and postpartum depression in females with lumbo-pelvic pain within six months of delivery. The association between kinesiophobia and depression in postpartum females with lumbo-pelvic pain came out to be significant.

The literature suggests that a variety of factors can lead towards postpartum depression, one of which is lumbo-pelvic pain itself in late pregnancy[15]. Studies have shown that pregnancy related lumbo-pelvic is related not only with physical factors but with mental factors as well such as stress, catastrophizing and fear avoidance beliefs that are an outcome of fear of pain, re-injury and movement [16]. It supported the results of the current study in which majority of participants with lumbopelvic pain reported severe depression. A study was conducted to investigate the association between pelvic girdle pain and fear of movement and it was found that the latter is higher in pregnant women with pelvic girdle pain than healthy pregnant

women [10] which is in accordance with the current study demonstrating association of kinesiophobia with postpartum females having depressive symptoms as well as pain in pelvic region. It results with the mechanism of fear avoidance model (FAM) is the vicious circle wherein pain evolves into depressive symptoms. This model is often applied to patients with chronic pain, including LBP. According to FAM, during a musculoskeletal pain episode, catastrophizing brings on pain-related fear that leads to avoidance of activities, and the excessive caution might cause disability, disuse, and depressive symptoms. Pain-catastrophizing patients will maintain pain experiences, thereby fueling the vicious circle of increasing fear and avoidance. One element of this vicious circle is fear of movement called kinesiophobia, which is defined as avoidance behavior and hypervigilance to bodily sensations which has been reported to be a predictive factor of depressive symptom[8].

Ebina A et al. conducted a study on women suffering from lumbo-pelvic pain in late pregnancy to investigate association between depression and kinesiophobia one month after delivery. In

univariate analysis, kinesiophobia was higher in females exhibiting depression than the group of females with no depression with kinesiophobia at one month after pregnancy being significantly associated with depression[2]. A recent cross-sectional study conducted by Sarwat M et. Al also showed strong correlation between the variables with a perceptibly high recurrence of kinesiophobia in post-caesarian females with low back and pelvic pain, [17] similar to the current study. Antunes RS et al. also concluded in their study that patients with low back pain and depression had a greater fear of movement [18].

Since the data was collected from a single set-up, and sample of convenience so the external validity may be affected.

CONCLUSION

The depression among postpartum female having lumbosacral pain has strong correlation with kinesiophobia. it is recommended that future studies may involve multiple centers nationwide alongside analyzing association of other social elements such as socioeconomic background and interpersonal relationships which may impact both depression and kinesiophobia in females with lumbopelvic pain, which have not been addressed in the current study.

Author's Contribution

SS: Idea, concept and design, data collection.

ZH and SA: Drafting the work and revising it critically for important intellectual content.

FA: Data collection and analysis of data and interpretation of data.

SS, ZH, SA, FA, and FA: final approval of the version to be published and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted in Gynecology and Obstetrics department of Jinnah Hospital, Lahore (DCC-29/01/2022) after taking approval from the Research & Ethics Committee of Riphah College of Rehabilitation Sciences (REC/RCR & AHS/21/-529).

Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Acknowledgments

None to declare.

Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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Research Article

Knowledge, attitude and practice behavior regarding blood pressure among physical therapists of twin cities

Ayesha Sana¹, Sumaiyah Obaid², Mahrukh Saleem³, Hina Ahmed³, Sania Kiani², Muniba Shamshad⁴

ABSTRACT

Background: Blood pressure (BP) monitoring has a very crucial role in physical therapy for accurate evaluation and re-evaluation of the patient, otherwise it can lead to inaccurate clinical decision making and the patient may be falsely diagnosed. It is an important cardinal sign that cannot be neglected in making clinical decision, may put the individual to a greater risk of cardiovascular and other health problems.

Objective: to explore the knowledge, attitude, and practice behavior regarding BP among physical therapists (PT) of twin cities.

Methods: A cross sectional study was conducted in 6 months, from January 2019 to June 2019 in different hospitals of Islamabad and Rawalpindi. The data was collected from n=296 PT of twin cities after obtaining the written consent. The data of knowledge, attitude and practice behaviors towards BP was collected by semi structured questionnaire. The results were presented in table and graph while description was given as Mean \pm SD and f (%).

Results: The mean age of study participants was 28.4 ± 3.71 years. The overall mean score of knowledge (4.27 ± 3.05) showed that n=159(53.72%) participants in the study have poor knowledge about the information related to BP. While attitude score (19.74 ± 2.29) showed that majority of the sample n=179(60.47%) have positive attitude towards the importance of BP evaluation during assessment, management and educating the patient. While observing the behaviour, mean score (14.55 ± 4.78) showed that physical therapist has acceptable behaviour towards the BP measurement. But frequency distribution showed that n=160(54.05%) physical therapist has poor behaviour towards BP measurement during their practice.

Conclusion: The knowledge and practice behavior regarding the BP assessment and evaluation among the physical therapist is very poor, while their attitude is positive towards the importance of BP evaluation during assessment, management and educating the patients.

Keywords: Blood pressure, inpatient clinic, outpatient clinic, physical therapy.

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INTRODUCTION

Blood pressures (BP) influence by five physiological factors including cardiac output (CO), circulating blood volume, peripheral vascular resistance, blood viscosity and vessel wall elasticity [1, 2]. It is an important cardinal sign that cannot be neglected in making clinical decisions. The BP monitoring is considering a vital part of clinical examination because a greater value of BP puts the individual to a greater risk of future health problems. There are several methods to measure the including mercury sphygmomanometer but the auscultatory method of measuring BP has always been considered the standard method for measuring BP but with advancing research many more techniques of measuring BP are now in practice [1, 3].

According to Guide to Physical Therapist Practice, vital sign assessment including BP should be made essential during physical therapy examination and management for patients with and without cardiopulmonary disease [4]. The BP should be measured accurately but if the physical therapist fails to do so it can lead to inaccurate clinical decision making and the patient may be falsely diagnosed [5]. The BP monitoring gives the physical therapist an overview about the energy consumption during ambulation and it can help to select the highly appropriate assistive device for the patient. BP evaluation guides the physical therapist in such a way that if the patient shows an abnormal BP report then the therapist is required to reduce the intensity of exercise protocol or intervention [6].

Many clinicians are not able to make optimal decisions based on visual inspection and past medical history of the patient thus making the BP measurement an integral part of examination [7]. Reported records show that many health care professionals including PTs and nursing staff lacked knowledge and skills about taking accurate BP readings [8]. Millar et al [6] have reported that there is a considerably low number of PTs in outpatient clinical settings that follow the practice guidelines for measuring heart rate (HR) and BP which increases the risks of CVS mishaps while giving physical therapy sessions. Low numbers of physiotherapists who measure BP and HR according to the guidelines, which can lead to poor decision making and affects the ability of physical therapist to make an accurate exercise protocol [9]. As the hypertension is a major risk factor for many other diseases and can be a contraindication to intervention so, BP monitoring should be considered important before starting a physical therapy intervention [10].

There is lack of literature regarding the knowledge, attitude and practice of physical therapist for blood pressure measurement before or

after the intervention. So the current study was conducted to explore the knowledge, attitude and practice behavior regarding BP among Physical therapist (PTs) of twin cities (Islamabad & Rawalpindi), also investigate association between blood pressure attitudes, practice behaviors and knowledge in PTs serving in in-out-patient and in-patient units.

METHODOLOGY

The study design was cross sectional survey, conducted at private and government hospitals of Rawalpindi and Islamabad, Pakistan from January 2019 to December 2019, after getting approval from the research and ethical committee (REC) of Faculty of Rehabilitation & Allied Health Sciences, Riphah International University Islamabad Pakistan. (RIPHAH/RCRS/REC/Letter-0642). The non-probability convenient sampling technique was used for data collection. The sample size was $n=296$, Physical therapists working in in-patient and out-patient clinical settings, at least 1 year of work experience in clinical setting, both male and female were included in study. As the Physical therapist assistants, DPT students, and PTs providing Home based physical therapy were excluded.

The data was collected after taking written informed consent from all the study participants. The semi structured questionnaire was used to explore the Attitudes, Knowledge, and Practice Behaviors of Physical therapist regarding Blood Pressure survey tool was used and found good (0.40–0.75) and excellent (>0.75) reliability in respective cultural practices [11].

The 23 items questionnaire was consist of questions related to knowledge (12-items), attitude (5-items) and behavior (6-items) used to explore the Attitudes, Knowledge, and Practice Behaviors of Physical therapist regarding Blood Pressure. The items responses of attitude (Maximum score 25) and behavior (Maximum score 30) were on 5-point Likert scale used while binary options i.e. correct or incorrect were used to evaluate the knowledge (maximum score 12). The higher score shows good, highly positive and very good knowledge, attitude and behavior respectively Data analysis was done with SPSS version 23.

