RESEARCH ARTICLE

Hamstring tightness among individuals with neck and low back pain: a cross-sectional study in a public sector institute of Karachi

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Abstract

Objective: To determine the frequency of hamstring tightness and its impact among patients with chronic neck and low-back pain.

Method: The analytical, cross-sectional study was conducted at the outpatient department of the Sindh Institute of Physical Medicine and Rehabilitation, Karachi, from September 10, 2021, to January 31, 2022, and comprised patients of either gender aged 18-40 years with non-specific cervical and lumbar pain for more than 3 months. The participants were divided into 2 groups. Group A included those with chronic neck pain and group B included participants with chronic low-back pain. Clinical assessment was done to measure hamstring tightness and pain by using the active knee extension test and the visual analogue scale, respectively. Data was analysed using SPSS 24.

Results: Out of 104 participants, there were 52(50%) males and as many females. The overall mean age was 28.15±5.10years. There were 52(50%) subjects in each of the two groups. Hamstring tightness was found in 73(70.2%) subjects. Patients with chronic low-back pain reported more tightness of hamstring muscle 38(73.1%) than those with chronic neck pain 35(67.3%) ($p>0.05$).

Conclusion: Hamstring tightness was frequent among patients with chronic neck pain and low-back pain though not significantly.

Key Words: Lumbar, Muscle, Neck pain, Pain intensity.

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Introduction

Spinal pain affects more than half of the population and still causes disability and pain one year later.[1] Due to spinal disorders, there is decreased ability of an individual to perform activities of daily living (ADLs), decreased work productivity and increased utilisation of healthcare services.[2] A study reported 12-month prevalence of neck pain to be 30-50%.[1] However, prevalence of low-back pain (LBP) and thoracic spine have been reported to be 57.8% and 26.4%, respectively.[1,3]

Tightness of muscle can give rise to multiple conditions related to the musculoskeletal system and may also be associated with postural disturbances. Muscle tightness is caused by decrease in the muscle capacity to contract and relax, resulting in decreased range of motion (ROM) in the joint on which that muscle acts.[4] Literature suggests reasons for the development of hamstring tightness, such as muscle injury, genetic predisposition and adaptive shortening of muscle due to chronic musculoskeletal disorders (MSDs).[5] Hamstring tightness arises in early childhood and with growing age, it tends to increase because increasing age may impair the elasticity of the muscle and affect the level of activity leading towards gradual decline in the flexibility of hamstring muscles.[4] Females are more flexible compared to males of similar age throughout life, while men are more prone to vigorous activities and micro-trauma due to variation in anatomical joint structures.[4]

Pelvic mobility may also decrease as a result of lacking in the extensibility of hamstring muscles. This inevitably leads towards changes in the bio-mechanics of pressure distribution of the spine, resulting in spinal disorders.6 Tightness in hamstring muscles can cause restriction in anterior pelvic tilt during spinal flexion. This phenomenon produces more tension in muscles and ligaments of lumbar region, resulting in considerably excessive compressive load on lumbar region.[5] Hamstring tightness can also cause posterior pelvic tilt, which leads to decreased lordosis of lumbar spine and resulting in LBP.[6]

A study found a positive association between severity of LBP and hamstring tightness.[5] It has been reported that when suboccipital muscles tone falls, the tone of hamstring muscles also decreases due to myofascial relaxation, which supports the theory that suboccipital

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muscles and hamstring are attached by one neural system passing through dura mater, which has been called the superficial back line.[7] Literature suggests that hamstring tightness is associated with increased ROM in thoracic spine and decreased ROM in lumbar spine and hip in flexion among non-athletic population.[8] Hence, the extensibility of hamstring muscles is vital for optimal level of overall wellbeing.[5]

There are many clinical tests available to assess hamstring flexibility, such as sit-and-reach test, active knee extension (AKE) test, and straight-leg raise (SLR) test.[4] Among them, AKE is the gold standard to measure hamstring flexibility.[9]

According to authors' knowledge, no study has evaluated the presence of hamstring tightness in patients with neck pain. The current study was planned to fill the gap by determining the frequency of hamstring tightness and its association with chronic neck pain and LBP.

