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RESEARCH ARTICLE
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EFFECTS OF 6-WEEKS PILATES EXERCISE VERSUS NEURAL DYNAMIC MOBILIZATION ON PAIN, FLEXIBILITY AND QUALITY OF LIFE IN PATIENTS WITH SCIATICA

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ABSTRACT

Background: Sciatica is a condition where the sciatic nerve, which travels from the lower back to the hips and down the legs, causes discomfort. Pilate's exercises emphasize on core strength and stability, controlled movements. Neural Dynamic Mobilization was a technique used in physical therapy to assess and treat conditions involving the nervous system by applying controlled movements to nerves. The objective of this study was to determine the effects of 6-weeks Pilates' exercises versus neural dynamic mobilization on pain, flexibility and quality of life in patients with sciatica.

Material & Methods: This Randomized Clinical trial was conducted on 20 patients aged 18-65 years diagnosed with sciatica. These patients were randomly divided into two groups using a non-probability convenient sampling method. Group A, received Pilates exercises while Group B received Neural Dynamic Mobilization along with conventional physiotherapy respectively. The treatment was administered for two consecutive days every week for a period of six weeks. Various outcome measures were utilized to evaluate the effectiveness of the treatments including the Back Pain Functional Scale, sit and reach test, and the SF-36 pre and post treatment. The data collected was analyzed using SPSS version 23.

Results: Within-group analysis was conducted using paired t-tests. In neural mobilization, the sit and reach test and Back Pain Functional Scale had a p-value of 0.00 respectively. In Pilates exercises, the sit and reach test had a p-value of 0.004, and the Back Pain Functional Scale had a p-value of 0.001. The paired t-tests for the SF-36 domains in the neural Neural Dynamic Mobilization group showed a ($p < 0.05$), suggesting a significant difference. However, in the Pilates Exercises group, the paired t-tests for the SF-36 domains resulted in a ($p > 0.05$), indicating no significant difference.

Conclusion: The study concluded that participants who underwent neural mobilization experienced greater improvement in pain, flexibility and Quality of life compared to those who practiced Pilates exercise in Sciatica.

Keywords: *Hip Joint, Pilates Based Exercises, flexibility, Sciatica.*

INTRODUCTION

The sciatic nerve (SN), the widest and extensive root of the sacral plexus, extends from the spinal roots L4 to S3 within the body. It is the most prominent and widest division of the sacral plexus, measuring 2 cm in width at its point of origin. Sciatica refers to a collection of symptoms characterized by pain that spreads, a tingling feeling, loss of sensation, and reduced strength along the path of the sciatic nerve (1). According to various studies, the prevalence of sciatica ranged from 1% to 40% in the general population. The frequency at which sciatica occurred is reported to range significantly (1.2% to 43%) (2).

The primary indication of sciatica was leg pain originating from the lower back and extending down the leg in a specific dermatome pattern, reaching below the knee and into the foot and toes. Individuals might present with sensory issues, restricted bending of the lower back, abnormal walking posture, and one-sided contractions of the paraspinal muscles (3). The different causes of sciatica included a protruding disc between the vertebrae (specifically in the posterior-lateral area), narrowing of the spinal canal in the lower back, spondylolisthesis, tumors in the spine, physical injuries, piriformis syndrome, cysts in the hip or lower back, abnormal blood vessel formation, or an aneurysm within the pelvis, as well as conditions like obesity linked to osteoarthritis, osteoporosis, and rheumatoid arthritis (4).

It has been emphasized that the efficacy of different treatments differ depending on the specific circumstances of each individual and the root cause of sciatica. While the conservative measures have often provided significant relief, some cases may require additional interventions, such as medication or, in severe cases, surgical options (5).

Neural dynamic mobilization improved neural flexibility that lead to better overall flexibility and movement in the affected areas. Basic aim of NDM was to alleviate nerve compression and irritation (6).Sciatica has significantly impacted a person's quality of life, causing pain, limitation in daily activities and emotional distress. Neural dynamic mobilization had a positive impact on patient's overall well-being by restoring mobility, function and engage them in their regular activities with less discomfort (7).

Pilate's exercises, on the other hand, has enhanced posture, flexibility, core muscle strength, and overall conditioning. By engaging in Pilates exercises, patients have strengthen the deep abdominal muscles, reduced compression and strain on the back joints. Notably, Pilates carried a significantly lower risk of injury compared to more intense forms of exercise (8).