RESULTS

In current study a total of $n=167$ (56.4%) were female and $n=129$ (43.6%) were male respectively. The mean age of study participants was 28.4 ± 3.71 years. The patient population for which physical therapist provide physical therapy services, $n=6$ (2%) from integumentary physical therapist, $n=142$ (48%) from musculoskeletal physical therapist, $n=60$ (20%) from cardiopulmonary physical therapist,

n=85(28.7%) from neuro physical therapist, n=3(1%) from others.

The overall mean score of knowledge (4.27 ± 3.05) showed that n=159(53.72%) participants in the study have poor knowledge about the information related to BP. The mean and frequency of responses regarding knowledge items and overall score can be seen in table 3 & figure 4.

The mean score of attitudes (19.74 ± 2.29) showed that majority of the sample n=179(60.47%) have positive attitude towards the importance of BP evaluation during assessment; management and educating the patients (figure 1). The mean score and frequency of responses for attitude domain can be seen in table 1.

Table 3: Knowledge items with their mean score and frequency distribution

Items	Mean \pm .SD	Incorrect	Correct
BP value between 120 mm Hg - 139mm Hg considered to indicate systolic pre-hypertension	.60 \pm .49	118(39.9)	178(60.1)
BP value(s) between 80 mm Hg -89 mm Hg considered to indicate diastolic pre-hypertension	.43 \pm .49	167(56.4)	129(43.6)
BP value(s) between 140 mm Hg-159 mm Hg considered to indicate systolic hypertension	.48 \pm .50	152(51.4)	144(48.6)
BP value between 90 mm Hg – 99 mm Hg considered to indicate diastolic hypertension	.40 \pm .49	175(59.1)	121(40.9)
It is contraindicated to start exercise with a systolic BP reading of 180mm Hg or above	.32 \pm .47	199(67.2)	97(32.8)
It is contraindicated to start exercise with a diastolic BP reading of 110 mm Hg or above	.13 \pm .34	256(86.5)	40(13.5)
It is recommended to terminate exercise with a systolic BP reading of 180mm Hg or above	.35 \pm .48	190(64.2)	106(35.8)
It is recommended to terminate exercise with a diastolic BP reading of 110 mm Hg or above	.28 \pm .45	211(71.3)	(28.7)
It is recommended to inform a physician or similar health care provider of a systolic BP reading between 80mmHg – 99 mmHg	.09 \pm .29	268(90.5)	28(9.5)
It is recommended to inform a physician or similar health care provider of a diastolic BP reading between 40mmHg -69mmHg	.37 \pm .48	186(62.8)	110(37.2)
It is recommended to inform a physician or similar health care provider of a systolic BP reading 140mmHg -169mmHg	.27 \pm .44	214(72.3)	82(27.7)
It is recommended to inform a physician or similar health care provider of a diastolic BP reading 100mmHg-139mmHg	.08 \pm .27	271(91.6)	25(8.4)
Knowledge Score	4.27\pm3.05		

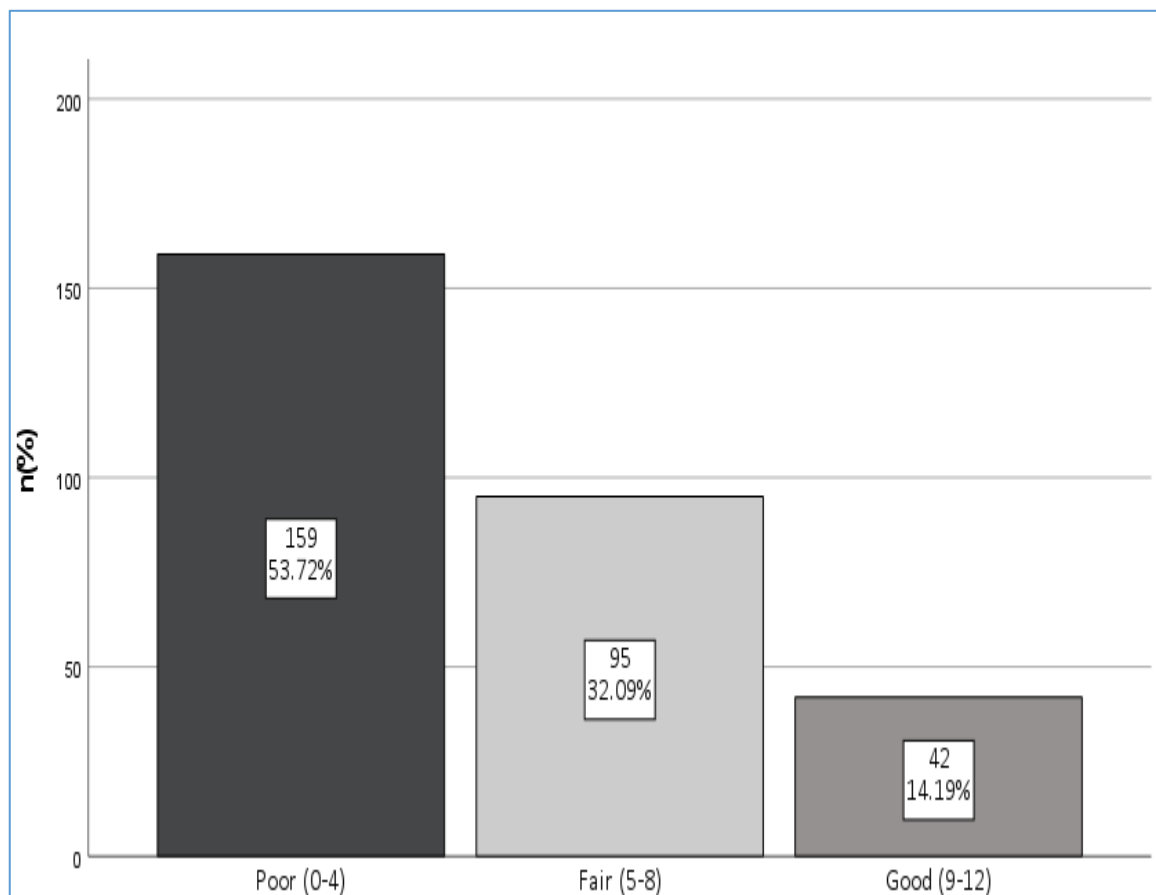
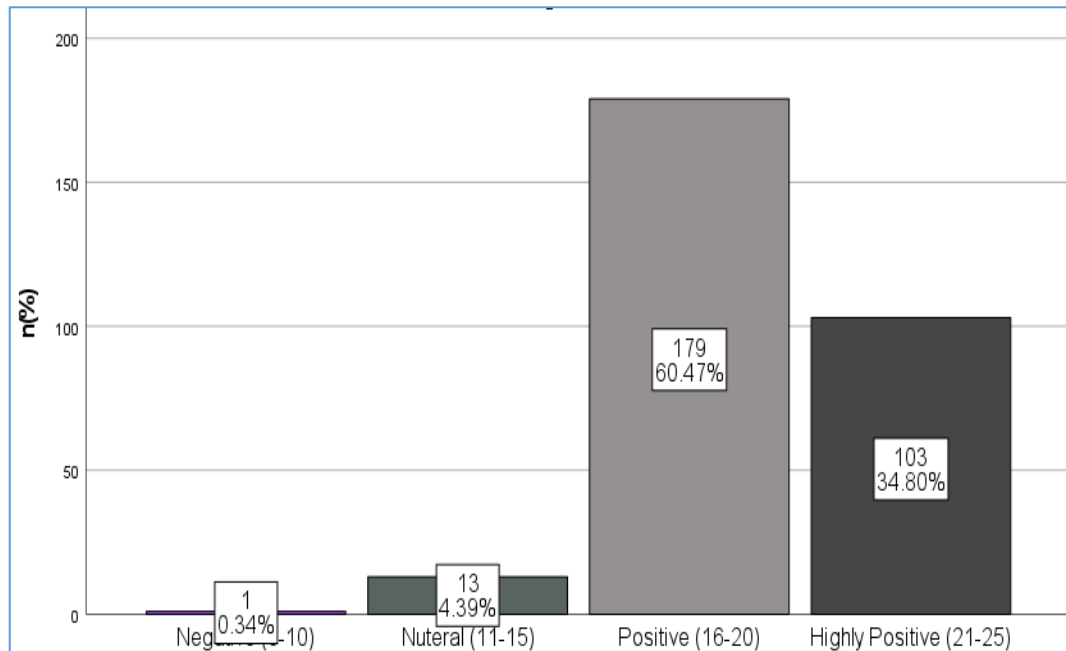


Figure 3: Frequency distribution of Knowledge domain

Table 1: individual items of Attitude domain with mean value and response frequency

	Mean±SD	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I feel it is important to take a BP reading on every patient/client during an evaluation or re-evaluation	3.97±.73	2(0.7)	10(3.4)	42(14.2)	181(61.1)	61(20.6)
I feel it is important to take a BP reading on every patient/client PRIOR to physical therapy treatment	3.82±.86	8(2.7)	20(6.8)	33(11.1)	189(63.9)	46(15.5)
I feel it is important to take a BP reading on every patient/client AFTER physical therapy treatment	3.89±.72	5(1.7)	10(3.4)	34(11.5)	208(70.3)	39(13.2)
I feel I am able to take an accurate BP reading	3.97±.77	8(2.7)	2(0.7)	39(13.2)	188(63.5)	59(19.9)
I feel confident in my ability to educate patients/clients about BP related findings	4.06±.68	4(1.4)	2(0.7)	29(9.8)	196(66.2)	65(22)
Attitude Score	19.74±2.29					

**Figure 1: Frequency distribution of attitude categories**

While observing the behaviour, mean score (14.55±4.78) showed that physical therapist has acceptable behaviour towards the BP measurement. But frequency distribution showed that n=160(54.05%) physical therapist has poor

behaviour towards BP measurement during their practice. (Figure 2)

The descriptive statistics of individual item can be seen in table 2.

