FREQUENCY OF CALF AND HAMSTRING TIGHTNESS AND ITS ASSOCIATION WITH FUNCTIONAL DISABILITY IN PATIENTS WITH LUMBAR RADICULOPATHY

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Highlights:

- The study was conducted among 149 patients at the Mansoorah Hospital and Nawaz Sharif Social Security Hospital in Lahore on conveniently sampled patients.
- Inclusion criteria were an age limit of 20-50 years, both genders, patients with lumbar radiculopathy, and chronic low back pain. An active knee extension test was performed to check the hamstring muscle tightness, and a calf muscle tightness test was performed to evaluate the tightness of the calf muscle.
- Hamstring tightness was not associated with the functional disability of patients (p=0.901), but calf muscle tightness had a significant association with the functional disability of patients (p=0.008).

Abstract

Background: Radicular pain is primarily due to the vertebra's impingement, inflammation, or nerve compression. It refers to a pathological process that involves the lumbar roots that cause symptoms of radicular pain in the lower extremity of the human body. **Objective:** To determine the frequency of calf and hamstring tightness and its association with functional disability in patients with lumbar radiculopathy **Methodology:** The study was conducted among 149 patients at the Mansoorah Hospital and Nawaz Sharif Social Security Hospital in Lahore on conveniently sampled patients. Inclusion criteria were an age limit of 20-50 years, both genders, patients with lumbar radiculopathy, and chronic low back pain. An active knee extension test was performed to check the hamstring muscle tightness, and a calf muscle tightness test was performed to evaluate the tightness of the calf muscle. **Results:** Mean age of the sample was 38.36± 12.74 years. Out of the total, 44.3% of participants had hamstring muscle tightness, 38.9% had calf muscle tightness, and 36.91% had a functional disability. Hamstring tightness was not associated with the functional disability of patients (p=0.901), but calf muscle tightness had a significant association with the functional disability of patients(p=0.008). **Conclusion:** About 44.30% of patients with lumbar radiculopathy had hamstring tightness, and 38.9% had calf muscle tightness. Hamstring tightness is not associated with the functional disability of patients, but calf muscle tightness has a significant correlation.

Keywords: Lumbar Radiculopathy, Oswestry Disability Index, Hamstring Tightness, Functional Disability

INTRODUCTION

Lumbar radiculopathy (LR) is a disease that involves the spinal nerve root of the lumbar area. Radicular pain is primarily due to impingement, inflammation or compression of a nerve in the vertebra. It refers to a pathological process that involves the lumbar roots that cause symptoms of radicular pain in the lower extremity of the human body.[1] The lumbar area of the spine contains the inferior end of the spinal column and in between the last vertebra of the thoracic area (T12) and the

first vertebra of the sacral area (S1). [2] The spinal cord in the lumbar area is protected from five mobile and durable vertebrae from L1 to L5 that permit the forces for the dispersion of axial. The spine consists of cartilage, bone, nerves, muscles and ligaments. Every component of the spine plays a significant role in the structure and function of the spine.[3]

The pathology of nerve root arises mainly from direct neural impingement regardless of whether the cause is displaced disc, acute herniated disk, foraminal stenosis, bony spurs, central stenosis or hypermobility of any segment of the vertebra. This pain is usually steady and deep and can mostly be reproduced with specific positions and activities, such as walking or sitting. [4]

The incidence of lumbosacral radicular pain is roughly 2–6%; however, the association of lumbosacral nerve roots that produce pain and spinal neural dysfunction is mainly resistant to conservative intervention than low back pain alone. The most usual reason for lumbar radiculopathy is a herniation of disc compression, irritation and compression of the spinal nerve root. L4–L5 and L5–S1 are the most often affected intervertebral discs that lead to L5 or S1 radiculopathies; these may lead to sciatic neuritis.[5]