The rationale of the study was to offer valuable insights to physiotherapists when treating patients, enabling them to achieve maximum benefits and assist in the restoration of their normal lifestyle. These techniques were highly efficient, time-saving, yield remarkable results, and were cost-effective. Moreover, the exercises proved to be easily adapted for use in clinics or incorporated into a home fitness program.

MATERIALS AND METHODS

Study design, setting & duration:

This was a Randomized Clinical trial. The setting was Service Hospital Lahore, Pakistan and the duration of the research was 6 months after approval of synopsis. Patients diagnosed with sciatica were screened according to inclusion and exclusion criteria. Informed consent was taken from the participants.

Population & sampling:

Both male and female participants aged from 18 to 65 years with first episode of low back pain in the last 3 months with radiating pain distal to knee and ankle in one extremity, SLR in 30 ° and 70 °of hip flexion and lower extremity symptoms such as tingling, dull aches or burning sensation were included in the study (9). While those with significant musculoskeletal deformity, prior history of knee, back surgery, cardiovascular issues, postural hypotension, foot ulceration or skin problems were excluded from the study (10). Sample size was calculated by using Epitool software patients were recruited by assuming the attrition rate 10% and sample size 28 was measured with margin of error 5% was 1.96 and 80% power by using a Variable range of motion/flexibility. Non probability convenience sampling technique was used.

Equipment, procedure, intervention, and follow-up:

Patients were randomly allocated into two groups by sealed opaque envelope method. It was Single Blinded Study. The assessor was blinded. There were two groups. Baseline measurement of all groups were taken by using back pain functional questionnaire to access pain, Sit and reach test for flexibility and SF- 36 questionnaire use to check quality of life. The participants were randomly allocated to one of the two groups: Pilates mat exercise with conventional physical therapy was given to group one, including a fundamental warm-up. These movements was performed 30 minutes session was given on a daily basis for twice consecutive days, in a week for 6-weeks (11) Pre-assessment was done before intervention and post treatment assessment was done by using these outcome measured after 6-weeks of interventions: Back Pain Functional scale, sit and reach test and SF-36 Questionnaire was used as outcome measure tools.

Neural dynamic mobilization techniques with conventional physical therapy was applied to patient in this group (12). In this group 10 subjects were treated with Neural Mobilization Techniques. Subjects were in sitting position. The procedure involved a sequence of movements involving bending the hip, knee, and ankle joints while extending the hip, knee, and ankle joints, while keeping the neck and upper back in a curved position. This set of movements was repeated for a duration of 15 minutes, specifically targeting the stronger leg. This session was conducted every twice consecutive days within a week, over a period of six weeks. A pre-assessment was conducted, followed by a post-treatment assessment using specific outcome measured after a six-week period of interventions. The outcome measure tools employed included the Back Pain Functional scale, the sit and reach test, and the SF-36 Questionnaire (13).

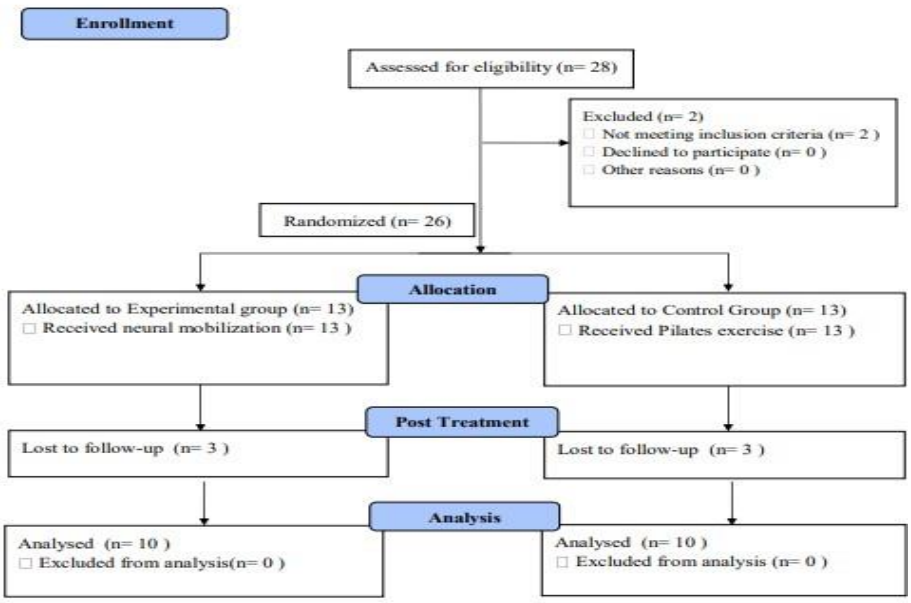

Figure 1 CONSORT Diagram

RESULTS:

In this study, 20 patients with sciatica were divided into two groups: group A (neural mobilization group) and group B (Pilates exercise group), each consisting of 10 patients.