Table 1: individual items of Behaviour domain with mean value and response frequency

	Mean±SD	Never	Seldom	<Half Of Time	>Half The Time	Always
A physical therapy assistant, technician, or other health care provider obtains the BP measurement in my practice setting	1.60±.98	188(63.5)	67(22.6)	20(6.8)	13(4.4)	8(2.7)
I measure BP during patient/client evaluation or re-evaluation	1.50±.94	205(69.3)	59(19.9)	17(5.7)	4(1.4)	11(3.7)
I measure BP on a patient/client PRIOR to physical therapy treatment	1.61±1.06	197(66.6)	53(17.9)	25(8.4)	6(2)	14(4.7)
I measure BP on a patient/client AFTER physical therapy treatment	1.53±1.03	212(71.6)	39(13.2)	9(3)	12(4.1)	2(0.7)
I inform a patient/client of their BP reading after each measurement	2.93±1.85	120(40.5)	34(11.5)	10(3.4)	9(3)	123(41.6)
I standardize the patient/client position each time I perform a BP measurement	1.85±1.32	187(63.2)	38(12.8)	23(7.8)	23(7.8)	23(7.8)
Behaviour Score	14.55±4.78					

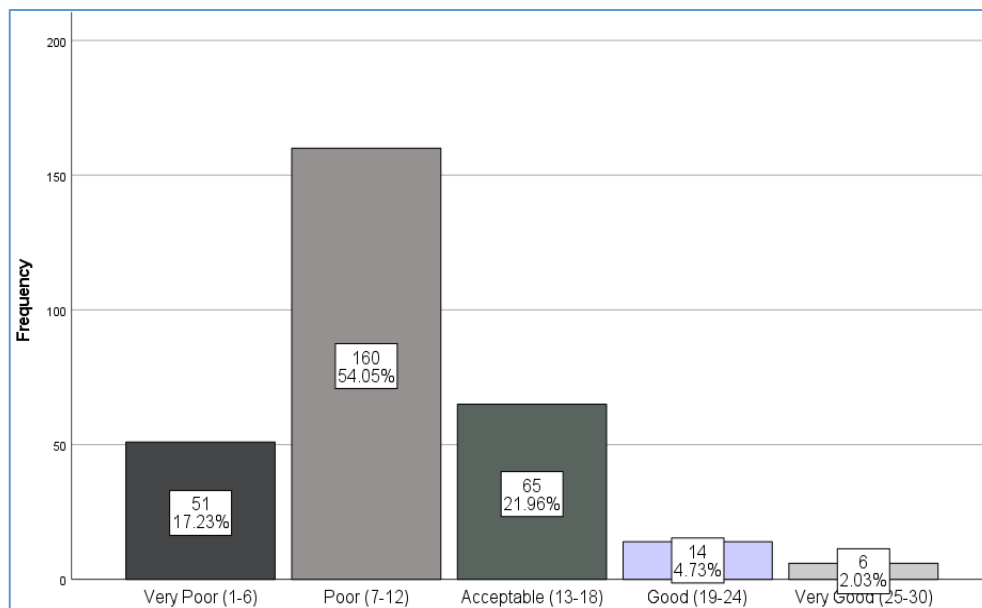


Figure 2: frequency distribution of Behaviour category

DISCUSSION

The main objective of this study was to explore the physical therapist (PT) attitudes, practice behaviors and knowledge regarding blood pressure during patient evaluation and management. The results showed that PT has poor knowledge and practice behavior about the blood pressure characteristics and importance during their clinical practice but having the positive attitude.

The results of the current study show that more than three fourth of the respondents were agreed and strongly agreed on the fact that BP monitoring is essential for patient evaluation and reevaluation but only 7% of the respondents performed BP measurement during evaluation [12]. It is considered very important to measure BP prior to physical therapy as it tells about the cardiovascular risk factors of the patient, a study conducted by Scherer SA et al shows that most of the physical therapists working in the in-patient and out-patient clinical settings admit that measuring BP is necessary for cardiovascular risk factor screening and exercise prescription but majority of them do not monitor vital signs including BP before starting an intervention[13]. According to the study conducted by Sara Arena about 50% of the respondents showed disagreement in measuring BP during patient evaluation/ re-evaluation. More than half of the respondents were disagreed and strongly disagreed that BP measurement is important prior and after the physical therapy treatment. The research showed that about more than three fourth of the participants felt confident in their ability to measure BP and educate patient regarding their BP readings and these results coincide with the previous literature[11]. Conversely our research showed that a significant

ratio of physical therapists were agreed and strongly agreed that BP evaluation should be made essential before and after physical therapy intervention.

The results of our study also showed that there are actually a very low number of physical therapists who actually pay importance to measure BP in the clinical settings. A study conducted by Millar et al [6] which states that there is a considerably low number of physical therapists in outpatient clinical settings that follow the practice guidelines for measuring heart rate and blood pressure. Ferese et al has also reported that there is a low frequency of physiotherapists who measure blood pressure and heart rate according to the guidelines which can lead to poor decision making and affects the ability of physical therapist to make an accurate exercise protocol. The majority of the physical therapists and health care providers have enough training in the techniques of measuring BP, but due to lack of attitude and interest they do not implement these guidelines in the practice settings[9]. Current study depicts that 92.9% (n=275) shows A physical therapy and other health care provider not obtained the BP measurement in there practice setting.

As far as behavior was concerned the respondents showed a poor behavior regarding BP measurement. The present research also shows that about 90% of the physical therapist population in the twin cities did not consider measuring BP important prior and after physical therapy treatment. A study conducted by Ferese et al showed that nearly quarter of the participants did not measure BP routinely because they thought that the information can be obtained by patient's history [9]. Another study conducted by Sara Arena also supports that about 85% and 96% physical therapists did not

consider BP measurement important before and after physical therapy intervention respectively[11]. The findings of our conducted research shows that about half of the respondents did not felt important to inform their patients about their BP readings. Nearly three fourth of the respondents did not standardize the position of their patient while measuring BP and this statement is supported by the research conducted by Fereese et al [9] as they observed that most of the health care providers only check BP in the sitting position.

Despite having established guidelines and classification[14] of BP the incorrect answers to the knowledge questions is a question mark. The findings of a study show that the knowledge of the physical therapists regarding HTN and P-HTN SBP values was at the rate of 23% and 17% and the DBP values at the rate of 25% and 19% respectively[11]. The findings of our study showed that about more than half of the respondents had correct knowledge about Pre hypertension systolic blood pressure value but the ratio of the respondents knowing the correct DBP value was less than half. The respondents that mentioned correct HTN SBP and DBP ranges were less than half. American College of Sports Medicine guideline suggest that exercise should be terminate at the SBP value higher than 200mmHg and another reference shows that SBP value higher than 260mmHg is recommended to terminate exercise [14, 15].

In the current study about half of the respondents did not even bother to guess the value and in the remaining half, most respondents mentioned incorrect values regarding terminating exercise. In evidence, it indicates the blood pressure control with exercise improves the health, but it requires educating knowledge for development of attitude and practicing[16]. The conducted research shows that almost three fourth of the respondents had manual BP apparatus with the cuff size of an adult in their practice settings. Almost 70% of the respondents felt barriers in measuring BP in their clinical sites due to lack of time due to multitasking, in availability of proper BP apparatus and lack of proper knowledge, training and insufficient behavior regarding BP measurement. Furthermore, inaccurate BP equipment's and work load were a main issue[10].

The sample size is very low and study is only conducted in twin cities. So the external validity may be compromised. Although the questionnaire has good reliability but need to be improved further for accurate information.

