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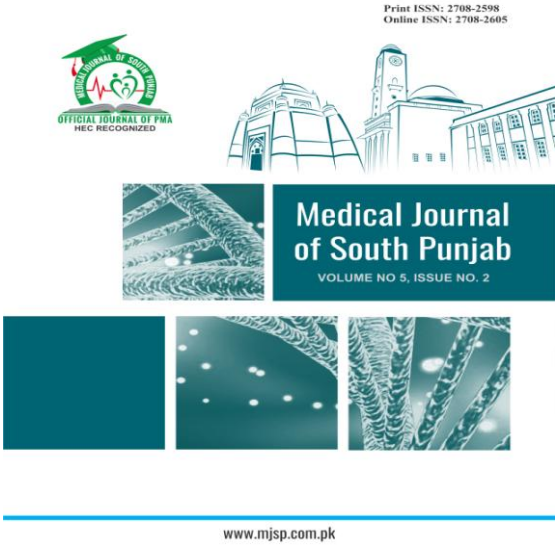

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Original Article

Conventional exercises plan with or without laser guided feedback for patients with non-specific low back pain

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ABSTRACT

Objective*: To find out what changes occurred after the application of two exercise modalities conventional Exercise and Laser-Guided Exercise on pain, pain pressure thresholds, disability, catastrophizing, kinesiophobia, and lumbar proprioception in subjects with nonspecific chronic low back pain (NSCLBP).*

Methods*: The study employed a randomized clinical trial design, conducted at Gillani Physiotherapy and Medical Center, Lahore. The inclusion criteria include participants who are between 18-45 years with non-specific low back pain and volunteer convenient sampling technique was used. Group A received conventional physical therapy program and group B received conventional physical therapy exercise program along with laser therapy which consists of infrared radiation therapy. Measurement instruments used in data collection were based on Numeric Pain Rating Scale and Oswestry Disability Index. Data analysis was done using statistical packages for social sciences (SPSS) version 25, and statistical analysis techniques used were Shapiro–Wilk test, Wilcoxon signed rank test and Mann–Whitney U test.*

Results*: The study involved 30 participants with non-specific low back pain. The mean age was 34.93±7.93 SD years, with 43.3% males and 56.7% females. Mann-Whitney U tests showed no significant differences in pre-intervention scores but significant post-intervention improvements in Group Oswestry Disability Index ($p = 0.016$). Wilcoxon signed-rank tests revealed significant improvements in both disability and pain levels for both groups post-treatment ($p < 0.001$), with Group B showing more substantial improvements (Oswestry $p < 0.001$; Pain $p < 0.001$).*

Conclusion: *Current study concluded that both conventional physical therapy combined with laser therapy significantly improve disability and pain level in patients with non-specific low back pain.*

Keywords*: Back Pain, Conventional Physical Therapy, Laser Therapy, Oswestry Disability Index.*

1. INTRODUCTION

Low back pain is a common ailment and It affects nearly everyone at some stage of life. For the majority of individuals who suffer from low back pain, any considerable discomfort or impairment is typically brief, and they promptly return to their normal activities regardless of any guidance or intervention they get. However, a small portion of individuals endure ongoing discomfort and functional limitations[1]. Low back pain (LBP) is a significant health issue. It impacts a significant portion of the adult population, reaching up to 80%, and results in substantial healthcare and socioeconomic expenses in Pakistan the prevalence of LBP is 45% to 55% in general population[2]. Low back pain is simply characterized as a dull, aching, and/or tightness in the low back with no clear explanation of why the area is painful. Several structures in the posterior area of the spinal column can might be involved in development of the symptoms which include the joints, discs, and other connective tissues[3].

The diagnosis of non-specific low back pain is used when the clinician can confidently exclude any possible cause for the patient's pain. Depending on what the clinician identifies as the particular cause for the patient's low back pain, they should coordinate the right investigations[4]. NSLBP is one of the most widespread conditions that affect individuals worldwide, and is associated with dysfunction in various deep trunk muscles, with the TrA and multifidus being most common. These muscles are reported to play a significant role in trunk stability but dysfunctional co-contraction with other muscles around the spine may affect movement control in subjects with nonspecific low back pain (NSLBP)[5]. Patients with NSLBP exhibit reduced activation of TrA when physical tasks are being performed later in the timeline, may demonstrate stability and motor coordination abnormalities in the lower back and pelvis[6]. Motor control exercises are suggested as the key form of treatment for these muscles, which helps to restore all the necessary motor patterns and facilitate the spinal movement control – all these aspects are used in the treatment of NSLBP on an international level[7].

