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Manual Therapy Followed by Dynamic Strengthening Exercise Along With Conventional Physiotherapy Versus Manual Therapy Along With Conventional Physiotherapy on The Improvement of Pain and Functional Disability In Patients With Chronic Non-Specific Low Back Pain: A Randomized-Controlled Pilot Study

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Abstract

Objective: This study aims to evaluate the effectiveness of Dynamic Back Strengthening exercise along with conventional physiotherapy for chronic non-specific low back pain (LBP) patients over a conventional rehabilitation protocol for chronic non-specific LBP patients.

Methods:

Between October to December 2021 to a total of 8 patients with non-specific LBP (5 males, 3 females; mean age: 41.12± years; ranged, 25 to 55 years) were included in this randomized - controlled pilot study. The patients were randomly assigned to experimental (n=4) and control (n=4) group. The treatment period was 3 days in a week for four consecutive weeks where pre & post assessment were done. Data were collected by using structured questionnaires related to CLBP and disability, socio-demographic data were collected through a semi-structured questionnaire including the Dallas Pain Questionnaire & Oswestry disability index (ODI).

Results: In Mann Whitney 'U', the level of significance is greater than p = > 0.05, and there is no significant difference in between group analysis for all traits of the Dallas pain questionnaire and the Oswestry disability questionnaire.

Conclusion: Effectiveness of Dynamic Strengthening Exercise along with conventional physiotherapy was the same in comparison to the conventional physiotherapy treatment for patients with CLBP. In these limited sessions, it has been found that the strengthening program could be started earlier but not for all kinds of patients. As the disability level has been improved by both groups, so it can be introduced earlier with the patients. A complete study should be done with a larger sample size to find out the effectiveness of the dynamic strengthening exercise along with the conventional physiotherapy treatment approach for CLBP patients.

Keywords: CLBP; Gradual Back Strengthening Exercise; Dynamic Back strengthening exercise

Background

Chronic low back pain (LBP), defined as back pain persisting for more

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Md Nazmul Hassan N et al. J Spine Res Surg 2022
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than 12 weeks, affects over 50% of the general population. [1] It is the second most common factor for patients in search of primary care services.[2]According to the US National Center for Health Statistics, 14% of new patients admitted to a hospital for treatment had low back pain, representing 13 million people.[3] Also, it is estimated that over 70% of adults have had at least one episode of LBP in their lifetime. [4]In 2007, another study revealed that lower back region pain is caused by disc degeneration, spondylolisthesis, lumbar stenosis, epidural hematoma, and other causes, and 3% of all patients discharged from hospitals have symptomatic low back pain.[5] Because the causes of LBP are variable, different exercise regimens have been used to treat patients, including lumbar flexion, extension, isometric flexion, passive extension, and intensive dynamic back exercise regimens, and many of these exercise regimens have not yielded satisfactory results.[6]Recently, some studies have focused on exercises that aim to maintain or improve lumbar spine stability, such as lumbar stabilization exercises, which are aimed at improving the neuromuscular control, strength, and endurance of the muscles that are fundamental to maintaining spinal and trunk stability through several groups of muscles, particularly transverse abdominis and lumbar multifidi, but also other paraspinal, abdominal, diaphragmatic, and pelvic muscles.[7] Unsubstantiated suggestions that stabilization training may be useful in reducing pain and disability for all patients with nonspecific LBP, have appeared in the literature,[8] but these assertions have not been definitively demonstrated. Weakness of the abdominal muscles among the trunk muscles of low back pain patients is generally prevalent, and the strengthening of the abdominal muscles is essential in the recovery of the spinal neutral position. [9] When imbalance between the abdominal muscles of the trunk and extensor muscles occurs, it triggers slow back pain and reduces stabilization of the lumbar.[10]The ability to actively control the muscles of the hip plays an important part in lumbar segmental stability. If the sacroiliac joint moves excessively, it results in pressure on the joints and disks between the L5–S1 vertebral body, sacroiliac joint, and pubic symphysis, which leads to functional failure of the sacroiliac joint and low back pain. This causes the gluteus maximus muscle to contract, creating a self-locking mechanism, thereby providing stability to the sacroiliac joint.[11]There are various forms of exercise that can be prescribed based on different schools of thought, which include intensive dynamic back extensor exercises (motor control exercises), yoga and aerobic exercises.[12]Graded strengthening exercises are aimed at improving the neuromuscular control, strength, and endurance of the muscles that are central to maintaining dynamic spinal and trunk stability. The effect of graded lumbar stabilization exercises has been studied in subjects with recurrent LBP (8). Dynamic strengthening exercises can strengthen the spinal column and supporting structures. [13] An electromyography study to compare recruitment of the rectus abdominis and erector spinae muscles during dynamic strengthening exercise revealed higher muscle activity in these muscles.[14]Therefore, the aim of this study is to compare the effects of graded lumbar strengthening exercises and lumbar dynamic strengthening exercises on the maximal isometric contraction strength of the lumbar extensors, pain severity, and functional disability in patients with nonspecific chronic LBP. According to many studies, the first step of the physiotherapy treatment pyramid is education of the patient.[15] In another study, researchers explored several research studies that included evidence on conservative treatments,[16] which included manual therapy or conservative physiotherapy, which included exercises, mobilization, McKenzie approach treatment, manipulation, strengthening programs, advice, and other manual therapy techniques, which have strong evidence of effectiveness for chronic low back pain patients.[17] According to a study,[18] rest and exercise are effective for low back pain patients.