Patients and Methods

The analytical, cross-sectional study was conducted at the outpatient department of the Sindh Institute of Physical Medicine and Rehabilitation, Karachi, from September 10, 2021, to January 31, 2022. The ethical approval was taken from Institutional Review Board (IRB) of Dow University of Health Sciences (DUHS) (IRB-2120/DUHS/Approval/2021/513) before the commencement of this study. The sample was raised using non-probability purposive sampling technique. Those included were patients aged 18-40 years[10] having non-specific cervical and lumbar pain for >3 months. Patients with history of surgery or injury related to spinal or hamstring muscles in the preceding 6 months,[4] acute spasm of hamstring muscles,[5] neuromuscular disorders of the lower extremity, like stroke, muscular dystrophy and peripheral neuropathy,[5] history of any malignancy or infectious disease, spinal or limb deformities,[11] congenital or acquired anomalies, like limb length discrepancy,[5] and those with pain intensity equal to and greater than 7.5 cm on visual analogue scale (VAS) were excluded.[5]

The sample size was calculated using PASS [11,12] with 95% confidence interval (CI), 80% power, effect size 0.341 and degree of freedom [4,13]

After taking informed consent, the subjects were equally divided into group A having chronic neck pain and group B having chronic LBP.

The AKE test was used to assess hamstring flexibility and VAS for pain assessment. Duration of assessment was 10 minutes. Hamstring muscle tightness was assessed by AKE Test with goniometer. Participants were asked to lie down in supine position on the couch and flex their knee and hip to 90º. The testing was done on the right lower limb and subsequently on the left lower limb. To minimise pelvic motion, the contralateral lower limb remained extended on the couch throughout the test. The fulcrum of the goniometer was centred on the lateral femoral condyle. The proximal arm was aligned with the greater trochanter of the femur, and distal arm with the lateral malleoli of the fibula. Participants were instructed to extend the lower limb as far as possible until a mild stretch was felt and keep foot in relaxed position. Three were performed and the average of the three trials on both sides was used for analysis.[6,11] Hamstring muscle was considered tight for males if AKE angle showed >33% and for females if >23.[4.14]

Data was analysed using SPSS 24. Frequencies and percentages as well as means and standard deviations were used to express data, as appropriate. For inferential analysis, chi-square test was used to assess association between the independent variables and the study outcomes. Comparison of AKE angle for hamstrings tightness and VAS scores for pain between the groups was done using independent t-test. $P<0.05$ was considered significant.

Results

Out of 104 participants, there were 52(50%) males and as many females. The overall mean age was 28.15±5.10 years. There were 52(50%) subjects in each of the two groups (Table 1). Overall, 100(97%) participants had an active lifestyle.

Table-1: Demographic characteristics.

Patient characteristics	Participants with Chronic Neck pain (n=52)	Participants with Chronic LBP (n=52)	Total Participants (n=104)
Age (yr.)	28.31±5.54	28.00±4.66	28.15±5.10
Weight (kg)	65.48±16.46	63.77±13.90	64.62±15.19
Height (m)	1.57±0.16	1.59±0.11	1.58±0.14
BMI	26.53±6.56	25.13±5.01	25.83±5.85
Duration of Pain (months)	27.12±24.26	26.52±32.71	26.82±28.66
VAS cm	4.28±1.79	4.76±1.49	4.52±1.66

LBP: Low-back pain, BMI: Bod mass index, VAS: Visual analogue scale

Hamstring tightness was found in 73(70.2%) subjects; 58(55.8%) bilateral and 15(14.4%) unilateral. Left hamstring muscles were more tightened 66(64%) than right 64(62%). Participants aged 18-30 years reported more tightness of hamstring muscles 52(71.2%), chronic neck pain 33(63.5%) and chronic LBP 38(73.1%) compared to those aged 31-40 years among whom the

corresponding values were 21(28.8%), 19(36.5%) and 14(26.9%). More tightness was seen in patients with chronic LBP 38(73.1%) compared to those with chronic neck pain 35(67.3%). Between the two groups, the frequency of bilateral and no tightness of hamstring muscles was higher in patients with chronic neck pain 30(51.7%) and 17(54.8%) as opposed to chronic LBP 28(48.3%) and 14(45.2%). Lower frequency of unilateral tightness was noted in the chronic neck pain group 5(33.3%) than chronic LBP group 10(66.7%). Significant association was not found between hamstring tightness and gender (Table 2).

Table-2: Association of hamstring tightness with gender (n=104).

Variables	Male (n=52)	Female (n=52)	P value
Hamstring tightness Right	29(45.3%)	35(54.7%)	0.227
Hamstring tightness Left	30(44.8%)	37(55.2%)	0.152

LBP: Low-back pain, BMI: Bod mass index, VAS: Visual analogue scale

Chronic neck pain patients reported more frequent tightness of hamstring muscle in right side 33(51.6%), while patients with chronic LBP had more frequent tightness 35(52.2%) in left side. Significant association was not found between hamstring tightness and the site of spinal pain (Table 3).