CONCLUSION

The knowledge and practice behavior regarding the BP assessment and evaluation among the physical therapist is very poor, while their attitude is

positive towards the importance of BP evaluation during assessment, management and educating the patients. As a Doctor of Physical Therapy (DPT), It is claimed that we can have direct access of the patients on the bases of their knowledge and training during education. It is recommended the institutions offering the DPT must improve there standard of teaching and training not regarding the BP but also about the other related subjects which facilitate direct access of the patients. It is also recommended to explore these areas with more reliable measures.

Furthermore, the health care departments should take an initiative to make BP examination and assessment an essential part of patient's primary health care protocol.

Author's Contribution

SO: Critical Appraisal, Questionnaire design, conception, and design of the study.

AS: Questionnaire design, data collection and manuscript drafting of the study.

MS and HA: data collection and manuscript drafting of the study.

SK and MSh: analysis of the data and interpretation of the study.

SO, AS, MS, HA, MSh and SK: final approval of the version to be published and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted at private and government hospitals of Rawalpindi and Islamabad, Pakistan after getting approval from the research and ethical committee of Faculty of Rehabilitation & Allied Health Sciences, Riphah International University. Islamabad (RIPHAH/RCRS/REC/Letter-0642).

Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Acknowledgments

None to declare.

Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study;

in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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Research Article

Correlation of mobile phone usage on grip strength, disabilities and posture in young adults

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ABSTRACT

Background: The musculoskeletal issues are now common in excessive use of mobile phone for communication, gaming and socialization on internet. The excessive use of mobile phone may decrease the muscle strength and lead to poor posture ultimately functional impairment related to upper extremity.

Objective: to determine correlation among duration of mobile phone usage, neck posture, disabilities and hand grip strength.

Methods: A correlational cross-sectional study was done at Riphah International University Lahore from March 2020 to February 2021. The target population was male and female young students of 18 to 24 years, used mobile phone more than 6 hours in a day. A total of n=400 subjects participated in the study in which n=235 were females and n=165 were males. The information was gathered using the DASH Questionnaire to identify upper limb problems, the photogrammetry method to determine the cervical angle, and a dynamometer to determine the strength of each hand's grasp. The Pearson product-moment correlation coefficient was done by using SPSS version 21.

Result: The mean age of the study participant was 20.99±2.34 years. A total of n=165(41.25%) were male and remaining n=235 females participated in the study. Increase use of mobile had negative significant small correlation with degree of cervical angle ($p=0.04$), right hand grip strength ($p=0.01$) and positive significant small correlation with DASH score (0.01). While no significant correlation between daily use of mobile phone and left-hand grip strength

Conclusion: The study concluded that as the duration of mobile phone usage increased, the forward head posture and disabilities of the upper limb also increased. But the grip strength of right hand decreased as the mobile phone duration is increased.

Key words: Correlation, disabilities, female, grip strength, mobile phone, male, posture.

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INTRODUCTION

As they are used for email, internet surfing and gaming, smartphones now have a major role to play in the daily lives of people. More heavy dependence of users on the mobile phone may lead to musculoskeletal injuries [1, 2]. In the past two decades, the incidence of chronic neck and shoulder pain has enlarged dramatically between the age group of 20 to 34 years. While holding a handheld device with a flexed head and neck pose, gravitational stresses on the neck muscles are reported 3-5 times greater than seated neutral position because of maximum head and neck flexion angle throughout texting [3].

Many symptoms, including headache, hand tremor, and finger pain, are frequently reported by smartphone users. Researchers found that at least one area of the upper extremities, upper back, and spine where users of mobile devices report discomfort [4]. The use of smartphones frequently can be linked to health issues like wrist and neck discomfort and exposes hands to high pressures that can cause hand pain, thumb pain, and musculoskeletal disorders [5]. The females are more addicted to mobile phone usage. The study concluded that male subjects show more Upper limb disability [6].

Smartphone use is associated with poor neck posture (forward head posture), which might cause neck discomfort [7]. Long-term usage of a mobile device in such positions might cause or exacerbate "text neck" symptoms, which are pain symptoms on or around the neck [8]. It has been shown that issues with the spine, shoulder, and forearm/hands are significantly correlated with occupational exposure at work and psychosocial risk factors [9]. According to reports, university students use their cellphones for more than 3.5 hours every day on average to send texts, make phone calls, arrange meetings, and conduct online searches [10]. The most prevalent disease of muscle weakness and text collar, as well as a decreased cervical range of motion, have all been linked to smartphone use, according to other studies [11, 12, 13, 14].

Literature suggested the disabilities and posture in mobile users common but there is paucity in the literature on direct relationship with hand grip strength not the grip strength of both hands. So the current study was conducted to determine correlation among duration of mobile phone usage, neck posture, disabilities and hand grip strength.

METHODOLOGY

A correlational Cross-sectional study was conducted within 6 months after the approval of ethical committee of RCRS (REC/RCRS/20/2030) Riphah International University Lahore Campus

Pakistan from October 2020 to March 2021. The non-probability convenient sampling technique was used to collect data. The sample size was $n=400$ which was calculated by using online Rao software by using previous study [15]. The young male and females between aged 18 to 24 years who uses mobile phones more than 6 hours per day were included in the study. All such individuals having any kind of injury in the arm, any deformity, having any other musculoskeletal problem in upper limb because of any other reason were excluded from the study.

Written informed consent was taken from the participants before the start of data collection. All participants were asked to fill demographics and DASH Score Questionnaire data sheet [16]. The grip strength of both hands was measured using handheld dynamometer. Grip strength of right and left hands were measured 3 times on both hands with resting pause of 1 minute between every trial. The average of every hand was calculated [6]. To find out cervical angle photogrammetry method was used [17]. The participants were asked to stand in neutrally position locate and mark C7 spinal process and took the picture of participants from lateral side and then analyze in photogrammetry software (Image J software) to calculate the degrees of craniovertebral angle. Digital video camera (Sony 16.1 M pixels) was used to take picture [18].

The demographic data was presented as mean, standard deviation, frequency, and percentages. The Pearson's product- Moment Correlation (r) was used to find association of excessive mobile use with hand grip strength, upper limb disability and posture individually for females and males. The SPSS version 21 was used for data analysis and level of significance was set at $p<0.05$.

RESULTS

A total of $n=77$ participants were female and remaining $n=73$ was male in the study. Most participants have age above the 20 years ($n=135$) and below 20 were $n=15$. A total $n=127$ were belong to middle, $n=8$ was from upper and remaining $n=15$ was from low socioeconomic status. The frequency distribution of the occupation, marital status, family system, diagnosis time, history of kidney transplant and patients on dialysis can be seen in table 1.

The mean age of the study participant was 20.99 ± 2.34 years. A total of $n=165$ (41.25%) were male and remaining $n=235$ were female participated in the study. The average use of mobile was 8.47 ± 2.25 hours per day. The mean degree of cervical angle was $46.4 \pm 5^\circ$, the right hand grip strength was 25.31 ± 10.65 , left hand grip strength was 22.8 ± 15.51 and mean total score of DASH was 16.81 ± 15.67 which showed that mobile phone user have mild disability.

The Pearson product-moment correlation coefficient showed that increase use of mobile had negative significant small correlation with degree of cervical angle ($p=0.04$), right hand grip strength

($p=0.01$) and positive significant small correlation with DASH score (0.01). While no significant correlation between daily use of mobile phone and left hand grip strength. (Table 1)

Table 1: Correlation between mobile phone usage on posture, grip strength and disabilities

		Cervical angle ^o	Grip strength (Rt hand)	Grip strength (Lt hand)	DASH Score
Daily use of mobile (hrs)	r-value	-0.011	-0.128	0.039	0.256
	p-value	0.04*	0.01*	0.44	0.01*

Level of significance: $p<0.05^*$, $p<0.01^{**}$, $p<0.001^{***}$

DISCUSSION

The current study is conducted to determine the correlation of mobile phone usage on grip strength of right and left hands, disabilities of the upper extremity and to check cervical angle (forward head posture) in female and male students. This result implied that as the number of hours of mobile usage increase, the more probability of to have Disabilities of the Arm, Shoulder and Hand and cervical angle problem (forward head posture). Findings also revealed a negative connection and statistically significant that grip strength of right hand decreases as mobile phone usage increases in duration and there was a positive link between using a phone and the left hand's grip strength, with no statistically significant outcomes.

A researcher investigated the effects of mobile phone usage. In that research the effects of mobile phone on functional hand performance, handgrip strength, pinch strength and overall hand function were evaluated. The findings showed that handgrip strength, hand-pinch strength and DASH scores were substantially reduced using mobile phone. On the dominant side, grip strength and hand-pinch strength capabilities were weaker than the non-dominant side in the mobile phone-user high-frequency community. Such results suggested that overuse of mobile phones predominantly can affect the dominant hand because it is more involved in everyday activities [19] which is quiet similar to recent study.