Patients and Methods

Study design and study population

This study was an experimental design of quantitative research, which was a randomized clinical trial (RCT), chosen because the experimental study is the best way to find out the effectiveness of any study. The researcher wished to conduct the study with an experimental group and a control group with the aim of comparing the experimental group and the control group. It was a double-blind study where the assessor and participants were blinded. Data was collected randomly from the outpatient, Musculoskeletal Physiotherapy unit of the Centre for the Rehabilitation of the Paralyzed (CRP), Savar. The duration of the study was from October 2021 to December 2021.

The researcher has taken eight participants as a sample. Obviously, this is a small sample as part of a pilot study. The researcher has to choose eight participants to conduct this study.

Intervention

The experimental group participants were received dynamic strengthening exercise with conventional physiotherapy treatment. The treatment was given according to patient's condition and dynamic back strengthening also given as the home advice. In control group participants were given conventional physiotherapy treatment. Both group received physiotherapy treatment three days in a week. Treatment has given by five professional physiotherapists who were registered in Bangladesh.

Experimental group comprises of Conventional physiotherapy interventions & Dynamic strengthening exercise. The exercise program consisted of twelve sessions,

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each lasting half an hour, spread out over four weeks. The program was similar to the core strengthening exercises aimed at all the back muscle groups. The overall aim was to accelerate and enrich rehabilitation protocol of the spine. No special equipment was needed. Although, conventional physiotherapy approach continued along with the program.

Data collection procedure

Result

The result found that, among the participants, ages ranged between 25 and 55, with a mean age of 41.12 years (32 years in the experimental group and 50.25 years in the control group). Males made up 62.5 percent (n=5) of all participants (37.5% in the experimental group and 25% in the control group), while females made up 37.5 percent (n=3) of all participants (12.5% in the experimental group and 25% in the control group).Among the participants, 37.5% (n=3) were housewives (12.5% in the experimental group and 25% in the control group), 25% (n=2) were businessmen (12.5% in the experimental group and 12.5% in the control group), and 37.5% (n=3) were the others. In this study, among the 08 participants, 62.5% (n=5) have completed secondary studies (25% in the experimental group and 37.5% in the control group), 25% (n=2) have completed graduation and further studies (they are in the experimental group), and 12.5% (n=1) have completed primary (in the control group).

In case of between group statistics, as the data are not normally distributed and the sample size is very small, researcher has applied Mann-Whitney 'U' test statistics. From the above mentioned chart, the calculated value of 'U' at 5% level of significance are less than critical value of 'U' and 'p' value of the test statistics is larger than the 0.05 which indicate that the null hypotheses may be accepted. We may come to conclusion that there is no significance difference in between

