RESEARCH ARTICLE

EFFECTS OF LATISSIMUS DORSI STRETCHING ON FUNCTIONAL DISABILITY RELATED TO CHRONIC LOW BACK PAIN

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ABSTRACT

Objective: To determine effects of latissimus dorsi stretching on functional disability related to chronic low back pain. **Methodology:** A single group pretest-posttest design trial was conducted in NOSIS clinics Mansehra Pakistan. Patients with the age between 20-60 years had chronic mechanical low back pain lasting for 7-12 weeks were included in the study. A total of n=64 randomly divided into experimental and control group, those received spinal stabilization exercises (SSE) plus latissimus dorsi stretching (LDS) and stabilization exercises alone respectively. Oswestry Disability Index (ODI) was used to determine functional disability. The level of significance was set at 95% CI ($p \leq 0.05$). **Results:** A total of n=61 participants participated in the study. The mean age of the study participants was 39.60 ± 10.02 and sitting time was 6.54± 1.23. It was observed that both the experimental group {$p<0.001$, $\eta p^2=0.934$} and control group {$p<0.001$, $\eta p^2=0.875$} significantly improved the ODI score with large effect size after 4 weeks of intervention. However, between the comparison showed significant improvement with large effect size in experimental group as compared to control group, after first week ($p<0.001$), and 2nd week ($p<0.001$) of intervention. **Conclusion:** the combination of spinal stabilization exercises and stretching of latissimus dorsi effective in improving functional disability related to chronic low back pain.

Keywords: Low back pain, stabilization exercises, stretching exercises, physical therapy

INTRODUCTION

Low back pain (LBP) can be defined by aches, soreness, pain, discomfort, and spasm in lumbar spine, and is considered as chronic if persists for more than 12 weeks.[1,2] LBP is ubiquitous in community and its prevalence is not just common in adults but also in children and adolescents. [3] The prevalence of LBP reaches to maximum between the ages of 35-55 years. It has been estimated that the prevalence of low back pain in Pakistan is 40.6%.[4,5,6,7] However, 23% of the population is affected from chronic low back pain worldwide.[8] According to World Health Organization (WHO), the most common cause of disability is low back pain which affects the health and performance at work.[9]

Low back pain is a major health problem and adversely affects the activities of daily living, quality of life, and functional mobility in elder population.[7] The leading cause of activity limitation,[4] long term disability[10] and absentees from work worldwide which increases socioeconomic burden on individual, community and government.[4]

The most common cause of low back pain is awkward and abnormal posture.[1] Lumbar spine holds more weight due to the lower position of vertebras in lumbar region, and therefore more prone to injury.[11] The number of risk factors has been identified in previous studies and it includes bending, twisting, prolonged standing, squatting, kneeling, and heavy physical work. Other than that, lack of physical exercise, smoking and life style also contributes to increase the risk of low back pain.[12]

The management of low back pain includes medications, surgery, physiotherapy, acupuncture, and chiropractic protocols. In previous literature effectiveness of physiotherapy including, strengthening and stabilizing the core muscles of back and abdomen has been discussed.[13] A systemic review also supports the findings of effectiveness of exercise therapy for low back pain. Exercise therapy including stretching and strengthening exercises under the supervision of professional may improve pain, and function in chronic LBP.[14]

Moreover, a previous study conducted by Cairns MC et al., spinal stabilization exercises was used for low back pain which showed very promising results.[15] In another study it has been concluded that spinal stabilization exercises on Swiss ball along with stretching of lower back and abdominal muscles improve pain, function and quality of life by reducing disability.[16]

As physical therapy is the first-line treatment to manage chronic low back pain. Thus this protocol will contribute to the public health by improving

comfort and quality of life in patients with chronic low back pain.[17]

There is paucity in the literature related to intervention in Pakistani population with duration of the intervention. The objective of the study was to determine the effectiveness of spinal stabilization exercises along with stretch of latissimus dorsi muscle on disability due to chronic mechanical low back pain.

