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EFFECT OF STATIC STRETCHING OF HAMSTRING ON NON-SPECIFIC LOW BACK PAIN

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ABSTRACT

Background of the Study: To determine the effect of static stretching of hamstring muscle on the non-specific low back pain.

Methodology: A Quasi-Experimental study was conducted in Rabia Moon Institute of Neurology which total 30 participants were included through non-probability purposive sampling. Thirty participants were selected who fulfilled our inclusion criteria, they were divided into two groups; group A or treatment group received conventional physiotherapy treatment as well a static stretching exercise protocol for 5 days. Group B or control group received conventional physiotherapy treatment only. VAS (Visual analog scale) and Oswestry Disability questionnaire, SFGD (Standing Finger to ground Distance,) PSLR (passive straight leg raise) for both legs were measured pre- and post-treatment.

Result*:* A total of 30 patients aged 20-55 were included in the study. Mean age of the participants was found to be 37.88 years. The difference in means of all the assessment parameters pre and post-treatment for both groups were analyzed through paired t-test. There was a significant improvement in VAS, SFGD, Passive Straight leg Raise PSLR (right leg), PSLR (left leg) and level of disability pre- and post-treatment in the treatment group.

Conclusion: This present study concluded that static stretching of hamstrings is effective in decreasing non-specific low back pain.

Keywords: *Oswestry disability index questionnaire, nonspecific back pain, static hamstrings stretching, altered lumbo-pelvic rhythm, posture, passive straight leg raise*

Introduction

Almost everyone will have low back pain (LBP) at some point in their lives. The disorder, which has an impact on daily functioning, can be divided into two categories: non-specific low back pain and specific low back pain. In 1990, 377.5 million people worldwide have LBP at any given moment; by 2017, this number had risen to 577.0 million. Females had a higher age-standardized prevalence of LBP than males did[2].Ethnic, community and financial homogeneity is not a feature of an underdeveloped country like Pakistan. The genetic diversity, differences in social makeup and difference in economic conditions between privileged and underprivileged nations that may trigger the difference in prevalence of low back pain is debatable In general; the incidence of 8–30 days of (moderate) nonspecific low back pain in a year reported to be 13.2%[4]. There is a high

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prevalence of self-reported non-specific low-back pain in urban compared to rural populations, which is 39.3% and 31.3% respectively, according to a cross-sectional study done in 2018 and 2019 respectively to find out the different risk factors for developing mechanical chronic LBP in the rural and urban societies of Pakistan[5,6]. Muscle tightness or stiffness below the costal margin up to the top of the inferior gluteal folds is referred to as low back discomfort. It may or may not be accompanied by sciatica or leg discomfort. Non-specific low back pain is defined as symptoms without a clear-cut explanation, also known as low back pain with no recognized aetiology. A specific somatic cause is identified in only 15% to 20% of patients, only 15% to 20% of patients have a particular somatic cause identified; non-specific LBP is diagnosed by ruling out all diseases, and it refers to a symptom or, at its worst, a syndrome rather than a diagnosis. 90% of people with low back pain have non-specific causes for their symptoms[10]. Numerous studies have shown a connection between low back discomfort and the flexibility of the hamstring muscles. Except for the short head of the bicep femoris, which attaches distally below the knee to the medial surface of the proximal tibia (semimembranosus and semitendinosus) and the lateral side of the head of the fibula, hamstring muscles attach proximally to the ischial tuberosity (biceps femoris). It is a knee flexor and a hip extensor muscle. The erector spinae, which runs close to the spine and aids in posture, core stabilization, and spinal movement, are the muscles that connect the top section of the pelvis to the spine. Hamstrings that are too tight start to restrict pelvic movement. Therefore, if the Therefore, restricted pelvic movement will result in tense back muscles, which may cause low back pain[13]. Decreased hamstring extensibility causes decrease in lumbar lordotic curve due to increased posterior pelvic tilt and therefore causes low back pain, it also reduces pelvic mobility and distorted lumbo-pelvic rhythm. It has been proposed that a decrease in flexibility in hamstrings will put undue pressure on lumber extensor muscles so as to maintain the pelvic motion, which will eventually lead to the development of low back pain. Increasing hamstring flexibility will increase the movement of the pelvis, which will in turn seize tension off low back; serving to decrease pain in back[15].Lumbo-pelvic rhythm is required for the motion of bending over to touch one's toes with straight knees. Lumbar flexion and anterior pelvic tilting at the hip joint make up the first portion of the forward bending. A posterior pelvic tilt at the hip joint, followed by lumbar spine extension, simulates a restoration to the upright position. The first movement of the pelvis delays lumbar extension until the trunk has been elevated high enough to shorten the moment arm, which lessens the strain on the erector spinae[16]. A person may lose rhythm and be unable to touch her toes if there is a restriction in movement at the hip or lumbar spine. Hypermobility of one section due to motion restriction[17].Decreased extensibility of hamstring is known as both standing finger to ground distance of greater than 0 cm and a supine hip flexion leg lift angle of $<80^{o}$[18]. pSLR is used to measure hamstring flexibility. pSLR, is a standard test and has been demonstrated to have a reliability of 0.97[19]. Tight hamstring is a common finding in people with low back pain. Literature lacks the evidence whether static stretching o hamstring done in order to improve hamstring length has a positive impact on reducing low back pain or not. Since the pelvis serves as the foundation of the spine and the hamstrings have their origin in the pelvis, tension in this muscle may affect how the pelvis sits. As a result, low back discomfort may develop if the hamstrings are too weak or rigid to maintain pelvic control. This study focused on whether static hamstring stretching helps people with low back pain. The study was aimed to find out the effect of static stretching of hamstrings on non-specific low back pain.