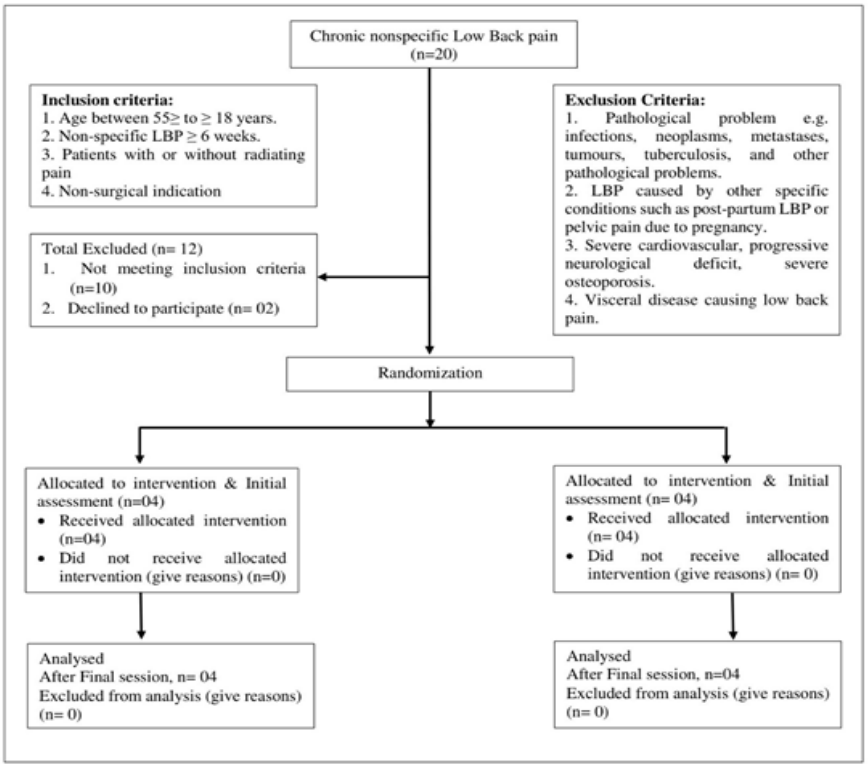

Figure 1: Strobe diagram

Table 1: Baseline Data

	Experimental Group		Control Group	
	Mean with SD	Min.-Max.	Mean with SD	Min.-Max.
Age (yrs.)	32 (±5.715)	25-38	50.25 (±5.5)	45-55
Height of the patient (inches)	65 (±6)	56-68	62.75 (±4.031)	57-66
Weight of the Patient (kg)	63.25 (±4.272)	58-68	64 (±4.83)	60-71
	Initial	Final	Initial	Final
ODI	43.50 (±17.464)	42.50 (±18.574)	61.50 (±26.096)	61.00 (±25.534)

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Table 2: Between group test statistics

	Mann-Whitney U	Asymp. Sig. (2-tailed)
Pain-post	5	0.386
Pain at night- post	5.5	0.468
Interfere with lifestyle- post	5	0.386
Pain severity at forward bending activity- post	7	0.773
Back Stiffness- post	8	1
Interfere with Walking- post	6	0.564
Hurt when Walking- post	4	0.248
Pain keep from standing still- post	5	0.386
Pain keep from twisting- post	7.5	0.885
Sit in upright hard chair- post	7.5	0.885
Sit in soft arm chair- post	6	0.564
Pain in lying- post	3	0.149
Pain limit normal lifestyle- post	6	0.564
Interfere with work- post	7.5	0.885
Change of workplace- post	8	1
Oswestry Disability Index- post	4	0.248

Table 3: Within group test statistics

	Conventional Group		Interventional Group	
	Z	Asymp. Sig. (2-tailed)	Z	Asymp. Sig. (2-tailed)
Pain-Day post - Pain-Day pre	-1.461[a]	0.144	-1.826[a]	0.068
Pain at night-Day post - Pain at night-Day 1	-1.069[a]	0.285	-1.342[a]	0.18
Interfere with lifestyle-Day post - Interfere with lifestyle-Day pre	.000[b]	1	-1.604[a]	0.109
Pain severity at forward bending activity-Day post - Pain severity at forward bending activity-Day pre	-.730[a]	0.465	-1.289[a]	0.197
Interfere with Walking-Day post - Interfere with Walking-Day pre	-1.826[a]	0.068	-1.095[a]	0.273
Hurt when Walking-Day post - Hurt when Walking-Day pre	-1.841[a]	0.066	-1.105[a]	0.269
Pain keep from standing still-Day post - Pain keep from standing still-Day pre	-1.826[a]	0.068	-1.841[a]	0.066
Pain keep from twisting-Day post - Pain keep from twisting-Initial-Day pre	-1.069[a]	0.285	-.184[a]	0.854
Sit in upright hard chair-Day post - Sit in upright hard chair--Day pre	-.730[a]	0.465	-.447[a]	0.655
Sit in soft arm chair-Day post - Sit in soft arm chair-Day pre	-.535[a]	0.593	-.736[b]	0.461
Pain in lying-Day post - Pain in lying-Day pre	-1.890[a]	0.059	-.743[b]	0.458
Pain limit normal lifestyle-Day post - Pain limit normal lifestyle-Day pre	-1.826[a]	0.068	-1.826[a]	0.068
Interfere with work-Day post - Interfere with work-Day pre	-1.289[a]	0.197	-1.826[a]	0.068
Change of workplace-Day post - Change of workplace-Day pre	.000[b]	1	.000[c]	1
a. Based on positive ranks.			a. Based on positive ranks.	
b. The sum of negative ranks equals the sum of positive ranks.			b. Based on negative ranks.	
c. Wilcoxon Signed Ranks Test.			c. The sum of negative ranks equals the sum of positive ranks.	
			d. Wilcoxon Signed Ranks Test	