A recent and efficient tool that may be effective in treating NSLBP is the laser-guided feedback. State-of-the-art feedback technology in the therapy setting uses laser in directing feedback to patients while they are carrying out certain exercises or movements[8]. The increases exactness and correctness of the therapy interventions by offering the patients a visual representation of their motions and postures to improve the efficiency. The mechanics of action are described by the integration of visual feedback into the sensorimotor system[9]. The laser can be seen to work as a signal which the patients are able to adjust their motions from. This reflexive feedback process engages the neuromuscular system in the learning of movement skills and it consolidates the correct patterns of movement. As a result, the patient gains more control over the positions and the movements since certain components that might give rise to the lower back pain are minimized[10].

Engaging in physical activity improves metabolism and increases oxygen intake, boosted by muscles which are major producers of lactic acid, carbon dioxide, and body heat. Learning precise movements improves coordination, automating both unconditioned and conditioned reflexes, allowing actions to be performed without immediate cortical control[11]. This motor skill programming involves creating pattern of stimulation and depression of the central nervous system that relates to contraction and relaxation of muscles in certain sequences. Therapeutic ultrasound is a branch of physiotherapy that employs sound waves of high pitch that go through tissues with

various effectiveness depending on the frequency of the sound waves[12]. In previous studies there is a lot of data available on conventional physical therapy exercises for low back pain. But there is dearth of availability of data on conventional physical therapy exercise plans along with laser guided feedback in patients of low back pain. Therefore, this topic will provide comparative effects of conventional exercise plan with and with laser guided feedback with patients of low back pain.

2. METHODOLOGY

The study followed a randomized clinical trial design and was conducted at Gillani Physiotherapy and Medical Center, Lahore, with a sample collected using non-probability convenient sampling. Sample size was calculated using "OpenEPI" tool and sample size was 30 after drop out of 2 patients. This study adopted the following inclusion criteria; participants were males and females of 18-45 years who had NSLBP, pain intensity >= 3 on the NPRS; exclusion criteria included participants with neurological signs, chronic fatigue syndrome, pregnancy, and previous low back surgery.

Group A received conventional physical therapy exercise program. The exercise program including core strengthening (pelvic tilt, bridging exercise and cat-cow stretch), knee to chest stretch and hamstring stretch. These exercises performed 3 times a week, 3 sets of each exercise which consists of 10 repetitions and each session lasted for 20-30 minutes and this treatment lasted for 6 weeks.

Group B received conventional physical therapy exercise program along with laser therapy which consists of infrared radiation therapy. IR therapy was given and 100-108Hz frequency for 15 minutes for each session and 3 sessions in a week. The conventional physical therapy program core strengthening (pelvic tilt, bridging exercise and cat-cow stretch), knee to chest stretch and hamstring stretch. These exercises performed 3 times a week, 3 sets of each exercise which consists of 10 repetitions and each session lasted for 20-30 minutes and this treatment lasted for 6 weeks.

Demographic data of patients were recorded prior to treatment then follow up and after 6 weeks via NPRS and ODI. There were 2 patients dropped out during treatment session. Statistical analyses of the data were carried using SPSS version 25 the within-group changes were analyzed by Wilcoxon signed rank test while the intergroup comparison was done using Mann Whitney U test with statistical significance set at p=0. 05.

3. RESULTS

In table 1 the age statistics of the sample (N=30) indicate a mean age of 34.93 years with a standard deviation of 7.93 years. The ages range from a minimum of 18 to a maximum of 45 years, reflecting a diverse age group within the sample.

Table-1: Statistics of age (N =30)

Mean ± Std. Deviation	34.93 ± 7.93
Minimum	18.00
Maximum	45.00

Table 2 Wilcoxon sign rank test between group A analysis

Variable	Treatment	Mean ± SD	Z value	P value
Oswestry disability index	Pre treatment	33.06±6.79	-5.055	.000
	Post treatment	22.43±5.63		
NPRS	Pre treatment	8.26±.90	-4.742	.000
	Post treatment	5.96±.80		

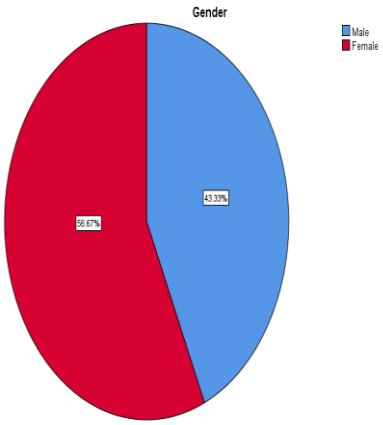
In table 2 the Wilcoxon sign rank test for Group A shows significant improvements in both the ODI and the NPRS following treatment. The pre-treatment Oswestry Disability Index had a mean score of 33.06 (SD = 6.79) and a mean rank of 15.00, which significantly decreased to a post-treatment mean score of 22.43 (SD = 5.63), with a z-value of -5.055 and a p-value of 0.000. Similarly, the pre-treatment NPRS had a mean score of 8.26 (SD = 0.90) and a mean rank of 15.00, which significantly decreased to a post-treatment mean score of 5.96 (SD = 0.80), with a z-value of -4.742 and a p-value of 0.000. These results indicate substantial improvements in disability and pain levels following the treatment in Group A.