METHODOLOGY

A single-blinded, randomized control trial was conducted at NOSIS clinics Mansehra for a time period of 1 year. A study was initiated after taking an approval from Institutional Review Board of NOSIS CLINICS. Patients with the age criteria of 20-60 years with chronic mechanical LBP lasting for 7-12 weeks were included in the study. However patients who had injury, the symptoms of radiating pain, disc pathology and any medical conditions due to which intervention was not possible were excluded from the study. Informed consent was taken from each participant according to Declaration of Helsinki,

A total of n=87 patient with low back pain were evaluated for the eligibility. A total of n=64 participants fulfilled the inclusion criteria, and were thus included in the study through non-probability convenient sampling technique. Participants were kept blind to the treatment protocol and randomly divided into two interventional groups i.e. experimental and control group, n=32 in each group, through the sealed-envelope method. Three (n=03) participants of control group were excluded from the study due to loss of follow-up. (Figure 1)

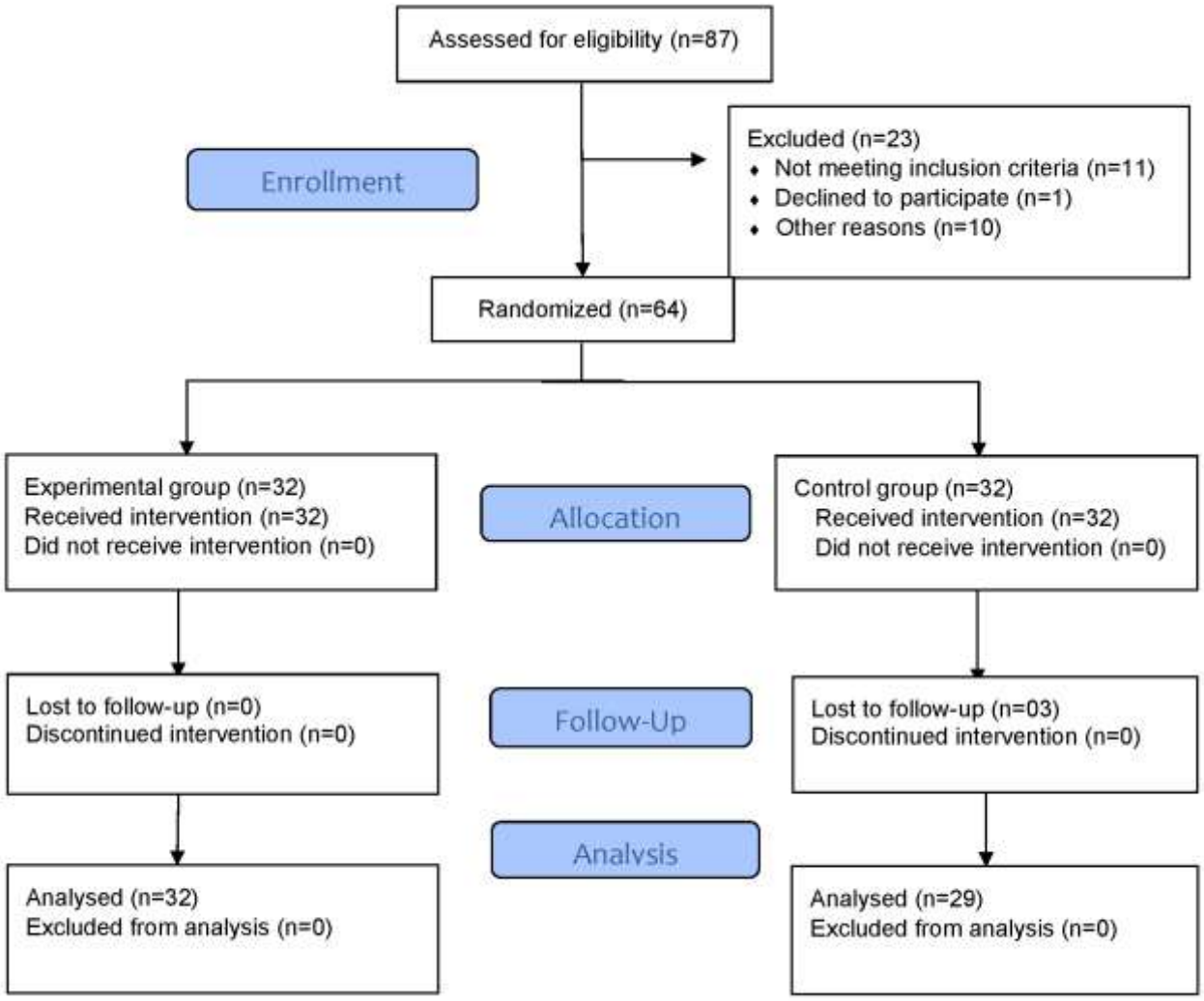

Figure 1: CONSORT diagram

In the experimental group, spinal stabilization exercises (SSE) including prone-Lying, gluteal brace, bridging from Crook Lying, stretching of lower back and lower extremity (LE), and stretching of

latissimus dorsi (LDS) were performed to each participant. While in control group, only spinal stabilization exercises (SSE) were performed.