Flexibility is the capability of a specific joint or series of joints to move smoothly and efficiently through a pain-free and full range of motion. It is linked with the musculotendinous components and its extensi-bility that cross a joint and deform a joint, based on its capacity to relax and produce an elastic force.[6] Flexibility has the capacity of a muscle to fully lengthen, allowing single or multiple joints to move throughout the entire ROM. Hence, the elasticity of muscle is an essential element of musculoskeletal health. Non-flexible joints are at high risk of injury. Muscle weakness and inadequate flexibility are two chief components of joint and joint pain dysfunction.[7 8] Muscle tightness happens due to the inadequate ability of the muscles to fully deform by reducing the ROM of the joints they act on. Tightness of muscle causes flexibility to reduce. The hamstring is one of the largest groups of muscles that is comprised of three major muscles; biceps femoris, semimembranosus and semitendinosus, which fully covers the posterior of the thigh.[9 10] The function of the hamstring muscle is to flex the knee joint and extend the hip. Therefore, it mainly contributes to keeping the human body flexible. Hamstring muscle tightness can sometimes lead to musculoskeletal disorders such as hamstring muscle injury, low back pain, plantar fasciitis and patellofemoral pain syndrome.[11]

Muscle tightness may be associated with a disturbance of posture. Postural disturbance and muscle tightness can lead to several musculoskeletal conditions. Reduction in muscle extensibility results from the stiffness of the hamstring muscle, and it could be a potential contributive factor to compromised functional disability.[12] The connection between hip flexion, reduced hamstring flexibility and dysfunction of the sacroiliac joint has not been established well; however, some connection between low back pain and reduced hamstring flexibility has been established.[13]

Lumbar radiculopathy frequently follows a precise distribution of lumbar dermatomes, indicating the involvement of the level of the spinal nerve root. Motor symptoms of lumbar radiculopathy include reduced deep tendon jerks and muscle weakness. Sensory symptoms may include pain, typically accompanied by

numbness or paranesthesia. This pain may cause multiple pathogeneses.[14,15] Studies have been conducted on the prevalence of hamstring and calf tightness in different populations such as athletes, college students and office workers. Nevertheless, studies were limited on the frequency and association of hamstring tightness with functional disability in patients with lumbar radiculopathy. Under-standing the prevalence of calf and hamstring tightness and its association with functional disability in patients with lumbar radiculopathy is essential. Therefore, I decided to conduct a study to check the frequency of hamstring and calf muscle tightness in patients with lumbar radiculopathy and their association with functional disability in patients with lumbar radiculopathy.

METHODOLOGY

The study was conducted among 149 patients at the Mansoorah Hospital and Nawaz Sharif Social Security Hospital in Lahore. A Performa with validated questionnaires was distributed among 149 patients who were willing to participate. The study duration was six months after the approval of the synopsis. Non-probability convenient sampling technique was used.[16] Inclusion criteria were age limit of 20-50 years, both genders, patients with lumbar radiculopathy and chronic low back pain. At the same time, patients with a congenital deformity, recent surgery lower limb and any musculoskeletal injury like fracture and dislocation were excluded from the study. Informed written consent was taken. Oswestry disability index (ODI) questionnaire is a disease-specific questionnaire to check the level of disability among patients.[17] Data were analyzed using IBM SPSS statistics-26. Categorical variables were presented in frequency percentage tables, and a chi-square test was applied to evaluate the association.

ACTIVE KNEE EXTENSION TEST

The participants were taken to the examination table in a supine lying position, then asked to bend one hip and knee to the vertical and lower leg to the horizontal on the table. The foot of the tested leg has to straighten actively until the thigh begins to move from the vertical position. Record the angle and measure the minimum angle of flexion at the knee. The unit of measurement was degrees. If the leg becomes straight, the angle would be measured as 0. Any degree of flexion was noted as a positive number, e.g., 10, 20, 30 degrees.

CALF MUSCLE TIGHTNESS TEST

Participants were taken to the table and positioned prone with their ankles and foot hanging over the table at the edge. Place the goniometer with the moving arm along the lateral midline of the fifth metatarsal bone, the fixed arm was parallel to the fibula's lateral midline, and the goniometer's axis was placed over the lateral malleolus. Passive ROM of the ankle was performed, and dorsiflexion of the ankle to the end of its range was measured and recorded.