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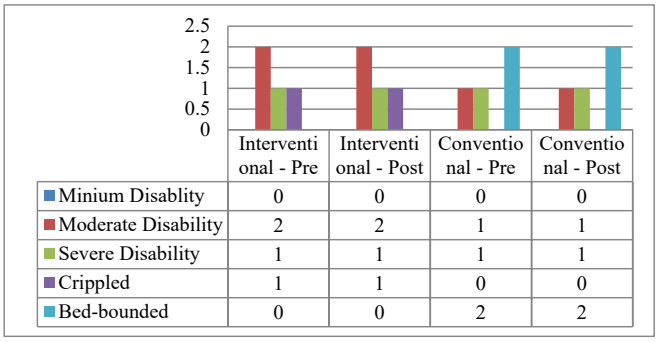

	Interventional - Pre	Interventional - Post	Conventional - Pre	Conventional - Post
Minium Disablity	0	0	0	0
Moderate Disability	2	2	1	1
Severe Disability	1	1	1	1
Crippled	1	1	0	0
Bed-bounded	0	0	2	2

Figure 2: Disability among the participants

group analysis for all traits of Dallas pain questionnaire and Oswestry disability questionnaire.

From the above mentioned chart, it has been revealed that there is no significance difference comparing the pre-post data within the groups at the 5% level of significance. That means, there is no significance improvement at within groups.

Discussion

The researcher tried to explore the effectiveness of the dynamic strengthening treatment approach for CLBP patients compared with conventional physiotherapy treatment. The different measurement tools were used to examine the hypothesis. A self-oriented structural questionnaire was used to find out the socio-demographical indicators. Different measures were recorded before and after treatment.

When it comes to between-group statistics, Mann-Whitney 'U' is the method of choice because the data is not normally distributed and the sample size is very small with a degree of freedom. From the data analysis, the observed value of "U" was less than the critical value of "U" and the level of significance was greater than p = > 0.05, which revealed that there was no significant difference in between-group analysis for all traits of the Dallas Pain Questionnaire and the Oswestry Disability Questionnaire.

In this study, 50% (n = 2) of the participants in the control group (n = 4) were bed-bound. On the other hand, in the experimental group (n = 4), 50% of the participants (n = 2) had moderate disability.

The Dallas pain scale was used to assess pain and discomfort in various working positions, such as general pain intensity, night pain intensity, pain interference with lifestyles, pain at forward-bending activity, back stiffness, interference with walking, pain with standing still, twisting activity, upright hard chair sitting, soft arm chair sitting, lying in bed, pain limiting normal life, pain interfering in work, and workplace change. Among these indicators, any one was not found statistically significant at a p value of 0.05% for the "Man Whitney "U" test. All of the domains did not show any significance statistically (p >.05).

In this study, the Oswestry disability index was used to evaluate the level of disability impacted by the CLBP subjects. According to the classification criteria determined by ODI, among the participants of the control group (n=4), 50% of the participants (n=2) had bed-bound disability. On the other hand, in the experimental group (n = 4), 50% of the participants (n = 2) had moderate disability. On the other hand, there were no participants with a bed-bound disability within the experimental group. Besides this, 50% of participants had severe disability in the initial assessment as well as in the final assessment. In this study, among the participants, the rate of mean disability was slightly higher within the control group. In the Oswestry low back pain disability questionnaire, both groups remained the same at p = 0.248%. From Wilcoxon Z statistics, it has been revealed that there is no significant difference when comparing the pre-post data within the groups at the 5% level of significance. That means there is no significant improvement within the groups.

The 10 sections of the ODI domains are: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life, and traveling, which give an outline of disability (in percentage; %).[19] It was found that the mean disability for the control group was at a moderate level (38%) on the initial day and was also at a moderate level (22.4%) on the final day. On the other hand, the mean disability for the experimental group was at a severe level (45%) at the initial day and a moderate level (27.20%) after 8 sessions of treatment, where they found two patients with bed-bound disability (82% and 90%) and one patient with a crippled level of disability (72%) at the very first session within the experimental group, whilst only one patient was found with crippled disability (78%) within the control group.

Limitation

As a pilot study, Data was collected from only one clinical setting i.e. CRP at Savar; it can be influencing to the result. Besides, the time was very limited for conducting, so less number of participants were taken by following criteria. Also, Mean age of the conventional group along with level of disability were comparatively higher than the interventional group.

Conclusion

The results of this study have shown that the effectiveness of Dynamic Strengthening Exercise along with conventional physiotherapy was the same in comparison to the conventional physiotherapy treatment for patients with CLBP. In these limited sessions, it has been found that the strengthening program could be started earlier but not for all kinds of patients. As the disability level has been improved by both groups, so it can be introduced earlier with the patients. A complete study should be done with a larger sample size

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to find out the effectiveness of the dynamic strengthening exercise along with the conventional physiotherapy treatment approach for CLBP patients.

Conflict of interest:

- ✓ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.
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