Spinal stabilization were repeated 5-15 times depending on the endurance of the patients. However, stretching of the lower back and lower extremity muscles along with the latissimus dorsi was of 20-30 seconds with 10-20 repetitions in each session. Each participant received 6 sessions in two weeks (three sessions a week). Each session had lasted for 30-40 minutes.

The general demographics in terms of age, gender, and sitting time was collected at baseline. Functional disability due to low back pain was assessed through Oswestry Disability Index (ODI),[18] at the baseline, after 1st week and then after 2nd week of intervention. The two mixed repeated measure ANOVA was used to see interaction effects among interventions, baseline and after 1st week of assessment on functional disability, as well as simple with-in and between the group main effects the level of statistical significance was set at $p<0.05$ and clinical significance was measured with partial eta square (ηp^2) The SPSS version 23 was used for analysis.

RESULTS

A total n=61 were participated in study, out of which n= 51 were males and remaining n=10 were females. The mean age of the study participants 39.60 ± 10.02 and sitting time was 6.54± 1.23. The n=49 participants had diabetes. The mean BMI was 26.95 ± 2.97 which showed that n=43 participants were overweight, n=9 were obese and the remaining n= 9 had normal weight.

As the sphericity was not assumed, the Huynh-Feldt values showed significant interaction effect {F=14.42 (2,18), p<0.001, ηp^2=.196} between interventions and time factor/assessment on disability related to back pain measure with Oswestry disability index (ODI). While considering the simple within subject main effect It was observed that both the experimental group {F=441.99 (2.000, 62.000), p<0.001, ηp^2=0.934} and control group {F=195.82 (1.859, 52.04), p<0.001, ηp^2=0.875} significantly improved the ODI score with large effect size after 4 week intervention as shown in table 1.

Table.1 Within group changes

		Mean	*SD*	*p-value*	*F(df)*	*ηp^2*
Experimental (SSE+LDS)	Baseline	22.59	1.54	[a].000***	441.99 (2.000,62.000)	.934
	1st week	19.71	1.80	[b].000***		
	2nd week	14.78	2.37	[c].000***		
Control (SSE)	Baseline	23.13	2.32	[a].000***	195.82 (1.859,52.04)	.875
	1st week	21.44	1.45	[b].000***		
	2nd week	17.44	2.72	[c].000***		

Significance Level: p<0.05, p<0.01**, p<0.001***.*
[a] baseline to. 1st week, [b] 1st week to 2nd week, [c] baseline to 2nd week

For between the comparison, main effect showed that there was no significant difference between the group at baseline {F=1.180(1, 31), p=0.282}. While after first week {F=16.818(1, 31), p=0.000}, and 2nd week {F=16.685(1, 31), p=0.000}, significant improvement with large effect size was observed in experimental group as compared to control group. (Table 2)

Table.2 between group comparisons

		Experimental (SSE+LDS)		Control (SSE)		F(df)	p-value	ηp^2
		Mean	SD	Mean	SD			
Oswestray disability index	Baseline	22.59	1.54	23.13	2.32	1(1.180)	[a].282	.020
	1st week	19.71	1.80	21.44	1.45	1(16.818)	[b].0001***	.222
	2nd week	14.78	2.37	17.44	2.72	1(16.685)	[c].0001***	.220

Significance Level: p<0.05, p<0.01**, p<0.001***.*
[a] baseline to. 1 week, [b] 1st week to 2nd week, [c] baseline to 2nd week

At the baseline all subjects (n=61) had moderate level of disability related back pain. But after one week the disability was reduced to minimal disability level in n=17 participants of experimental group and n=6 control group. While at the end of 2nd week, the n=32 participants of experimental group as well as n=24 participants of control group, improved to minimal disability level. But in control group n=5 participants were remained in moderate level of disability as shown in Figure 2.