Methodology

A Quasi-Experimental study was conducted in Rabia Moon Institute of Neurology where total 30 participants were included through non-probability purposive sampling[20]. All participants were divided into two groups. Group A consist of 15 participants in which we gave conventional physiotherapy treatment along with static hamstring stretching on other hand group B contained participants who were given a conventional physical therapy treatment only for low back pain. Each participant of both groups performed for 5 days a week for 4 weeks.

Pre and post assessment of each participant in both groups were done through using inclinometer, Visual analog scale (VAS), Oswestry Disability questionnaire (OSI) and Standing Finger to ground Distance (SFGD).The subject was positioned supine on a plinth with a pillow under their head, their arms at their sides, their trunk in neutral posture with no lateral rotation or flexion, and their hips in a neutral position. Then, the test leg's tibial tuberosity of the participant was immediately marked with an adhesive marker. When the participant initially reported feeling either stretched out or uncomfortable, that was used to establish the PSLR movement's end point.For SFGD test the participants were asked to stand behind a line with their feet shoulder width a part in order to measure standing finger to ground distance. The subject was then asked to bend forward to touch the ground with fingers keeping the knee extended. The researcher measured the distance from the tip of the subject's finger and the ground with a handheld ruler. Three readings were recorded to allow an average of the readings to be calculated.

Scoring Method for Oswestry Disability Questionnaire:

For each subdivision the total possible score is 5: if the first statement is marked the section score = 0; if the last statement is marked, it = 5. If all 10 sections are filled the score is calculated as follows:

1. Example: 16 (total scored)
2. 50 (total possible score) x 100 = 32%
3. If one section is missed or not relevant the score is calculated:

16 (total scored)

45 (total possible score) x 100 = 35.5%

Least detectable change (90% confidence): 10% points (change of less than this may be attributable to error in the measurement). SPSS version 20.0 was used for data analysis. All continuous variables were reported as Mean and Standard Deviation. Normality of data was checked by using Kolmogorov Smirnov test. The data was found to be normally distributed. To know the significance between two groups independent sample t test was applied. Pre & Post comparison was checked through Paired sample t test. P-value ≤ 0.05 considered to be statistically significant.

Stretching Protocol

The active static stretching exercises were performed in the following order with holding duration of 30 seconds. 3 sets of each exercise were performed with 30 seconds of rest between sets. The exercises were performed 5 days for 4 week.

1. Unilateral standing hamstring stretch (performed on both legs);
2. Bilateral stretching while sitting in a stool/chair;
3. Unilateral stretching while lying supine (performed on both legs);
4. Bilateral standing hamstring stretch[21].