According to a study the three main risk factors (1) posture, (2) muscle force and (3) muscle use were identified in studies which are responsible for upper-limb musculoskeletal disorders. Three bad postures are usually assumed by mobile phone users included the stretching or bending the shoulders greater than 20 degree, setting elbows greater than 100 degrees and bending wrists greater than 15 degree with ulnar variations and bending the forward neck and trunk 20 degree or greater [20].

Another research contrasted two young adult groups with a non-mobile phone user group that

was a control group and a group that used mobile in excess, in which found that high-frequency mobile phone users have distended median nerve, further thumb pain, reduced pinch intensity and hand tasks compared to less-frequency mobile phone users [10].

A study revealed that there was an opposite relationship between prolonged use of mobile phones and handgrip and pinch-grip strength. The outcome showed that the weaker handgrip and weaker pinch-grip were associated with longer use of mobile phones. Young people should be conscious of the adverse effect of mobile phone [21].

Research to include information that could be used to help avoid musculoskeletal disorders caused or worsened by the use of smartphones. Repeated movements in a static pose can lead to a number of issues, such as shoulder and neck problems. The longer the display terminals are used, the greater the bending angles of the bone of the neck and the bone of the waist. According to research, the adoption of an incorrect pose for a long period of time can lead to a decline in the function of the waist muscles, causing waist pain. In this research, it was found that the most frequently encountered forms of pain were neck pain and shoulder pain. It was also shown that the bending angles of the neck and back bones increased considerably [22].

Some other demographic factor may contribute in the neck pain, disability and hand grip strength i.e gender base differences, position while using the mobile phone etc. these factor were not evaluated in the study.

CONCLUSION

It is concluded that increase in number of hours of mobile phone usage the probability of forward head posture, Disabilities of the Arm, Shoulder and Hand (DASH) increases and the probability of the grip strength of dominant hand was decreased.

Author's Contribution

UB: substantial contributions to the conception, design and statistical analysis of the study.

RN: acquisition of data for the study.

MLA: interpretation of data for the study.
 HS: analysis of the data for the study.
 MTJ: Appraisal of result of the study.
 ZH: drafted the work and revised it critically for important intellectual content.
 UB, RN, HS, MLA, MTJ and ZH: final approval of the version to be published and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was ethically approved by the ethical committee of RCRS (REC/RCRS/20/2030) Riphah International University Lahore Campus Pakistan.

Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Acknowledgments

None to declare.

Conflicts of Interest

The authors declare no conflict of interest. There is no funding source in the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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Research Article

Effect of Kegel exercises on distress symptom and quality of life in elderly Pakistani female with urinary incontinence- A randomized control trial

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ABSTRACT

Background: The stress urinary incontinence was the reason the affected women experienced anxiety and depression. the more severe the symptoms of stress urinary incontinence were, the more negative impact to aspects of quality of life was seen.

Objective: To determine the effects of Kegel exercises on distress symptom and quality of life in elderly Pakistani female patients with stress urinary incontinence.

Methodology: A single-blinded, randomized control trial was conducted on n=50 female patients having stress urinary incontinence at department of physiotherapy, Haleema Siraj Hospital Rawalpindi from January 2021 to June 2022. The participants with the age above 55 years were recruited through non-probability convenient sampling technique and divided into experimental and control group; n=25 participants in each group. The experimental group received Kegel exercise as an intervention for three months and 3-4 time/day. While control groups didn't received any intervention but continue the regular medicines. Both groups were evaluated pre and post interventional (after 3-months) by using urinary distress inventory (UDI) for distress symptoms and incontinence impact questionnaire (IIQ) for quality of life. SPSS version 21 was used for data analysis. Independent t-test was used for between group comparisons of mean differences.

Results: The mean age of the study participants was 65.00±8.90 years. Between group analysis, showed that symptom distress {MD=16.21, 95%CI (3.10 to 14.55)} on urinary distress inventory (short Form), and life quality {MD=8.83, 95%CI (3.10 to 14.55)} on incontinence impact questionnaire significantly greater in experimental group as compared to the control group.

Conclusion: Kegel exercises significantly improved distress symptoms and quality of life in females with stress incontinence.

Keywords: Elderly, incontinence, kegel exercises, stress incontinence.

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Citation

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INTRODUCTION

Urinary incontinence (UI) is defined as involuntary loss of urine that leads to social or hygienic problem which can occur in children, men, and women, but females are more commonly affected [1]. According to a recent literature, UI affected women twice as often as men. The UI in young women is 20-30%, the percentage in middle aged women is 30-40% and up to 50% in elderly female[2]. Studies reported that the most important factors affecting the incidence of UI in females are age, obesity, diabetes, education, delivery rank, hypertension, urinary tract infection, and smoking[3].

Stress incontinence (SI), over active bladder (OAB) or urgency incontinence (UI), and mixed urinary incontinence (MUI) are common types of urinary incontinence. The prevalence of SI is 74.19%, while OAB and MUI is 12 to 56% [4]. The SI is a complaint of involuntary leakage on effort or exertion i.e. sneezing or coughing, UI is involuntary leakage along with urgency while MUI is a complaint of involuntary leakage associated with urgency, and also with effort, exertion, sneezing and coughing. Also, nocturnal enuresis is any involuntary loss of urine occurring during sleep. Post-micturition dribble and continuous urinary leakage indicates other symptomatic forms of incontinence [1].

According to 6th International Consultation on Incontinence, any pelvic organ prolapse or urogenital atrophy, vaginal or rectal prolapse, pelvic floor muscle weakness, estrogen deficiency, comorbidities, and UTI are the possible causes of urinary incontinence [1] Urinary incontinence is associated with poor quality of life because of depression, anxiety, psychological distressed, emotionally disturbed, and poor life satisfaction contributes to poor quality of life [5]. Different treatment approaches including pharmacological, surgical procedures and behavioral therapy has been used for the UI treatment[6]. Use of medicines including alpha adrenergic antagonist, bladder training, anti-muscarinic, and beta 3 agonist is found very helpful for management of UI [1]. Conservative management was first line of treatment due to significant results. Previous studies found that pelvic floor exercises significantly improve UI [6].

Furthermore, Kegel exercises reported 30-90% success rates in females with SI. In Kegel exercises, the number of contractions and duration of holding time is decided according to the need of patient. No specific protocol has been designed for Kegel exercises but some points should be considered for better results which include identification of muscle to slow urine, contraction of muscle in a correct manner, and repetition of cycle. Also, a study was

conducted to determine the effectiveness of Kegel exercises in pregnant females, before menopause and post-menopausal age and significant improvement was found in treating UI [7].

A very few literature was found which compare the effects of Kegel exercises with regular medicine and in the recent study Kegel exercises were compared with the regular medicines in Pakistani population. Though many studies have been conducted to determine the effectiveness of Kegel exercises however in this study the effects of Kegel exercises on distress symptom and quality of life in elderly Pakistani female patients with stress urinary incontinence was determined.

METHODOLOGY

A single blinded, randomized control trial study was conducted from January 2021 to June 2022 in the department of physiotherapy, Haleema Siraj Hospital Rawalpindi (Ref no: IRB2021-12/034). The study was initiated after taking approval from the authorities. The informed consent was taken from all the participants and assurance concerning the confidentiality of the data was also taken prior to conducting research.

The female participants with the age > 55 years, had stress incontinence and showed willingness to participate in the study was included in the study. However, participants with any diagnosed neurological condition, cognitive issues, not able to understand and respond, and who had hearing issues were excluded from the study. The participants were recruited through non-probability convenient sampling technique.

Sealed envelope method was used to randomly allocate the participants in the study groups through computer generated random sequence table. Randomly assigned index cards having consecutive numbers were prepared and put in thick sealed envelopes before the study commencement. Envelope was only opened when participants signed the informed consent and were thus provided by the assigned treatment. The study was single blinded, since patient wasn't aware of the other treatment being provided.