Distribution of cases:

The mean age of group A was 32.50 ± 3.27, while the mean age of group B was 34.30 ± 5.2. The mean BMI of group A was 26.27 ± 1.29, and for group B it was 25.80 ± 1.81. Regarding the gender distribution, in group A, 70% of the participants were female and 30% were male. In group B, 60% were female and 40% were male.

Within-group analysis:

Within-group analysis was conducted using paired t-tests. For group A, the sit and reach test had a p-value of 0.00, indicating a significant difference. The back pain functional scale also showed a significant difference with a p-value of 0.000. In group B, the sit and reach test had a p-value of 0.004, and the back pain functional scale had a p-value of 0.001. The paired t-tests for the SF-36 domains in the neural mobilization group showed a p-value less than 0.05, suggesting a significant difference. However, in the Pilates exercise group, the paired t-tests for the SF-36 domains resulted in a p-value greater than 0.05, indicating no significant difference.

Between-group analysis:

This was performed using independent t-tests. The p-values for age, BMI, pre sit and reach test, and pre back pain functional scale were all greater than 0.05, indicated no significant difference between the groups. However, the p-values for post sit and reach test and post back pain functional scale were less than 0.05, suggesting a significant difference between the groups. The independent t-tests for the pre and post SF-36 domains showed a p-value greater than 0.05, indicating no significant difference between the groups.

DISCUSSION:

A study was conducted to compare the effectiveness of neural mobilization and Pilates exercise in improving flexibility, pain, and quality of life. The study observed a significant difference in flexibility and pain between the two groups. The results of the current investigation were congruent with those of a study conducted in 2018 by Srishti Sanat Sharma, which sought to determine how NDM affected pain and function in people with lumbo-sacral radiculopathy. According to the findings, there was a substantial difference between pain during activity and pain at rest in each group. However, only Group B showed a noticeable variation in function. Along with functional differences, there was a substantial difference in pain during activity between Group A and Group B. NDM significantly reduced pain during activity and improved function as compared to traditional therapy. However, there was no appreciable reduction in discomfort while at rest (14). The current study found that neural mobilization, a technique used to treat patients with lower back pain (LBP), was effective in reducing pain and improving functionality and SLRT (Straight Leg Raise Test) performance, which was supported by an earlier study conducted by Kurt and Vedat in 2020. Gait (walking pattern) and static balance characteristics, however, were unaffected. The findings imply that neural mobilization can be utilized as a self-practice complement to traditional LBP treatment regimens. This study was conducted to compare the effects of Pilates exercise with those of other types of exercise on pain and disability in people with chronic non-specific low back pain (CNSLBP), the results of a study conducted by Chi Ming Wong in 2022 do not correspond to those of the current study. We examined eleven RCTs (randomized controlled trials). Although the certainty of the evidence is low, it appears that PE is more beneficial than general exercise (GE) at reducing pain. However, when comparing the efficiency of PE with dynamic stabilization exercises (DSE) for pain relief and when comparing PE with specific stabilizing exercises (SSE) for both pain and disability, the certainty of the evidence was

very low. The analysis the research did not uncover compelling data in support of any specific exercise strategy for treating CNSLBP (15).

CONCLUSION:

The study concluded that participants who underwent neural mobilization experienced greater improvements in pain, flexibility and Quality of life compared to those who practiced Pilates exercise in Sciatica.

LIMITATIONS:

The major limitation of this study was limited funding that restricted the scale and duration of study, limiting the ability to conduct large-scale, long-term investigations. Moreover, Patient adherence to the protocol was difficult due to which there was drop out in the study.

RECOMMENDATIONS:

More studies were with collaboration among multiple institutions will allow for a larger sample size, increased variability in practice settings, and improved external validity. In addition, further researches should investigate the effects of NMD and Pilates exercises on different parameters such as ROM, Balance, trunk stability etc.