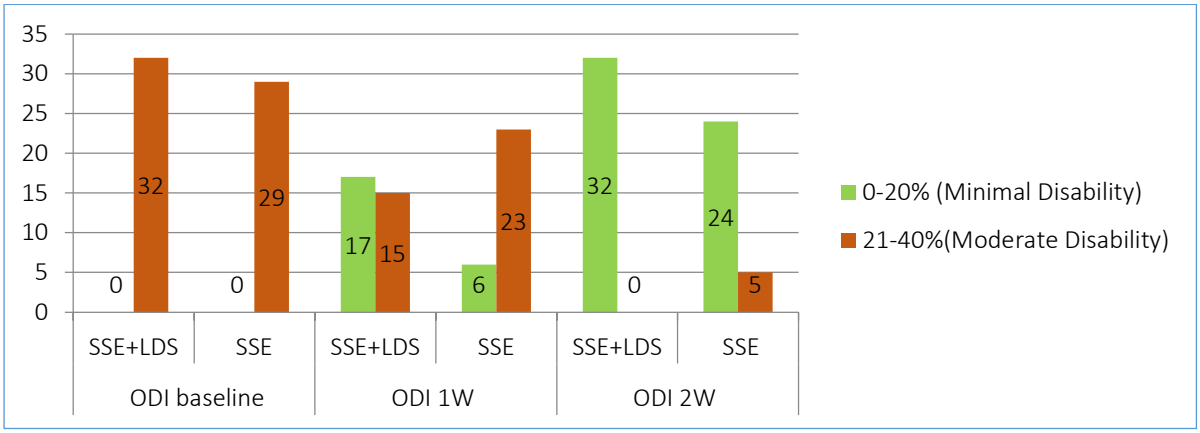

Figure.2 Change in the disability level before, after 1st week and after 2nd week

DISCUSSION

The objective of the study was to determine the effectiveness of spinal stabilization exercises with latissimus dorsi stretch on functional disability due to chronic mechanical low back pain. The results showed that functional disability was significantly improved in both experimental and control group. While comparing the groups spinal stabilization exercises with latissimus dorsi stretch showed significant improvement as compared to conventional physical therapy. So, null hypothesis was rejected.

According to the results of the study a significant improvement was observed on Oswestry Disability Index after two week of intervention of spinal stabilization exercises. But a study conducted by Woo SD et al., described significant improvement on Oswestry Disability Index, after 1 month of lumbar stabilization exercises.[19]

The spinal stabilization exercises showed clinically significant improvement in pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex and social life on Oswestry Disability Index throughout the intervention of spinal stabilization exercises. It has been discussed in previous literature that spinal stabilization exercises increases physical endurance and muscle strength[20] which significantly reduced low back pain and thus improve functional activities,[21,22] And good muscle strength and physical endurance are important aspects of physical performance and balancing abilities.[23] Also, seven randomized clinical trials were included in a previous systemic review in which improvement in pain and reduction in disability was significantly improved after lumbar stabilization exercises in chronic low back patients.[24]

Furthermore, spinal stabilization exercises along with latissimus dorsi stretch also showed clinically significant improvement in functional disability measured on Oswestry disability index (ODI). A study by Akhlaq Ahmed et al. for low back pain in which spinal stabilization exercises along with the stretching of latissimus dorsi showed significant improvement in functional index and pain.[25]

It has also been discussed that contractions of latissimus dorsi muscle directed stress on the thoracolumbar fascia, and anterior rotation of pelvis occurs due to the tightness of latissimus dorsi which leads to hyperextension of lumbar region and thus causes low back pain.[26] And stretching exercises reduces muscle tightness and improves muscle length.[27] Similarly lumbar stabilization and strengthening exercises to lengthen the lumbar extensors found significant improvement in ODI scores.[28] Also, a study performed in India reported significant improvement after stretching along with the strengthening of latissimus dorsi muscle and spinal stabilization exercises on chronic mechanical low back pain.[29]

The limitation of the study was that it was single centered study. Confounding variable such posture, physical activity ergonomic setting etc were not included in the study.

CONCLUSION

Spinal stabilization exercises with and without stretching of latissimus dorsi muscle improves functional disability in patient with chronic low back pain. While comparing both groups, the combination of spinal stabilization exercises and latissimus dorsi stretch was more effective to improve functional disability.

To generalize the results the multi-cantered study with large sample size should be incorporated in future studies. Long treatment duration and controlling the confounding variables should also consider for more confined results.

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