RESULTS

The result regarding the age of respondents showed that the mean age of participants was 38.36, the minimum age of 14 and the maximum was 76, and the standard deviation was ±12.74. The findings regarding the dominant side of participants showed that 26.8% were left side dominant, and 73.2% were right side dominant. Regarding pain intensity, 24.2% of participants responded that they could tolerate pain without using pain medication, 18.8% people responded that their pain got entirely relieved by medicine, 15.4% people responded that pain medicine gave them little relief and 10.1% participants responded that pain medicine does not affect

pain. (Table -1)

Table I: Descriptive Statistics of Dominent Leg

Variable	Construct	Frequency	%
Dominant Leg	Left	40	26.8
	Right	109	73.2
Pain Intensity	Controlled without medicines	36	24.2%
	Pain relived with medicine only	28	18.8%
	Medicine gives a little relief	23	15.4%
	Pain killers have no effects on medicine	15	10.1%

The findings of hamstring muscle tightness indicated that 55.7% of participants had a popliteal angle less than 20 degrees which means that they did not have hamstring muscle tightness, and 44.3% of participants had a popliteal angle of more than 20 degrees which signifies that they had hamstring muscle tightness. Concerning calf muscle tightness, 61.1% of participants had no muscle tightness, and 38.9% had muscle tightness. The total score demonstrated that 36.4% of participants had a moderate functional disability, and 63.1% had a minimal functional disability. (Table- II)

Table II: Descriptive Statistics of Muscle Tightness and Functional Disability

Variable	Construct	F	%
Hamstring Muscle Tightness in Accordance with Active Knee Extension test & popliteal angel	Popliteal angle less than 20º, negative test (No muscle tightness)	83	55.7%
	Popliteal angle more than 20º, positive test (muscletightness)	66	44.3%
Calf Muscle Tightness	No tightness (Negative calf muscle tightness test)	91	61.%
	Tightness (Positive calf muscle tightness test)	58	38.9%
Functional Disability	Moderate Functional Disability	55	36.9%
	Minimal Functional Disability	94	63.1%

Association between hamstring tightness and functional disability exhibited that the value of the chi-square test is 0.901, which signifies that hamstring tightness is not associated with functional disability. The association between calf muscle tightness and functional disability revealed that the value of Pearson chi-square is 0.008, which means that there is a significant association between calf muscle tightness and functional disability of participants with lumbar radiculopathy.

Table III: Chi square association of muscle tightness and functional disability

	Muscle Tightness	P-Value
Functional Disability	Calf Muscle Tightness	0.008
	Hamstring Muscle Tightness	0.901

DISCUSSION

In this current study, it was seen that hamstring tightness does not affect gender. This study held no significant association between gender and calf and hamstring tightness. The previous study, which was conducted on the impact of gender on hamstring and calf muscle tightness by Aparna Sarkar et al. in 2022, directed a significant association between the gender of participants and calf muscle tightness. It was also observed that the tightness of calf muscle in women of older, middle and younger age decreased as the age increased. The study also explained gender-based variation between men and women between the age of 41- 60 years, but there was no gender-based difference in men and women between the age group of 21- 40 years. The study also concluded that there is a rise in calf and hamstring muscle tightness with aging in males and females. [18 19]

Formerly a study conducted by Pradip et al. in 2018 found that hamstring tightness was 80.5%, and the frequency of iliopsoas muscle was 69.7% among middle-aged female Indians. The

study also found that the prevalence of hamstring muscle was higher in middle-aged women. In contrast to the previous study, the current study revealed that the frequency of hamstring muscle tightness was 37.6%, and the prevalence of calf muscle tightness was 38.9% which is lower than the previous study. [20 21] In this study, it was found that there was no association present between hamstring tightness and functional disability among patients with pre-diagnosed lumbar radiculopathy, and there was a significant association present between calf muscle tightness with functional disability among lumbar radiculopathy patients. Contrary to the present study, a previous investigation conducted by Jeronimo Weerts et al. in 2019 showed the relationship between lumbopelvic kinematics and hamstring flexibility among male adolescent professional rowers. Hamstring tightness was assessed by applying a passive knee extension test, and it was found that there was no association present between pelvic kinematics and hamstring flexibility. [22] Research by Astrid Feinisa Khairani et al. in 2020 on body postures and functional activities found that they were associated with low back pain; it demonstrated that 63.4% of participants have a functional disability due to low back pain. In this study, a modified Oswestry questionnaire index was used to check the functional disability of patients with lumbar radiculopathy and found that 36.9% of participants have an abnormal functional disability due to pain and inability to perform personal care, standing, walking, sleeping, lifting heavy weight and travelling. [23]

CONCLUSION

On the basis of results, it was concluded that 44.30% of patients with lumbar radiculopathy have hamstring tightness and 38.9% have calf muscle tightness. It is also concluded that hamstring tightness is not associated with functional disability of patients but calf muscle tightness has significant association with functional disability of patients.

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