A total of n=107 participants were evaluated, of which n=50 participants fulfilled the inclusion criteria and were thus recruited for the study. However, 57 out of 107 participants didn't fulfilled the inclusion criteria or showed unwillingness to participate in the study. The recruited n=50 participants were then divided in to experimental and control group, n=25 in each group. Experimental group received intervention of Kegel exercises while control group was on regular medication as prescribed by their doctor. (Figure 1)

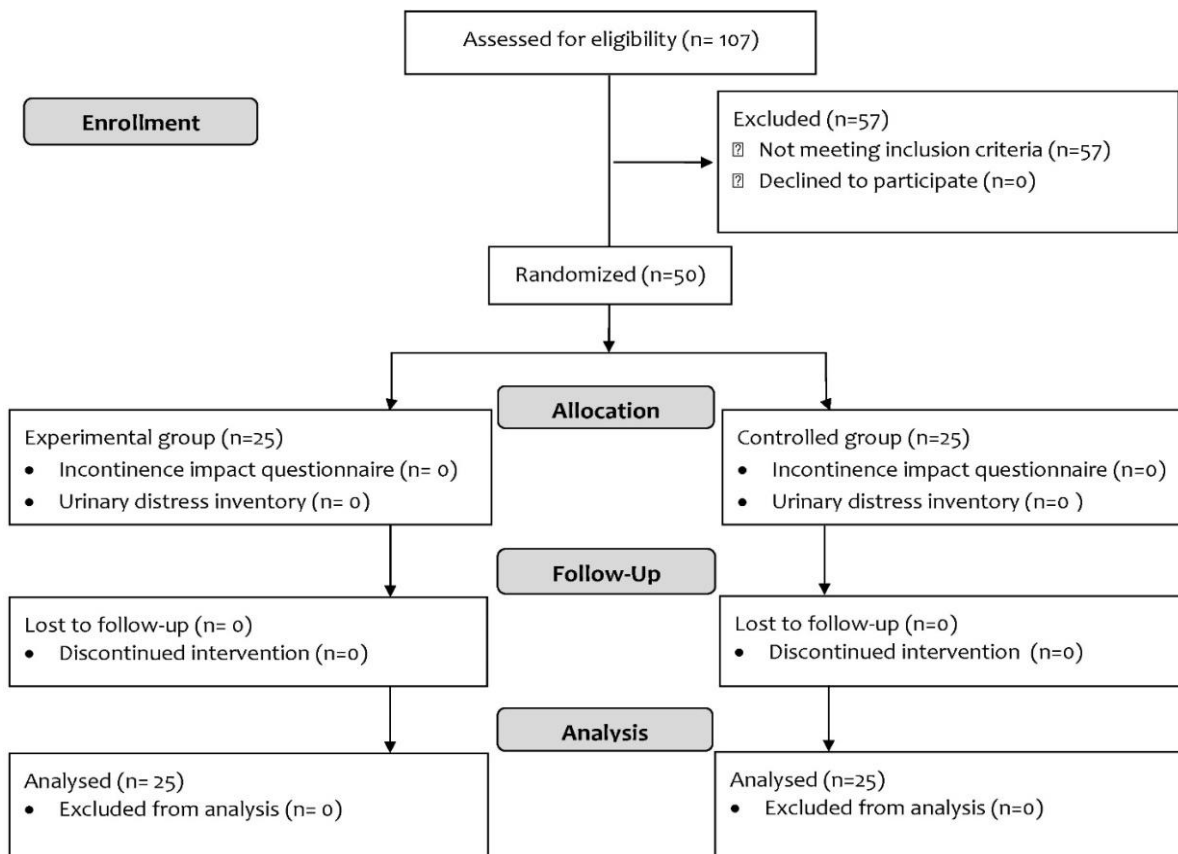


Figure 1: CONSORT diagram

The duration of intervention was three months and 3-4 times a day. The participants were called on follow-up after every week to check either the intervention i.e. KE been performed accurately and confirm timely medications. The procedure of Kegel exercises were thoroughly explained to the study participants [8].

The demographic data including age, and BMI was obtained at baseline. The urinary distress inventory scale has constructed validity and reliability, and was used to determine urinary distress. While quality of life was measured through incontinence impact questionnaire which is a valid and reliable tool [9]. The pre and post data was obtained at baseline and 3 months of intervention. Independent t-test was used for between group

comparisons. The data described in terms of mean±SD, mean difference (MD), and confidence interval (CI). SPSS version 21 was used to analyze the data.

RESULTS

The mean age of the n=50 female study participants was 65.00±8.90 years. The mean BMI was 29.54±5.24 kg/m².

In the between group analysis, mean difference showed that symptom distress {MD=16.21, 95%CI (3.10 to 14.55) on Urinary distress inventory (short Form), and life quality on Incontinence Impact Questionnaire {MD=8.83, 95%CI (3.10 to 14.55) significantly greater in experimental group as compare to control group. (Table 1)

Table 1: Between-group comparison (UDI & IIQ)

	Groups	Mean	SD	MD	95%CI of difference	
Incontinence Impact Questionnaire	Experimental	33.56	12.34	16.21***	10.66	21.77
	Control	17.34	6.19			
Urinary Distress Inventory	Experimental	18.66	9.63	8.83**	3.10	14.55
	Control	9.83	10.47			

Significance Level: $p < 0.05^*$, $p < 0.01^{**}$, $p < 0.001^{***}$

DISCUSSION

The purpose of the study was to determine the effects of Kegel exercises on distress symptom and quality of life in elderly Pakistani female patients with stress urinary incontinence. The results of the

study showed significant improvement in experimental group presented with urinary incontinence.

According to the results of the study distress symptoms assessed on urinary distress inventory

scale and life quality on incontinence impact questionnaire significantly greater in the group who were performing Kegel exercises after 3-months of intervention. The results of current study corresponds with the previous study which concluded that Kegel exercise is an effective therapy which shows improvement in distress symptoms and quality of life in patients with urinary incontinence and thus improves healthy life style [10]. Also, previous studies determine the effectiveness of Kegel exercises in female patients with comorbidities [10], pain and backache [11].

The common causes of UI is pelvic floor muscle weakness and Kegel exercises have been playing an important role in strengthening pelvic floor muscles which may prevent urinary incontinence [12]. During pelvic floor exercises the voluntary contraction of pelvic floor muscles causes inward movement and squeeze of pelvic floor muscle which stabilizes, and helps in urethral closure and downward movement resistance. This voluntary contraction of pelvic floor muscle also contracts the gluteal, hip adductor and abdominal muscles. Due to weakness, muscles aren't in anatomical position to support urethral and bladder neck descent [13] and repetitive contractions strengthen the muscles [14]. Therefore, strengthening of pelvic floor muscle build-up the structural support and levator plate may elevated upward in pelvis because of hypertrophy and increased stiffness of pelvic floor muscles and connective tissues. Thus automatic unit firing is improved which prevent descent when abdominal pressure is increased [13]. Furthermore, the strengthening of pelvic floor muscle enhance physical activities among women and thus improve quality of life and functioning of women even during and after pregnancy [12]. Strengthening of the pelvic floor muscles is beneficial and prevents pelvic floor dysfunctions in females with stress urinary incontinence. It was single-centered study and sample size was not large enough which limits the generalizability of the study.

CONCLUSION

It was concluded that Kegel exercises in females with stress urinary incontinence is more effective which not only improved urinary incontinence but also quality of life. Future studies should incorporate with multicentre and large sample size. Also, a study on effects of Kegel exercises in urgency and mixed urinary incontinence in Pakistani population should be conducted.

Author's Contribution

AA: substantial contributions to the conception and design of the study.

AA and SA: acquisition of data for the study.

MR: interpretation of data for the study.

AO: analysis of the data for the study.

NA: drafted the work.

AA, SA, MR, AO, NA and HA: revised it critically for important intellectual content.

AA, SA, MR, AO, NA and HA: final approval of the version to be published and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted from January 2021 to June 2022 in the department of physiotherapy, Haleema Siraj Hospital Rawalpindi (Ref No: IRB2021-12/034).

Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Acknowledgments

None to declare.

Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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Research Article

Effects of footwear modification along with physiotherapy on activity of daily living (ADLS) in patients with medial knee osteoarthritis

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ABSTRACT

Background: the management of osteoarthritis (OA) of the knee with biomechanical therapies claimed that application of orthotic devices is another crucial component of a rehabilitation program. Several footwear modifications are used to lessen medial knee loading (MKL), which helps to reduce pain and other symptoms.

Objective: to compare the effects of lateral heel wedge insole alone and in combination with medial arch support on ADLs in patient with medial knee OA.

Methodology: A randomized clinical trial was conducted on n=60 patients with medial knee OA were randomly allocated in to group A, received lateral heel wedge insole (LHWI) along with medial arch support (MAS) and group B only adjusted with LHWI. Nonprobability convenient sampling technique was used to collect the data on the knee injury and osteoarthritis outcomes score (KOOS) was used as outcome measures. The outcome measures were assessed at the baseline, and after 8 and 16 weeks.

Results: The results of independent t-test showed that group A which received LHWI along with MAS showed more significant improvement ($p < 0.05$) in pain, ADLs, sports activity on KOOS questionnaire at each level of assessment than group B which only received the LHWI. But KOOS quality of life scores only showed significant improvement after 8 weeks of intervention in group A while after 16th weeks no significant difference ($p = 0.09$) was observed.

Conclusion: the lateral wedge insoles with medial arch support combined with conventional physical therapy protocol is more effective to improve activities of daily living (ADLS) in patients having medial knee osteoarthritis.

Keywords: Footwear, osteoarthritis, lateral heel wedge insoles, KOOS, ADLS.