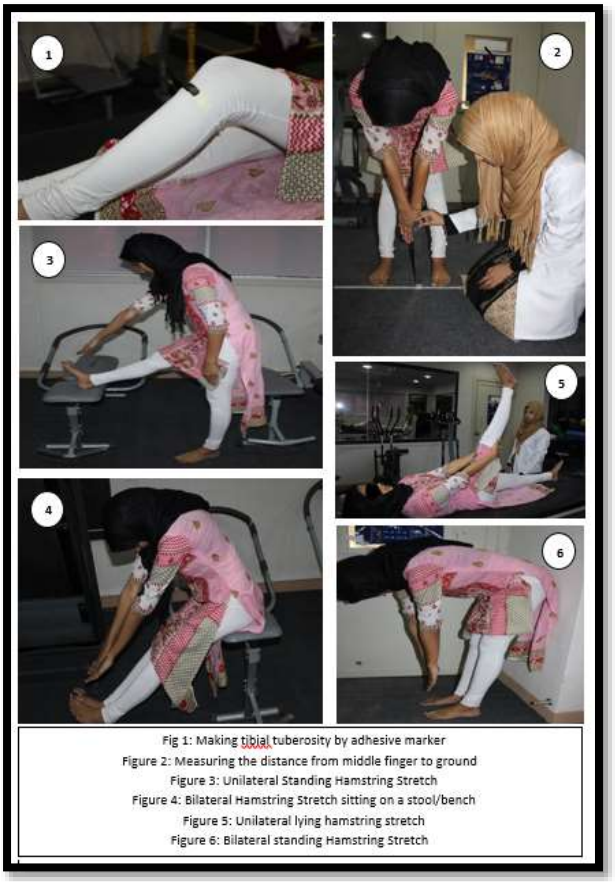

Fig 1: Making tibial tuberosity by adhesive marker
Figure 2: Measuring the distance from middle finger to ground
Figure 3: Unilateral Standing Hamstring Stretch
Figure 4: Bilateral Hamstring Stretch sitting on a stool/bench
Figure 5: Unilateral lying hamstring stretch
Figure 6: Bilateral standing Hamstring Stretch

Inclusion Criteria

Housewives aged between 20 to 55 years with non-specific low back pain and having Passive Straight Leg Raise (PSLR) angle < 80 degrees and Standing Finger to Ground Distance (SFGD) greater than 0 cm were included in present study.

Exclusion Criteria

Participants having non-mechanical pain (unrelated to time or activity), having any previous history of carcinoma, steroids, prolapsed intervertebral disc (PIVD), structural Spinal deformity, wide spread neurological symptoms, radiating pain to foot or toes, numbness and paresthesia along the nerve distribution were excluded from the study.

Operational Definitions

Non-Specific Low Back Pain: Non-Specific Low Back Pain (NSLBP) is Low back pain general known as muscular tension or stiffness localized lower than the costal margin and on top of the inferior gluteal folds defined as symptoms which are present without an obvious and a specific cause that is low back pain of unidentified source.

Static Stretching: Static stretching is a type of stretching method in which in which the muscle is gradually stretched out to tolerance (comfortable stretch, short of pain) and the position held with the muscle in this maximum tolerated length.

Oswestry Disability Index: The Oswestry Disability Index is an index derived from the Oswestry Low Back Pain Questionnaire used by clinicians and researchers to quantify disability for low back pain.

Results

A total of 30 participants aged 20-55 were included in the study. Mean age of the participants was found to be 37.88 years. Pre and post assessment of control and treatment group were separately analyzed. In treatment group, VAS pre score was 7.56 + 1.365 and VAS post score was 2.38 + 1.962 with significant P-value 0.012. Passive Straight Leg Raise (SLR) Right leg was found to be 57.56+ 11.622 degrees in pre session and 72.81+ 11.250 degrees in post session with significant P-value of 0.002. Passive SLR Left leg was observed to be 58.75 + 10.878 degrees in pre assessment and 72.50 + 11.255 degrees in post assessment with not significant p-value of 0.067. Standing finger to ground distance was found to be 8.70 + 5.631 cm in pre-treatment and 1.38 + 2.247 cm in post-treatment with significant p-value of 0.001. Disability index was pre assessed as 66.38+ 18.290 and post-treatment was 34.13+ 12.722 with significant p-value of 0.008, see Table 1.

	VAS Score	Passive SLR Right leg in degree	Passive SLR Left leg in degree	Standing finger to ground distance in cm	Disability index score (%)
Pre-Treatment	7.56±1.365	57.56± 11.622	58.75±10.878	8.70±5.631	66.38,± 18.290
Post-Treatment	2.38,±1.962	72.81,± 11.250	72.50,±11.255	1.38±2.247	34.13,± 12.722
P-value	0.012	0.002	0.067	0.001	0.008

Table1: Pre and Post Treatment Comparison of Treatment Group Treatment Group Comparison

In control group, VAS pre score was 7.40 + 0.986 and VAS post score was 6.20 +1.146 with significant P-value 0.031. Passive SLR Right leg was found to be 62.67 +6.510 degrees in pre session and 64.67 + 6.114 degrees in post session with significant P-value of 0.001. Passive SLR Left leg was observed 67.67 +7.988 degrees in pre assessment and 70.33 +1.791degrees in post assessment with significant p-value of 0.001. Standing finger to ground distance was found 6.40 +1.957 cm in pre-treatment and 6.0 +2.204 cm in post-treatment with significant p-value of 0.005. Disability index was pre assessed as 64.0 +17.452 and post-treatment was 61.07 + 14.2 with significant p-value of 0.001, see Table 2.