Table-3: Association of hamstring tightness with site of pain (n=104)

Variables	Chronic neck pain (n=52)	Chronic LBP (n=52)	P value
Hamstring tightness	35(67.3%)	38(73.1%)	0.520
Hamstring tightness Right	33(51.6%)	31(48.4%)	0.687
Hamstring tightness Left	32(47.8%)	35(52.2%)	0.539

Patients with chronic LBP had greater right and left hamstring mean AKE angle for hamstring tightness 35.78o ±17.29 and 35.73 ±17.34 respectively, compared to those with chronic neck pain 33.50o ±13.35 and 34.65 ±12.04 respectively. Patients with chronic LBP had higher mean of pain intensity 4.76±1.492 cm compared to chronic neck pain 4.28±1.79 cm (p>0.05).

Discussion

The current study found that the frequency of hamstring tightness was high, but the association of hamstring tightness with chronic neck and LBP was non-significant. Besides, age group 18-30 years reported more pain in neck and back region, and tightness in hamstring muscles compared to age group 31-40 years. In a previous study, there was no significant difference in hamstring tightness in age group 5-49 years. Those aged 40-59 years had more tightness in hamstring muscles compared to other age group. It was also found that hamstring muscles' flexibility decreased with age.[15] Scarabottolo et al. conducted a study in children and adolescents of 10-17 years of age, and concluded that higher prevalence of neck and back pain was found in older adolescents than the younger adolescents.[16] The difference in results is due to difference in population studied and greater numbers of participants aged 18-30 years.

Another study showed that males had reduced hamstring flexibility compared to females.[17] A study done on healthy Nigerians concluded that females had better flexibility of hamstring muscles.[18] In the current study, females recorded higher value of hamstring muscles tightness of both sides compared to the males with equal gender distribution. The contradictory results might be due to more physical activity found in female patients and difference in the study population.

A study concluded that male participants had more tightness of hamstring muscle in left side compared to females who had tightness in right side. Also, there was a significant association found in a study in left and right sided hamstring tightness in both genders.[8] Contrary to this, the current study found that right hamstring muscles were tighter in comparison to left in males, and in females, left hamstring muscles had increased tightness than right. Also, there was no significant association of right and left hamstring tightness with gender. Inconsistent results might be due to difference in age group, selection of study participants and method of assessing hamstring tightness.

In a previous study, female dancers with injury reported significantly high tightness of hamstring muscles with left lower limb.[19] The current study revealed that in females with chronic neck and LBP had no significant association of hamstring tightness in left lower limb. It might be due to difference in the subjects studied.

In the current study, VAS score of patients with chronic neck pain were in the mild and moderate pain category, while the majority of patients with LBP had pain score falling under the moderate category. Similarly, in a previous study, mean numerical rating scale score was 4.9±2.0 in patients with non-specific neck pain which were in the mild and moderate category of pain-related functioning.[20, 21] A study showed that the level of pain intensity was high in patients with chronic back pain.[22]

AKE test with goniometer used in the current study is considered the gold standard test to measure the flexibility of hamstring muscles.[9] The present study

showed that there was no significant association between hamstring tightness and chronic LBP. Similarly, a previous study, which used passive knee extension test to measure the hamstring muscle length in undergraduate students, showed no significant association of LBP and hamstring tightness.[4] Another study showed that hamstring flexibility was reduced in patients with chronic LBP and there was significant difference in hamstring flexibility and chronic LBP[11]. This variation in results might be due to difference in age group, which was 40-60 years in the previous study.[11]

Fasuyi et al. concluded that in individuals with LBP, the length of hamstring muscles was significantly reduced.[23] A study done on college students reported that in comparison to iliotibial band tightness, more tightness of hamstring muscles was found in students who had non-specific back pain.[24] Similarly, in the current study patients with non-specific chronic LBP showed more tightness of hamstring muscles. The earlier study[24] also supported the current finding that patients with non-specific chronic LBP had hamstring tightness frequently in left side. A previous study found that during prolonged standing, there was no relationship between hamstring flexibility and LPB.[25] The findings are in line with the present study. However the current results are based on different population and a different test was used for measuring hamstring tightness.

Theoretically, it is found in literature that tone of neck muscles directly impact the tone of hamstring muscles. When the tone of suboccipital muscles falls, hamstring muscles also decreases due to relaxation of myofascia.[7] The theory supports the findings of the current study in which chronic neck pain had tight hamstring muscles. More tightness of right side was found than the left side. But there was non-significant association of hamstring tightness with chronic neck pain. In that sense, the current study provided novel findings regarding neck pain.

The current study has its limitations because of its cross-sectional design, providing only major baseline evidence regarding hamstring tightness in both chronic neck pain and LBP. The AKE angle measurement was limited to goniometer which may have manual error, but average value of three readings was considered to overcome this limitation.

Conclusion

Tightness of hamstring was frequent in cervical and LBP cases. However, hamstring tightness was not associated with the site of spinal pain. Also, there was no significant association with gender.

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Conflict of Interest: None.

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