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INTRODUCTION

Osteoarthritis (OA) is the most frequently diagnosed joint disease worldwide. It is distinguished by borderline bone outgrowth and articular cartilage degradation[1]. According to statistics, 10% of adults above 60 years have serious clinical problems may have osteoarthritis. Knee OA was predicted to become the fourth most frequent cause of disability by the year 2020[2]. People with high body mass indices are seven times more likely to develop knee osteoarthritis[3]. Patients been diagnosed with knee OA frequently struggle with knee pain, stiffness, restricted mobility, crepitation, an unstable and swollen joint, diminished muscular strength, motor and sensory issues, and functional limitations that restrict their ability to engage in regular physical activity and have a negative impact on their quality of life[4].

In order to maintain regular mobility and an independent way of life, pain-free walking is a key requirement. Mobility constraints can be brought on by irregular gait patterns, muscle wasting, a reduced range of motion (ROM), decreased endurance, functional loss, and knee tightness. Walking with pain can cause people to become less active and restrict their participation[5].

Combination therapies are a large category of interventions offered by a diverse group of medical professions[6, 7]. The management of OA of the knee with biomechanical therapies is a current area of ongoing research. Exercise is an essential component of treating knee OA and focus on reducing pain and improving function [8-11]. Exercises for knee OA should Investigations on long-term favorable effects are also few, and they indicate that over time, the benefits of exercise diminish[12]. Functionally and mechanically, the entire lower limb is seen to be an interconnected entity, thus any change in one area of the limb, like the foot, can have a major effect on other areas of the limb, like the knee [13]. Understanding the design, selection, and application of orthotic devices is another crucial component of a rehabilitation programme. As treating patients with complex illnesses holistically requires a variety of skills and knowledge, multidisciplinary teams are particularly effective in rehabilitation when orthotics and prosthetics are included[14,15]. Numerous footwear changes are used to lessen Medial Knee Loading (MKL), which helps to reduce pain and other symptoms, halt the disease's progression, and improve both the quality of life for people who have knee problems as well as their overall quality of life. Lateral heel wedged insoles have been shown to lower peak knee loading in patients having OA of the medial compartment of the knee[13]. The LWIs with medial arch support considerably decreased the knee adduction moment to 8.8% during walking in

healthy adults when compared to lateral heel wedged insoles (LWIs) alone[16].

There is widespread agreement that reliable outcome assessments are required to distinguish between ineffective and effective therapies. To achieve this, patient-centered, uniform, and cost-effective measures are required. Symptoms and functional restrictions are the most common reasons why patients seek treatment. Therefore, it is essential to give these outcomes priority when comparing the efficacy of various treatment modalities[17]. So the purpose of the study was to compare the lateral heel wedge insole alone and in combination with medial arch support on ADLS in patient with medial knee OA.

METHODOLOGY

A randomized clinical trial (NCT04536519) was conducted on n=60 patients with medial Knee osteoarthritis (OA). The data was collected from Janjua Rehab Centre after the approval from the ethical review committee of department of physical therapy, Elite College of Management Sciences, Gujranwala (ECOMS/ER/01-0717).

A non-probability convenient sampling technique was used to collect the sample The 50 years or older patient with BMI range 22-25 kg/m² and radiographically diagnosed case of grade 2-3 medial knee OA according to the Kellgren-Lawrence System for Classification of knee osteoarthritis², having knee pain for minimum 1 month with a severity of at least 4 on numeric pain rating scale (NPRS), were included in the study. Patients with systemic arthritic disease, serious medical conditions or severe co-morbidities, systemic disease which cause dependent edema, that makes it challenging to wear shoes in the previous month, patients having established histories of the knee injury, patients going through knee or lower extremity surgical intervention for fracture or joint replacement, patients receiving intra-articular injections which are steroid-based or physical therapy treatment in the previous six months, and patients with any of the following conditions were excluded.

The data was collected after taking the written informed consent from the all participants. The data was recorded on Knee injury and Osteoarthritis outcomes score (KOOS) which is a valid and reliable tool for measuring knee related quality of life with internal consistency ranged from 0.65-0.94 for KOOS Pain, 0.56-0.83 for Symptoms, for ADL ICC reported as 0.78-0.97, for Sport/Rec was 0.84-0.98, and for QOL was 0.71-0.85[17-19]. It is a self-administered questionnaire and was filled by the patients themselves or by therapist according to patient responses. The assessment was done at the

baseline, after 8th week and 16th week of intervention.

The participants were randomly allocated in to group A (n=30), received lateral heel wedge insole (LHWI) along with medial arch support and group B

(n=30) only adjusted with LHWI. From the both groups there were n=4 participants were lost the follow up due to unknown reason, some comorbidity as well accessibility issue. A total of n=56 participant completed the intervention protocol and included in the analysis (Figure 1).

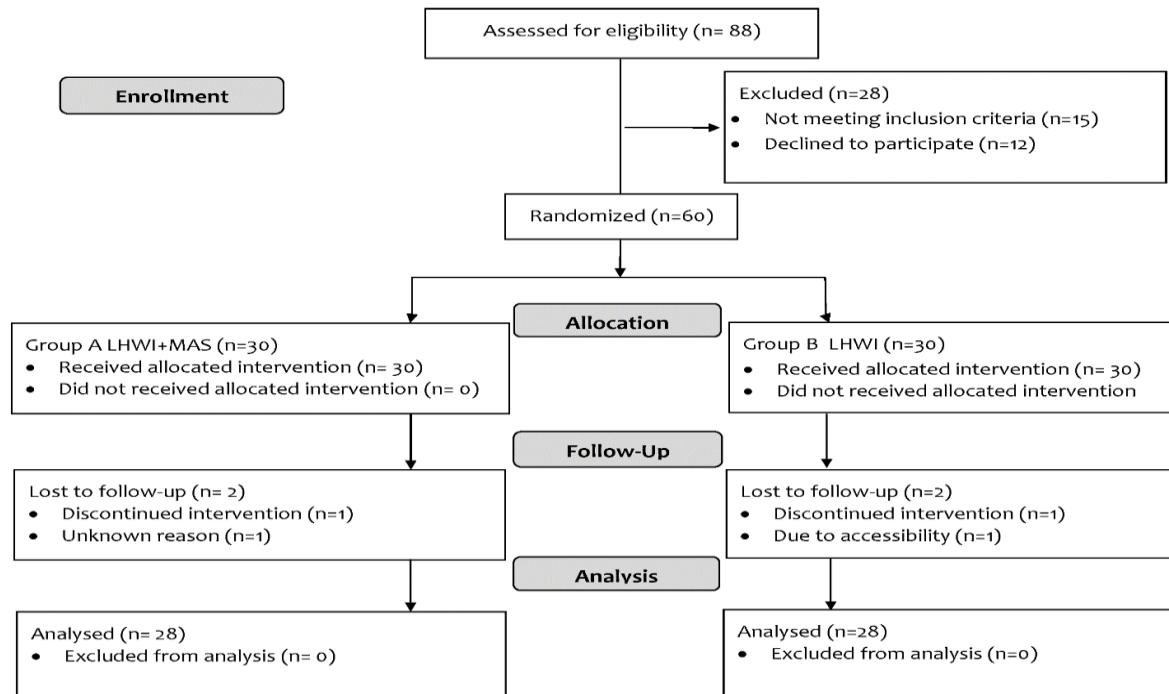


Figure 1: CONSORT diagram

Since all groups get the same standard of treatment, closed shoes made it possible for patients to conceal. The individuals received treatment for 16 weeks. Both groups also received conventional physical therapy as well.

The conventional physical therapy treatment methods that were used were as follows: Manual mobilization techniques (3 set x 10 reps per session), sustained hamstring and calf stretches (3 times/session 15 sec hold, depending upon patient tolerance, and 10 sec rest interval) and Active ROMS (two 15-sec bouts with 3-sec hold at each end range) to improve mobility, quadriceps setting, hamstring setting and multiple angle isometric exercises of knee (1 set of 7-10 repetitions with 6 seconds hold, as patient tolerance, and 10 sec rest between repetitions) to improve neuromuscular control as well as muscle performance and improving balance through therapeutic balance training exercises and low-impact aerobic exercises were used. These conventional activities were given to both groups as initial treatment.

The lateral heel wedged insoles (LHWIs) used in the study were non-custom, distributed bilaterally, high-density ethyl-vinyl acetate insoles which were preferred to be encased in leather. The lateral wedge tilt of the insoles was 5°-6°. Other insole

consisted of above-mentioned lateral heel wedged insole (LHWIs) with a medial arch support made up of same material which extended to full length of metatarsals. The patients were advised to wear modified footwear for 16 weeks while standing, walking, or doing any ambulation task.

For data analysis, Statistical Package for Social Sciences (SPSS) version 24 was used. The frequencies of demographics were presented as mean \pm standard deviation for some variables and percentages for other variables as well. For within-groups analysis, Repeated Measures ANOVA with Bonferroni correction was applied and for between-groups analysis, independent t-test was applied.