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REFERENCES:

1. Shevlin S, Johnston D, Turbitt L. The sciatic nerve block. BJA education. 2020;20(9):312.
2. Fairag M, Kurdi R, Alkathiry A, Alghamdi N, Alshehri R, Alturkistany FO, et al. Risk factors, prevention, and primary and secondary management of sciatica: an updated overview. Cureus. 2022;14(11).
3. Naber WJ, Netzloff CL, Bakshi RR. Atypical Cause for Back Pain and Sciatica in a 35year-old Female with Fibromyalgia. American Journal of Physical Medicine & Rehabilitation. 2023:10.1097.
4. Hochschuler S. Sciatica Causes. Spine. 2019.
6. Kayiran T, Turhan B. The effectiveness of neural mobilization in addition to conservative physiotherapy on cervical posture, pain and functionality in patients with cervical disc herniation. Advances in Rehabilitation. 2021;35(3):8-16.
7. López LL, Torres JR, Rubio AO, Sánchez IT, Martos IC, Valenza MC. Effects of neurodynamic treatment on hamstrings flexibility: A systematic review and meta-analysis. Physical Therapy in Sport. 2019;40:244-50.
8. Yang C-Y, Tsai Y-A, Wu P-K, Ho S-Y, Chou C-Y, Huang S-F. Pilates-based core exercise improves health-related quality of life in people living with chronic low back pain: A pilot study. Journal of bodywork and movement therapies. 2021;27:294-9.
9. Gaskell L, Williams AE. A qualitative study of the experiences and perceptions of adults with chronic musculoskeletal conditions following a 12-week Pilates exercise programme. Musculoskeletal care. 2019;17(1):54-62.
10. Alshami AM, Alshammari TK, AlMuhaish MI, Hegazi TM, Tamal M, Abdulla FA. Sciatic nerve excursion during neural mobilization with ankle movement using dynamic ultrasound imaging: a cross-sectional study. Journal of Ultrasound. 2022;25(2):241-9.
11. Vijayalakshmi R, Rajamani L, Kanthanathan S, Aseer A, Ramachandran S. Effects of neural mobilization on sciatic nerve excur-sion, symptoms, and regional function in individuals with nerve-related low back pain. Physiother Quart. 2022;30(3):27-33.

12. Shah C, Amin H, Siyani M. Effect of Nordic eccentric hamstring stretching exercise and sciatic nerve slider technique of neural mobilization in college students: A Comperative study. 2019.
13. Sharma SS, Sheth MS. Effect of neurodynamic mobilization on pain and function in subjects with lumbo-sacral radiculopathy. Med Sci. 2018;7(1):5-8.
14. Wong CM, Rugg B, Geere JA. The effects of Pilates exercise in comparison to other forms of exercise on pain and disability in individuals with chronic non-specific low back pain: A systematic review with meta-analysis. Musculoskeletal Care. 2023;21(1):78-96.
15. Whalen WM, Hawk C, Farabaugh RJ, Daniels CJ, Taylor DN, Anderson KR, et al. Best Practices for Chiropractic Management of Adult Patients With Mechanical Low Back Pain: A Clinical Practice Guideline for Chiropractors in the United States. Journal of Manipulative and Physiological Therapeutics. 2023.

	Treatment Groups	Mean	St. Deviation
Age	Neural Mobilization group N= 10	32.50	3.27
Age	Pilates Exercise Group N= 10	34.30	5.20
BMI	Neural Mobilization group N= 10	26.27	1.29
BMI	Pilates Exercise Group N= 10	25.80	1.81

Table 1 Descriptive statistics of Age and BMI

Variables	Statistics	Sig.
Age	.965	.639
BMI	.978	.905
Pre sit and reach test	.960	.536
Post sit and reach test	.927	.133
Pre back pain functional scale	.935	.194
Post back pain functional scale	.941	.253
Pre SF36 physical functioning	.85	.189
Pre SF36 limitations due to physical health	.496	.074
Pre SF36 limitations due to emotional problems	.628	.370
Pre SF36 Energy/Fatigue	.888	.149
Pre SF36 emotional Well being	.923	.111
Pre SF36 social functioning	.881	.089
Pre SF36 pain	.958	.511
Pre SF36 general health	.966	.665
Post SF36 physical functioning	.937	.214
Post SF36 limitations due to physical health	.780	.072
Post SF36 limitations due to emotional problems	.696	.096
Post SF36 Energy/fatigue	.942	.260
Post SF36 emotional wellbeing	.960	.553
Post SF36 social functioning	.873	.089
Post SF36 pain	.939	.226
Post SF36 general health	.907	.065