Table 3 Wilcoxon sign rank test between group B analysis

Variable	Treatment	Mean ± SD	Z value	P value
Oswestry disability index	Pre treatment	34.10±7.43	-4.787	.000
	Post treatment	12.60±4.63		
NPRS	Pre treatment	8.40±.72	-4.808	.000
	Post treatment	3.33±1.37		

In table 3 The Wilcoxon sign rank test for Group B indicates significant improvements in both the ODI and the NPRS following treatment. The pre-treatment Oswestry Disability Index had a mean score of 34.10 (SD = 7.43) and a mean rank of 15.50, which significantly decreased to a post-treatment mean score of 12.60 (SD = 4.63), with a z-value of -4.787 and a p-value of 0.000. Similarly, the pre-treatment NPRS had a mean score of 8.40 (SD = 0.72) and a mean rank of 15.50, which significantly decreased to a post-treatment mean score of 3.33 (SD = 1.37), with a z-value of -4.808 and a p-value of 0.000. These results demonstrate substantial improvements in both disability and pain levels after the treatment in Group B.

Figure 1 Pie chart of gender



In figure 1 the gender distribution of the sample (N=30) shows that there are 13 males, comprising 43.3% of the sample, and 17 females, making up 56.7% of the sample.

4. DISCUSSION

The aims of this study were to evaluate and contrast the results of supervised exercise, with and without laser guided feedback together with PNE on an extensive range of factors such as pain intensity, PPTs, disability status, pain catastrophizing, kinesiophobia and lumbar proprioception in patients with NSCLBP. In the within-group analysis, both groups had an increase in the positive outcomes for all of the domains during the post-intervention assessment. The exact OT group that engaged in their exercises using the laser-guided feedback had significantly better perceived pain intensity changes post-intervention and 3 months later, together with perceived fear of movement /reinjure after intervention.

One randomized controlled trial (RCT) compared a standard core stabilization exercise program to the same program augmented with laser-guided feedback. The results showed that both groups experienced significant reductions in pain and disability over the intervention period[13]. However, the group receiving laser-guided feedback demonstrated

greater improvements in pain intensity, functional capacity, and exercise adherence. The authors concluded that laser-guided feedback enhances the effectiveness of conventional exercise programs by ensuring precise execution and increasing patient motivation[14].

In a study by Qaseem et al. , (2017) the described type of feedback is called Laser-Guided Feedback: The newly introduced feedback technique Coordinates of the laser beam guide the individual in the correct manner of touching and handling an object with a view of offering real time visual aide during the performance of an exercise. To achieve the goal of postural adjustments and proper position of movements in order to help in maintaining positions that stop further injuries while improving the efficiency of exercises[15]. Laser guided feedback was used by participants making them have better control of their posture, and they also followed instructions as to required movements than those in the conventional group. Thus, concluding the evidence presented above, it is possible to assert that the application of laser technology may show numerous advantages in terms of the quality of exercise and patients[16].

Another study was aimed at the impact of exercise programs with and without laser-guided feedback in the long-term follow up. Patients were followed for six months after completing a 12-week intervention. The findings indicated that both groups maintained improvements in pain and function at the six-month follow-up[17]. However, the laser-guided feedback group reported higher levels of satisfaction and continued engagement in their exercise routines. This suggests that laser-guided feedback may have a lasting impact on patient behavior, promoting sustained exercise adherence and ongoing benefits[18].

The current study had several limitations. Larger effects and statistical power are constrained by small sample sizes which can also limit the external validity of the study. Furthermore, there is also the question of the length of the intervention, which was six week and perhaps may have been too short to elicit long-term change in the individuals. Furthermore, the laser-guided system used in the intervention might have limitations related to its applicability and effectiveness during different exercises, potentially impacting the consistency and accuracy of the treatment. These factors should be considered when interpreting the study's outcomes and in designing future research.

As for further research, this study should attract a larger number of participants and be more diverse in order to generalize the findings. Extending the follow-up period would be beneficial to assess the long-term effects of the interventions, providing a more comprehensive understanding of their sustainability. Additionally, including participants from diverse backgrounds with varying ages and severity levels of the condition would offer a broader perspective and more robust findings. These improvements would address current limitations and contribute to more reliable and applicable conclusions in the field of physical therapy and rehabilitation.

5. CONCLUSION

The study concluded that both conventional physical therapy and conventional therapy combined with laser therapy significantly improve disability and pain levels in patients with non-specific low back pain. Group B, which received the combined therapy, showed more substantial improvements in both the Oswestry Disability Index and Numeric Pain Rating Scale compared to Group A.

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