RESULTS

The mean age of the participants was 57.52 ± 3.77 years and average BMI was 23.98 ± 0.78 kg/m². A total of n=23 participants were males, while remaining n=33 were females. The results of RM ANOVA with Bonferroni correction showed a significant improvement ($p < 0.001$) in all five subscales' of KOOS in both groups from the baseline to 16th weeks at each level of assessment. (Table 1)

Table 1: Within-groups comparison of KOOS Score

^a KOOS Subscales	Group A				Group B			
	Mean±SD	MD	F(df)	P-value	Mean±SD	MD	F(df)	p-value
Pain Score	Baseline	32.94±5.27	31.13 ^a	0.00*** ^a	33.83±6.04	19.74 ^a	445.52 (2,54)	0.00*** ^a
	8 th week	64.07±6.39	8.14 ^b	0.00*** ^b	53.57±5.81	12.19 ^b		0.00*** ^b
	16 th week	72.21±7.21	39.27 ^c	0.00*** ^c	65.76±7.06	31.93 ^c		0.00*** ^c
ADLs Score	Baseline	33.81±6.48	24.39 ^a	0.00*** ^a	32.98±5.75	21.23 ^a	1101.8 (1.61,43.48)	0.00*** ^a
	8 th week	58.20±4.32	11.22 ^b	0.00*** ^b	54.21±4.01	9.9 ^b		0.00*** ^b
	16 th week	69.42±6.73	35.61 ^c	0.00*** ^c	64.11±4.60	31.13 ^c		0.00*** ^c
Sports Score	Baseline	8.39±8.39	35 ^a	0.00*** ^a	10.17±7.99	29.29 ^a	399.6 (1.65,44.5)	0.00*** ^a
	8 th week	43.39±8.17	14.46 ^b	0.00*** ^b	39.46±5.82	13.75 ^b		0.00*** ^b
	16 th week	57.85±9.56	49.46 ^c	0.00*** ^c	53.21±7.35	43.04 ^c		0.00*** ^c
Quality of Life (QOL) Score	Baseline	24.80±5.51	24.78 ^a	0.00*** ^a	26.58±6.93	17.63 ^a	359.1 (2,54)	0.00*** ^a
	8 th week	49.58±7.95	12.73 ^b	0.00*** ^b	44.21±5.62	14.51 ^b		0.00*** ^b
	16 th week	62.31±7.88	12.73 ^c	0.00*** ^c	58.72±7.68	32.14 ^c		0.00*** ^c

^abaseline to after 8 weeks, ^bafter 8 weeks to after 16 weeks, ^cbaseline to 16 weeks.

Level of significance p<0.05*, p<0.01**, p<0.001***

The results of independent t-test showed that group A which received LHWI along with MAS showed more significant improvement (p<0.05) in pain, ADLs, sports activity on KOOS questionnaire at each level of assessment than group B which only

received the LHWI. the KOOS quality of life only showed significant improvement after 8 week of intervention in group A while after 16th weeks no significant difference (p=0.09) was observed. (Table 2)

Table 2: Between groups comparison for KOOS score

^a KOOS Subscales	Group A		Group B		Mean Difference	p-value
	Mean±SD		Mean±SD			
Pain Score	Baseline	32.94±5.27	33.83±6.04		-0.886	0.56
	8 th week	64.07±6.39	53.57±5.81		10.504	0.00***
	16 th week	72.21±7.21	65.76±7.06		6.446	0.00***
ADLs Score	Baseline	33.81±6.48	32.98±5.75		0.829	0.615
	8 th week	58.20±4.32	54.21±4.01		3.989	0.00***
	16 th week	69.42±6.73	64.11±4.60		5.307	0.00***
Sports Score	Baseline	8.39±8.39	10.17±7.99		-1.786	0.418
	8 th week	43.39±8.17	39.46±5.82		3.929	0.04*
	16 th week	57.85±9.56	53.21±7.35		4.643	0.04*
Quality of Life (QOL) Score	Baseline	24.80±5.51	26.58±6.93		-1.789	0.29
	8 th week	49.58±7.95	44.21±5.62		5.368	0.00***
	16 th week	62.31±7.88	58.72±7.68		3.586	0.09

Level of significance p<0.05*, p<0.01**, p<0.001***

^aKOOS: Knee Injury and Osteoarthritis Outcome Score

DISCUSSION

The current study found the effects of lateral heel wedged insoles (LWIs) alone and LWIs with medial arch support along with physical therapy on daily living functional status of patients having knee osteoarthritis. The findings of study showed that a significant difference was found in KOOS Pain, ADLs and Sports score between group A and B with a higher score recorded in group A. These results indicate that in knee OA patients, administration of physical therapy protocol and using LWIs with medial arch support is more effective in reducing knee related difficulties in daily living tasks as compared to physical therapy with LWIs alone.

These findings were strengthened by a recent investigation by Michael A. Hunt et al [20], which compared the effects of lateral heel wedged insoles with medial arch support and LWIs alone. They came to the conclusion that 77% of patients in the medial arch group and 58% of patients in the LWIs group had improved physical function. These findings

demonstrate that, in comparison to LWIs alone, the lateral wedged insole anchored by the medial arch is more effective in enhancing knee OA function [20]. The validity of these conclusions was further strengthened by a study that found that LWIs with medial arch support are effective in lowering adduction moment of knee joint, which improves the overall stress distribution on the knee and enhances functional ability in patients having medial knee osteoarthritis [21]. LWIs paired with medial arch support result in a decrease in KOOS pain score, according to a meta-analysis by Mobina Khosravi et al [22] on the impact of orthoses and LWIs on pain and physical function in knee OA[22]. Contrarily, Dessery et al [16] found no appreciable differences in pain severity when comparing those wearing 6° and 10° lateral wedge insoles having arch support to those not using insoles [16].

To determine the effects of LWIs among Pakistan's knee osteoarthritic people, Rabbiya Riaz

et al [23] conducted a study. The results of the study demonstrated that conventional physiotherapy alone was better to lateral wedge insoles, which were thought to be more beneficial in treating knee osteoarthritis. A within-group analysis revealed that while both groups' KOOS scores significantly improved during the treatment, conventional physical therapy showed more clinically significant improvement[23]. A comparison of the two groups revealed a substantial difference between the group utilising lateral wedge insoles and the group receiving conventional physical treatment. The lateral wedge insoles may increase pronation and foot invertor moment, according to this study's other findings[23]. The patient's ability to do ADLs is hindered because an elevated moment of invertors causes the muscles in the lower extremities to get exhausted after prolonged use. Insoles with arches in the lateral wedge reduce the ankle eversion and moment of inversion as a result[23].

In current study, there was a difference recorded in mean values of KOOS Symptoms score but a statistically, a non-significant difference was observed in KOOS Symptoms score, which is contrary to previous findings[23]. According to a study, a medial arch support may have nullified the effectiveness of LWI in generating foot pronation and lower extremity postural changes that decrease adduction moment of knee. The authors advise against using lateral heel wedged insoles with medial arch supports based on this theory[24, 25]. Another study that compared the effects of LWIs alone and LWIs with medial arch support found that the pain rating of the two groups did not vary significantly, whereas the knee adduction moment was reduced considerably in the medial arch groups. This resulted in patients feeling more comfortable when using lateral heel wedges with medial arch support because it offers better foot support[26].

Hsieh and Wen-Chung Lee[27] came to the conclusion that there was a significant difference between the baseline KOOS quality of life score and the post-3-month follow-ups score ($p=0.021$). According to the study's findings, individuals with knee OA who used LW with medial arch insoles for a short while reported pain reduction, improved function during physical activity, daily living, sports, and recreation, and a better quality of life in relation to their knees[27].

In this study, the intervention's effects are only examined for a small amount of time—16 weeks (4 months)—but they may be examined for a prolonged time to understand their long-term impacts more fully. Moreover, the study does not address the complications which may arise due to biomechanical alteration of knee joint that in turn may affect opposite side. So, Future studies should be conducted while considering these effects.

CONCLUSION

The lateral heel wedged insoles with medial arch support combined with conventional physical therapy protocol is more effective to improve ADLs as compared to physical therapy with lateral heel wedged insoles alone in patients with medial knee osteoarthritis.

Author's Contribution

UIJ and SMH: substantial contributions to the conception and design of the study.

UIJ and SA: acquisition of data for the study.

MFK: interpretation of data for the study.

RM: analysis of the data for the study.

HA: drafted the work.

FS and RS: revised it critically for important intellectual content.

UIJ, SMH, SA, MFK, RM, HA, FS and RS: final approval of the version to be published and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted on $n=60$ patients with medial Knee osteoarthritis (OA). The data was collected from Janjua Rehab Centre after the approval from the ethical review committee of department of physical therapy, Elite College of Management Sciences, Gujranwala (ECOMS/ER/01-0717).

Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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Thanks to the participants of this study for sharing their personal experiences.

Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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