	VAS Score	Passive SLR Right leg in degree	Passive SLR Left leg in degree	Standing finger to ground distance in cm	Disability index score (%)
Pre-Treatment	7.40, ± 0.986	62.67, ±6.510	67.67, ±7.988	6.40, ±1.957	64, ±17.452
Post-Treatment	6.20, ±1.146	64.67, ± 6.114	70.33, ±1.791	6, ±2.204	61.07, ± 14.2
P-value	0.031	0.001	0.001	0.005	0.001

Table 2: Pre and Post treatment comparison of Control group Control Group Comparison

Discussion

This study sought to determine the impact of static hamstring stretching on generalized low back pain. This study was quantitative and focused on women. Standing finger to ground distance of more than 0 cm and PSLR of less than 80° are both indicators of reduced hamstring flexibility**. T**his study demonstrated that static hamstring stretching raised PSLR and dramatically decreased SFGD, indicating increased hamstring flexibility. The VAS scores and degree of disability had also decreased, according to this study. Hamstring extensibility has been suggested as a risk factor for accidents, non-specific low back pain, and alterations in lumbo-pelvic rhythm, making it an essential variable. Hamstring flexibility is diminished in low back pain patients[22]. Hamstring tightness could be one of the reasons of the Low back pain can become chronic if hamstring tightness is not treated, and it may be one of the causes of developing low back pain. The Oswestry Disability Questionnaire was utilized to measure functional disability caused by low back pain, while a visual analogue scale was used to measure pain in the current investigation. The visual analogue scale is a trustworthy instrument for both acute and chronic pain. (Hall, 2002) According

to a pain rating scale, our study indicated that the treatment group that followed a stretching programme for five days experienced a considerable reduction in pain. It's possible that the combined effects of conventional physiotherapy treatment and the stretching procedure used in this study contributed to the intra-group reduction in VAS scores. 48 patients with chronic low back pain were randomly assigned to three groups by Marchand et al (TENS, placebo and control). They discovered a 43% reduction in pain intensity on the VAS in the TENS group and a 17% reduction in the placebo group when they compared TENS with placebo. These observed results are consistent with those of Pratik A. et al., who found that Mulligan's two-legged rotation technique and short wave diathermy had a combined impact to reduce pain as measured by the VAS scale[23,24]. Same observations were noted in present study as lowering the disability index by 32%, Oswestry Disability scores also demonstrate a significant decline in the degree of disability in present study. In a study, Pratik A. et al. found that the Modified Oswestry Disability Questionnaire's Disability scores had significantly decreased, indicating a decrease in the severity of the disability. Additionally, our study showed an increase in the standing finger-to-ground distance. All of the individuals had a finger-to-ground distance of more than 0 cm at the outset. Their standing finger to ground distance dramatically decreased after following the stretching regimen for 5 days, improving hamstring flexibility[25]. Our study also demonstrated improvements in standing finger to ground distance. At the beginning all the participants had a finger to ground distance greater than 0 cm. After performing stretching protocol for 5days their standing finger to ground distance significantly decreased which shows improvements in hamstring flexibility. According to Sarah Bellew's research there is a correlation between less pelvic rotation and a smaller range of forward bending and less hamstring flexibility. According to that study, forward bending is a motion used in daily tasks like lifting something up off the ground. Enhancing hamstring flexibility in people with low back pain may enable more pelvic motion around the hips during forward bending, which relieves pressure on the spine's and legs' posterior components thus reduce pain[26]. Farooqi S. et al. et al. conducted research on university students with non-specific low back pain to test hamstring flexibility retention with sit-and-reach boxes. The study's findings revealed that after a sit and reach box training regimen of four weeks, most candidates' flexibility significantly improved on their fifth attempt. After a stretching session, flexibility gains were maintained for two weeks[27]. Flexibility improvements are kept for at least two weeks. Additionally, it gave the idea that gaining a significant increase in flexibility only required 2 sets, each consisting of 3 repeats of the sit-and-reach test[27, 28].

Conclusion

The present study concluded that static stretching of hamstring is effective in reducing non-specific low back pain and increasing the extensibility of hamstring among housewives.

Limitations of the study

1. The study was single centered.
2. Small sample size.
3. Only females were included.

Strength of the study

1. Generalized to single muscle work
2. Limited work done locally as far as our best knowledge.

Recommendations

1. Large sample size with both genders.
2. Can be multi centered.

AUTHORS' CONTRIBUTION:
The following authors have made substantial contributions to the manuscript as under:
Conception or Design: *Syeda Anum Riaz, Muhammad Usman*
Acquisition, Analysis or Interpretation of Data: *Muhammad Usman*
Manuscript Writing & Approval: *Syeda Anum Riaz*
All authors acknowledge their accountability for all facets of the research, ensuring that any concerns regarding the accuracy or integrity of the work are duly investigated and resolved.

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