Table 2: Test of Normality

Treatment Groups	Variables	Mean	St. Deviation	p-value
Neural Mobilization Group	Pre sit and reach test Post sit and reach test	24.1 29.0	1.66 1.94	0.000
Pilates Exercise Group	Pre sit and reach test Post sit and reach test	23.5 26.8	1.58 1.81	0.004
Neural Mobilization Group	Pre BPFS Post BPFS	36.1 40.9	4.12 3.92	0.000
Pilates Exercise Group	Pre BPFS Post BPFS	34.7 36.6	4.01 30th.97	0.0019

Table 3: Paired t-test of Sit and Reach test and Back Pain Functional Scale

Variables	Mean	St. Deviation	p-value
Pre SF-36 Physical Functioning Post SF-36 Physical Functioning	26.50 46.00	25.50 22.08	0.011
Pre SF-36 limitation due to physical health Post SF-36 limitation due to physical health	12.50 56.25	31.73 41.77	0.006
Pre SF-36 limitation due to emotional problem Post SF-36 limitation due to emotional problem	23.33 60.00	31.62 51.64	0.040
Pre SF-36 energy/fatigue post SF-36 energy/fatigue	42.00 53.00	20.16 17.02	0.002
Pre SF-36 Emotional well being Post SF-36 Emotional well being	42.80 50.00	17.59 14.99	0.014
Pre SF-36 Social functioning Post SF-36 Social functioning	30.00 46.25	19.72 17.72	0.001
Pre SF-36 Pain Post SF-36 Pain	30.25 47.00	18.98 15.58	0.00
Pre SF-36 General health Post SF-36 General health	35.00 46.00	18.10 16.12	0.002

Table 4: Paired t-test of SF36 Pre and Post Domains in Neural Mobilization group

Variables	Mean	St. Deviation	p-value
Pre SF-36 Physical Functioning Post SF-36 Physical Functioning	22.00 25.00	25.94 20.13	0.58
Pre SF-36 limitation due to physical health Post SF-36 limitation due to physical health	17.50 40.00	37.36 44.41	0.25
Pre SF-36 post limitation due to emotional problem post limitation due to emotional problem	20.00 40.00	42.16 46.61	0.35
Pre SF-36 energy/fatigue Post SF-36 energy/fatigue	33.00 41.00	19.60 17.60	0.006
Pre SF-36 Emotional well being Post SF-36 Emotional well being	32.80 36.00	16.52 11.47	0.300
Pre SF-36 social functioning Post SF-36 social functioning	33.75 38.75	19.58 13.75	0.104
Pre SF-36 Pain Post SF-36 Pain	33.00 40.75	19.53 9.13	0.173
Pre General health Post SF-36 General health	33.00 37.00	18.13 12.29	0.196

Table 5: Paired t-test of SF36 Pre and Post Domains in Pilates Exercise group

Variables	Mean Difference	Std. Deviation	p-value
Pre back pain functional scale Post back pain functional scale	1.4000 4.3000	1.8165 1.7679	0.451 0.026

Table 6: Independent t-test for Back Pain Functional Scale:

Variables	**Mean Difference**	**Std. Deviation**	**p-value**
Pre Sit and reach test Post Sit and reach test	0.6000 2.2000	0.72572 0.84063	0.419 0.017

Table 7: Independent t-test for Sit and Reach Test:

Variables	Mean	Std. Deviation	p-value
Pre SF36 Physical Functioning Post SF36 physical Functioning	4.5000 21.000	11.505 9.452	0.700 0.039
Pre SF36 Limitations due to physical health Post SF36 Limitations due to physical health	5.000 16.250	15.501 19.280	0.751 0.410
Pre SF36 Limitations due to Emotional problems Post SF36 Limitations due to Emotional problems	3.333 20.000	16.667 21.999	0.844 0.375
Pre SF36 Energy/Fatigue Post SF36 Energy/Fatigue	9.000 12.000	8.894 7.746	0.325 0.139
Pre SF36 Emotional Well Being Post SF36 Emotional Well Being	10.000 14.000	7.633 5.970	0.207 0.031
Pre SF36 Social Functioning Post SF36 Social Functioning	3.750 7.500	8.790 7.096	0.675 0.304
Pre SF36 Pain Post SF36 Pain	2.750 6.250	8.614 5.711	0.753 0.288
Pre SF36 General Health Post SF36 General Health	2.000 9.000	8.103 6.412	0.808 0.177

Table 8: Independent t-test of pre and post SF36 Domains: