

## HAMSTRING TIGHTNESS AND LOWER LIMB DISABILITY IN INDIVIDUALS WITH ROUNDED SHOULDER

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### Keywords

Rounded Shoulder Posture; Hamstring Tightness; Lower Limb Disability; Postural Dysfunction

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### Abstract

**Background:** Rounded shoulder posture is a common postural abnormality characterized by protracted shoulders, increased thoracic kyphosis, and muscular imbalance. It is often associated with prolonged sitting, poor ergonomics, repetitive work, and sedentary lifestyle. This condition may lead to a chain reaction affecting distant body segments, including hamstring tightness and lower limb dysfunction through biomechanical and myofascial connections.

**Objective:** The objective of this study was to determine the prevalence of hamstring tightness and lower limb disability in individuals with rounded shoulder posture.

**Methodology:** A cross-sectional study was conducted in Layyah, Punjab, Pakistan over a period of six months. A total of 150 participants were included using non-probability convenient sampling. Individuals aged 18–60 years with rounded shoulder posture, forward head posture, hamstring tightness, and history of neck pain were included. Active Knee Extension (AKE) was used to assess hamstring tightness, while the Lower Extremity Functional Scale (LEFS) was used to evaluate lower limb disability. Data were analyzed using SPSS version 25 with descriptive statistics.

**Results:** A total number 150 participated of which 108(72%) were male and 42 (28%) were female. The mean age in the study was 34.87 and standard deviation was 9.53. The analysis revealed a strong and statistically significant positive correlation between hamstring tightness and lower extremity functional ability ( $r = -0.698$ ,  $p = 0.001$ ). A considerable proportion of participants reported frequent hamstring tightness (58.0%) and showed severe difficulty in the toe touch test (51.3%). The Active Knee Extension test indicated moderate restriction (mean = 2.22, SD = 0.87). Functional assessment using LEFS demonstrated minimal difficulty in low-demand activities, whereas high-demand tasks such as running and rapid directional changes were significantly impaired. Overall, the findings suggest that increased hamstring tightness is associated with reduced functional performance, particularly during physically demanding activities.

**Conclusion:** This study concludes that hamstring tightness is strongly and significantly associated with reduced lower limb function in individuals with rounded shoulder posture.

**INTRODUCTION**

A common postural condition affecting the shoulder joint, rounded shoulder syndrome is defined by a raised and extended outward scapula.

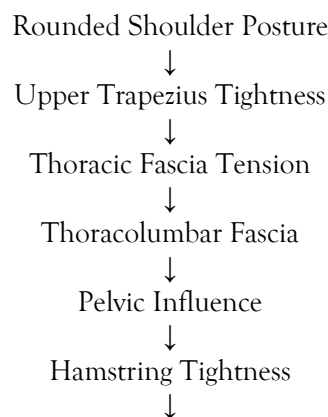
<sup>1</sup> A type of bad posture known as "rounded shoulder syndrome" is linked to increased kyphosis in the thoracic spine and anterior shoulder position <sup>2</sup> typical maladaptive posture that increases due to repetitive work and poor posture. <sup>3</sup> Up to 73% of the group of healthy individuals between the ages of 18 and 60 experience it. It is distinguished by an extended, anteriorly tipped, downwardly rotated scapula posture with enhanced cervical lordosis and upper thoracic kyphosis. The literature refers to rounded shoulder posture as abduction, which is the elevation of the scapula that creates the illusion of a hollow chest.

This disorder affects the upper quarter of the body and has multiple causes. Musculoskeletal abnormalities may develop over extended periods due to biomechanical, psychological, and social stresses and repetitive activities. Some adverse effects of RSS include early fatigue, pain in the back, neck, and shoulder segments, decreased respiratory capacity and increased residual volume, reduced aerobic endurance, an unattractive appearance, and vertebral fractures. This highlights the importance of preventing and correcting this postural abnormality. <sup>4</sup>

Complications include inadequate

scapulohumeral rhythm, shoulder discomfort, tendinitis, bursitis, impingement, instability, and muscle imbalance. <sup>1</sup>

Postural problems have increased as a result of extended computer and laptop use, particularly among office workers and independent contractors. <sup>5</sup> Its prevalence among people who participate in upper arm sports such as basketball, badminton, gymnastics, swimming, squash, table tennis, volleyball, and field events is quite evident and such individuals are more likely to have rounded shoulders. According to prior research, certain psychological factors and emotional responses might influence muscle function, body posture, and movement. <sup>1</sup> Due to the growth of the economy and the demands of authorities, hospital employees now use computers for everything from drafting medical records to verifying the results of various examinations. Physical issues include the length of time spent using computers and awkward postures, as well as workload (number of hours worked). However, these factors were mostly responsible for the initial emergence of acute or chronic RSS, which significantly affects the lives of workers and health professionals as well as society. Tightness is more prevalent in women (96%) than in men (4%). <sup>6</sup> It has been observed that RSS can lead to a chain reaction of disorders in more distant segments, such as the lower limbs.



## Lower Limb Dysfunction

One sign of this chain reaction event, which affects the rear of the leg muscles (hamstring), is a rise in lumbar hyper-lordosis due to alterations in thoracic hyper-kyphosis and cervical hyper-lordosis.<sup>4</sup> Hamstring is a key component of flexibility in the human body and it is more prone to get tightened. Inability to achieve greater than 160 degrees of knee extension when the hip is flexed to 90 degrees is considered as hamstring tightness.<sup>7</sup> In the seated position, hamstring is held at shortened position due to knee flexion and posterior pelvic rotation. In prolonged sitting, this constant shortened position develops hamstring trigger points and cause muscle tightness.

Additionally, sitting puts more strain on the lumbar intervertebral disk. As a result, extended sitting may put the lumbar spine under more mechanical strain. Additionally, for those who have hamstring tightness, repeated forward bending increases the mechanical load on the spine.

This distortion in the lumbar pelvic region can also cause limitation in a variety of cervical movements and can cause neck pain. The fact is because one neural system connects the hamstrings and those muscles around the neck. That neural system passes through the dura and is known as the superficial back line (SBL). The Superficial Back Line (SBL) connects and protects from the base of the lower limbs to the top of the head on the posterior surface of the human body.<sup>8</sup> The flexion of upper limb increases movement of same erector spinea, gluteal region till hamstring and muscles of foot. According to the concept of the Superficial back line, rounded shoulder posture may increase myofascial tension in the posterior chain, which is transmitted inferiorly to the hamstring. This altered tension distribution can contribute to hamstring tightness and subsequent lower limb functional limitations, even in the absence of direct lower extremity pathology.

Rarely is a chemical imbalance that can be corrected by medication the cause of persistent muscle stiffness and postural issues like rounded

shoulders. Rather, it is a complicated interaction between weak, overextended antagonistic muscles and taut muscles. Therefore, restoring appropriate muscular balance and function is the aim of treatment. One method that is frequently used to improve hamstring flexibility is static stretching.<sup>9</sup> Nonetheless, there are several kinds of stretching, and studies have compared different stretching techniques to determine which is superior. A few types of stretching interventions include proprioceptive neuromuscular facilitation (PNF) stretching, manual stretching, passive stretching, and active stretching. Hamstring stiffness can also be treated with additional techniques like electrotherapy, massage, dry needling, and neurodynamic exercises, either separately or in combination.<sup>10</sup> The purpose of this study is to propose that these problems may have various effects on society. For example, bad posture and tense muscles can cause discomfort and exhaustion, which can lower productivity. This may eventually result in lower limb impairment.

**LITERATURE REVIEW**

In 2025 thakur et al., has out a cross-sectional study on the prevalence of rounded shoulder syndrome among young females as a result of psychological and physical factors. They look into the relationship between low self-esteem, stress, and "flexed" postures, as well as how conditions like macromastia affect body image and alignment, and how muscle imbalances (shortened front muscles vs. lengthened back muscles), heavy backpack use, and sedentary habits contribute to postural changes. The connection between Rounded Shoulder Syndrome and disorders such thoracic outlet syndrome and myofascial pain syndrome, as well as discomfort in the neck, shoulders, and upper back.<sup>1</sup>

Sepehri et al., in 2024 Examine how different therapy activities affect hyperkyphosis, rounded shoulders, and forward head posture in individuals with upper crossed syndrome. To determine how various activities impact upper crossed syndrome, they examined 22 distinct

research. Repetitive activities and biomechanical, psychological, and social pressures can cause musculoskeletal anomalies, which can result in movement disorders. It caused a cascade of lower limb problems. The findings suggest that reducing forward head, rounded shoulders, thoracic kyphosis, and overall UCS may be achieved by engaging in therapeutic exercises such as strength training, stretching, shoulder-based exercises, and extremely comprehensive exercises that target all muscles.<sup>4</sup>

In 2024 Jamil et al., conducted a cross-sectional study on prevalence of hamstring tightness among healthcare workers. They focusing on the anatomy of the hamstring, definitions of muscle tightness, and the musculoskeletal challenges faced by healthcare workers. They analyze different external studies (from Nigeria, Malaysia, Saudi Arabia) to identify which were used to compare and contrast the current study results. The specific assessment protocols contain, the Straight Leg Raise (SLR) and Active Knee Extension (AKE) tests, to provide background on their clinical usage. They also focus on the relationship between Body Mass Index (BMI) and hamstring flexibility. The prevalence of hamstring was found in all healthcare workers of research but the highest percentage was found in physical therapists as compared to other professions.<sup>11</sup>

Baig et al., in 2023 Use a cross-sectional study to assess hamstring tightness and neck pain. They concentrate on the anatomical and clinical relationship between hamstring tightness and neck pain, which is connected via a particular neurological and fascial system. The myofascial chain known as the Superficial Back Line (SBL) runs from the bottom of the feet to the top of the head, connecting the rear surface of the body. Planter fascia, Achilles tendon, gastrocnemius, hamstring, erector spinae, and neck muscles are some of its components. Tension in one region might lead to tension in another since these structures are interconnected. It is suggested that hamstring flexibility might be increased by treating the neck muscles.<sup>8</sup>

Martinez et al., in 2023 Examine how dynamic stability and agility are affected by hamstring

fatigue and tightness in young men who engage in physical activity. To identify and summarize the main hypotheses and current studies, with an emphasis on the connection between hamstring tightness, dynamic stability, and the risk of lower limb injuries. They summarize the most important prior research on how tiredness affects the neuromuscular system and how it affects sports performance and postural control. The passive straight leg raise test (SLR) was used to split the participants. They used the modified Star Excursion Balance Test (mSEBT), the Dynamic Postural Stability Index (DPSI), and the hexagon agility test to analyze dynamic stability and agility.<sup>12</sup>

In 2022 Arif et al., carried out a cross-sectional study to find out how often rounded shoulders are among computer users. In healthy individuals between the ages of 20 and 40, they examined the prevalence rates of FHP and RSP. They offered biomechanical and anatomical explanations for rounded shoulders, concentrating on the functions of the pectoralis minor, rotator cuff, and scapula alignment in computer users. They address the main subjects, including ergonomics, computer-related muscular activity, and psychological aspects of pain. They came to the conclusion that rounded shoulders can result from bad, prolonged posture. Long-term technology use without leading a healthy lifestyle has also been shown to induce pain in people.<sup>13</sup>

Kanishka et al., in 2019 conducted a cross-sectional study to determine the prevalence of hamstring tightness and associated factors among sewing machine operators. This study was carried out among 169 sewing machine operators aged between 18-60 years using the methodology, the Passive Knee Extension test. The key statistical findings, specifically the 83.4% prevalence rate, and the correlations found with gender, sitting duration, BMI, and physical activity levels. They also compare their results with previous studies on college students, office workers and physiotherapy students. They conducted that prolonged sitting is a contributory factor in hamstring muscle tightness. Majority of the sewing machine operators have hamstring tightness.<sup>7</sup>

We considered this study since there is a dearth of material on hamstring tightness and lower limb impairment in the Pakistani population with rounded shoulders. Sedentary workers who frequently move their upper limbs frequently experience neck ache.<sup>14</sup> Neck pain and hamstring tightness is a less known connection but neck pain is the 4<sup>th</sup> highest reason for disability among adults.<sup>8</sup> The decision making for assessment and treatment of neck pain in clinical settings can be complex for health care providers when it is accompanied by hamstring tightness. This feature can put the health care provider at risk of avoiding connection of neck pain and hamstring tightness.

**2.1: Objective**

The objective of this study is to determine the prevalence hamstring tightness and lower limb disability in individuals with rounded shoulder.

**2.2: Hypothesis**

**2.2.1: Alternate Hypothesis:**

There was significant prevalence of hamstring tightness and lower limb disability in individuals with rounded shoulder.

**2.2.2: Null Hypothesis:**

There was no significant prevalence of hamstring tightness and lower limb disability in individuals with rounded shoulder.

**METHODS AND MATERIALS**

**3.1: Study Design:**

The study design was Cross-sectional.

**3.2: Study Setting:**

The study setting was Layyah Punjab, Pakistan.

**3.3: Duration of Study:**

The study duration was 6 months after approval of synopsis.

**3.4: Sample size:**

The sample size was 150 calculated by epitool.<sup>7</sup>

The screenshot shows the EPITOOLS Inputs interface. At the top, there is a navigation menu with links: Home, Prevalence, Freedom, Studies, Diagnostics, and Sampling. Below the menu is a table with the following data:

inp1	0.034
inp3	0.05
inp2	0.9
inp4	N/A

**Results**

**Sample size required for specified inputs**

Large population	150
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**3.5: Sampling Technique:**

The sampling technique was non-probability convenient sampling technique.

**3.6: Sample Selection:**

**3.6.1: Inclusion Criteria:**

- Age between 18 to 60.<sup>7</sup>
- Both genders.<sup>11</sup>

- Subjects with Forward head posture (Tragus to wall distance more than 10 cm).<sup>1</sup>
- Patients with hamstring tightness (SLR test <80°).<sup>15</sup>
- History of neck pain >3 months.<sup>16</sup>

**3.6.2: Exclusion Criteria:**

- Prior surgeries on lower limb.<sup>12</sup>

- Recent history of surgery on a specific shoulder, post-traumatic shoulder discomfort and stiffness.<sup>13</sup>
- Neurological disorders in lower limb.<sup>15</sup>
- Several spinal disorders, systemic disease, spinal surgery and pregnancy.<sup>6</sup>
- Physically and psychologically unfit individuals.<sup>7</sup>

### 3.7: Data Collection Tools:

- Active Knee Extension (AKE)
- Lower Extremity Functional Scale (LEFS)

#### 3.7.1: Active Knee Extension:

It is a procedure that evaluate the tightness of hamstrings. Participants were asked to lie in the supine position on a plinth while keeping extension in both lower limbs. Pillows were used to adjust both the anterior superior iliac spines. The untested lower limb was secured to the plinth with one examiner by putting her hands over the lower third of the thigh. The participants were asked to flex the hip and knee to 90° until the thigh and leg came in contact with the pillows. Another examiner asked participants to raise the knee in extension position as much as possible and maintain it for approximately 5 seconds while keeping the foot relaxed. The joint axis was marked for the placement of a universal goniometer with its arms fixed parallel to the femur and tibia. The examiner asked the participant to move their feet downward and maintain a relaxed plantar flexed position. So, the pressure on the neural structures in the posterior aspect of the lower limb is decreased and the gastrocnemius passive insufficiency is avoided. Measurement of this test was known as the knee flexion degree from the last knee extension. Each knee angle was measured for three times, with 1 minute rest between trials, calculating the mean to

use it for the analysis of the AKE test.<sup>6</sup>

#### 3.7.2: LEFS:

The Lower Extremity Functional Scale (LEFS) is a questionnaire containing 20 questions about a person's ability to perform everyday tasks. The LEFS can be used by clinicians as a measure of patients' initial function, ongoing progress and outcome, as well as to set functional goals. The LEFS can be used to evaluate the functional impairment of a patient with a disorder of one or both lower extremities. It can be used to monitor the patient over time and to evaluate the effectiveness of an intervention.<sup>17</sup>

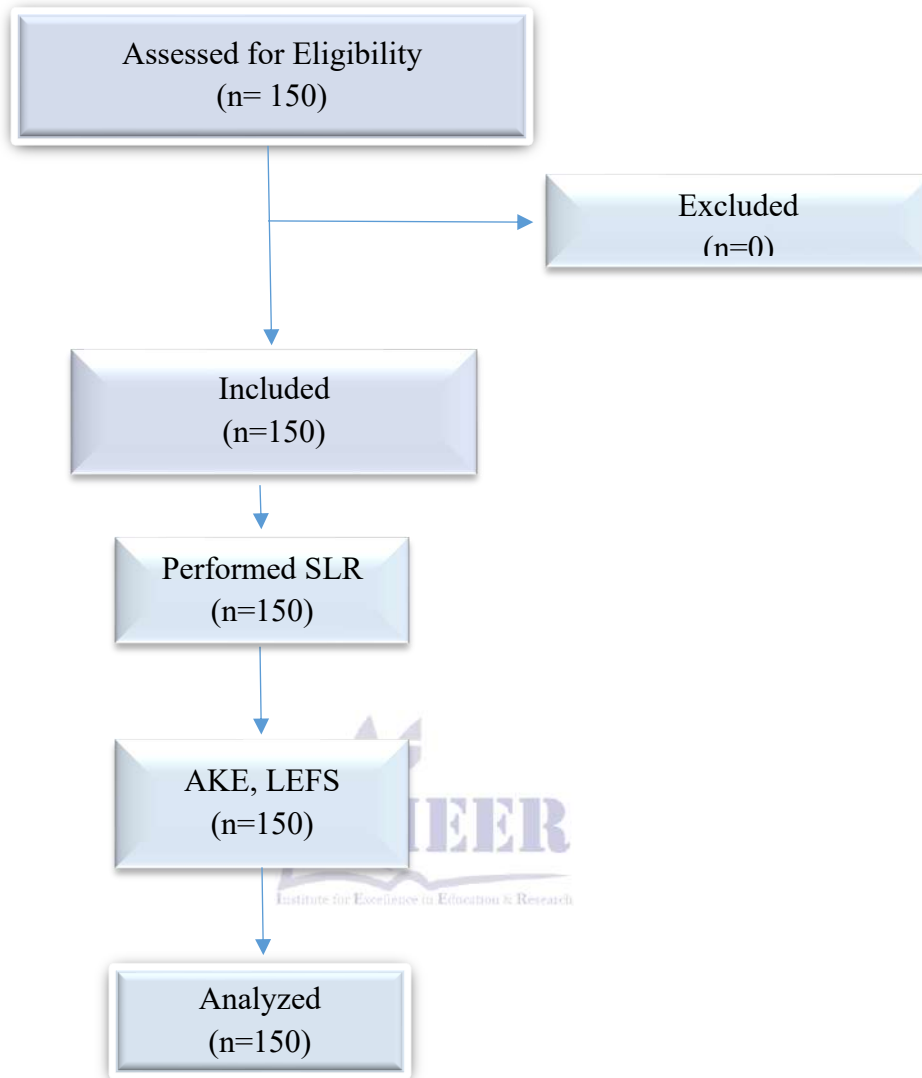
#### 3.8: Data Collection Procedure:

The subject who meets the inclusion criteria will be included in this study. The nature and purpose of study along with questionnaires will be explained to each and every subject. Consent will be taken and SLR test will be performed to confirm the condition, after this data will be filled, analyzed and interpreted accordingly.

#### 3.9: Ethical Considerations

1. The rights of the research participants were protected, and the ethical guidelines established by the GCUF Layyah ethical committee will be adhered to.
2. All participants were required to sign written informed consent forms, which are attached.
3. All data collecting information will be kept private.
4. All study participants were remaining anonymous.
5. The participants were made aware that there will be no danger or drawbacks to the study's methodology.
6. Participants were made aware that they are free to leave the study at any time.

3.10: Consort Flow Diagram



3.11: Data Analysis Procedure:

Data was analyzed by using The Statistical Package for Social Science Software (SPSS) version 27.0 for window Microsoft, also Microsoft word and excel will be used to generate graphs, tables etc. The

quantitative data will be presented in the form of mean and standard deviation. The categorical data will be presented in the form of frequency and percentage.

RESULTS

4.1. Sociodemographic

Demographics	Mean	Std. Deviation
What is the age of patient?	34.87	9.53
What is the gender of patient?	1.28	0.45

Table 4.1 shows the mean and SD of sociodemographic including age and gender. The mean age in study was 34.87 and SD of 9.53. Gender statistics shows mean 1.28 and SD of 0.45.

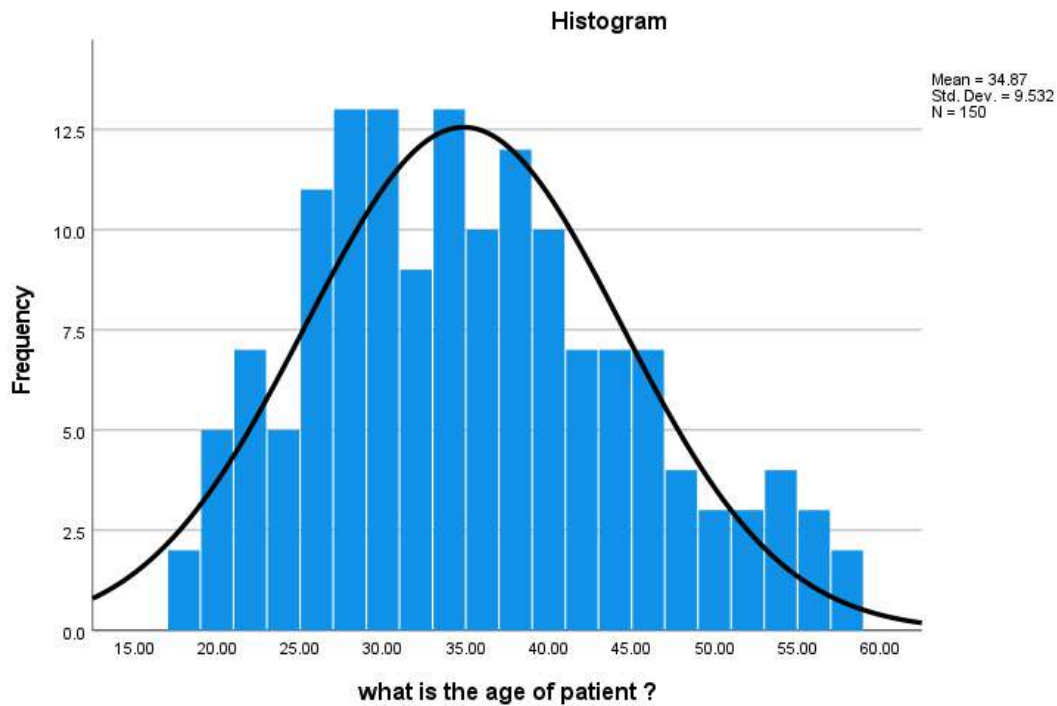


Fig.1. Histogram of age statistics

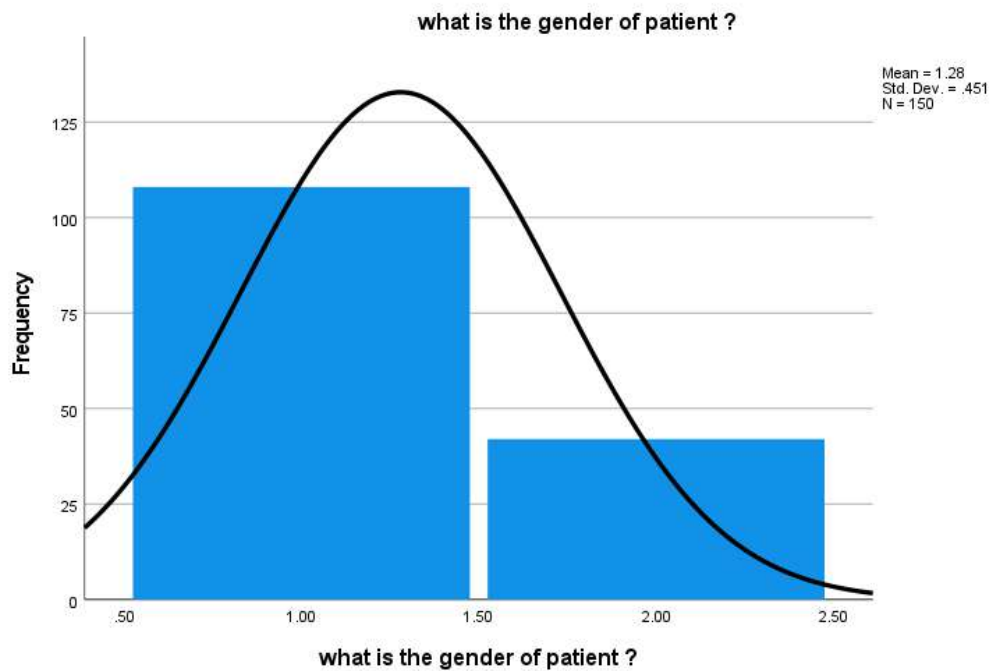


Fig.2. Histogram of gender statistics

4.2. Descriptive Statistics of Age

	Frequency	Percent	Valid Percent	Cumulative Percent
18.00	2	1.3	1.3	1.3
19.00	3	2.0	2.0	3.3
20.00	2	1.3	1.3	4.7
21.00	4	2.7	2.7	7.3
22.00	3	2.0	2.0	9.3
23.00	2	1.3	1.3	10.7
24.00	3	2.0	2.0	12.7
25.00	6	4.0	4.0	16.7
26.00	5	3.3	3.3	20.0
27.00	7	4.7	4.7	24.7
28.00	6	4.0	4.0	28.7
29.00	9	6.0	6.0	34.7
30.00	4	2.7	2.7	37.3
31.00	5	3.3	3.3	40.7
32.00	4	2.7	2.7	43.3
33.00	6	4.0	4.0	47.3
34.00	7	4.7	4.7	52.0
35.00	7	4.7	4.7	56.7
36.00	3	2.0	2.0	58.7
37.00	9	6.0	6.0	64.7
38.00	3	2.0	2.0	66.7
39.00	7	4.7	4.7	71.3
40.00	3	2.0	2.0	73.3
41.00	3	2.0	2.0	75.3
42.00	4	2.7	2.7	78.0
43.00	4	2.7	2.7	80.7
44.00	3	2.0	2.0	82.7
45.00	3	2.0	2.0	84.7
46.00	4	2.7	2.7	87.3
47.00	3	2.0	2.0	89.3
48.00	1	0.7	0.7	90.0
49.00	2	1.3	1.3	91.3
50.00	1	0.7	0.7	92.0
51.00	2	1.3	1.3	93.3
52.00	1	0.7	0.7	94.0
53.00	2	1.3	1.3	95.3
54.00	2	1.3	1.3	96.7
55.00	2	1.3	1.3	98.0
56.00	1	0.7	0.7	98.7
57.00	1	0.7	0.7	99.3
58.00	1	0.7	0.7	100.0

Table 4.2 shows age frequency of participants of study. The highest frequency was observed for ages 29 and 37 years with 9 participants each (6.0%).A

significant proportion of participants (52.0%) were aged 34 years or below, while 47.3% of participants were between 25 to 39 years of age.

4.3. Descriptive statistics of Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	108	72.0	72.0	72.0
Female	42	28.0	28.0	100.0
Total	150	100.0	100.0	

Table 4.3 shows the statistics of frequency and percentage of gender distribution. A total number

of 150 individual participated of which 108 (72%) were male and 42(28%) were female.

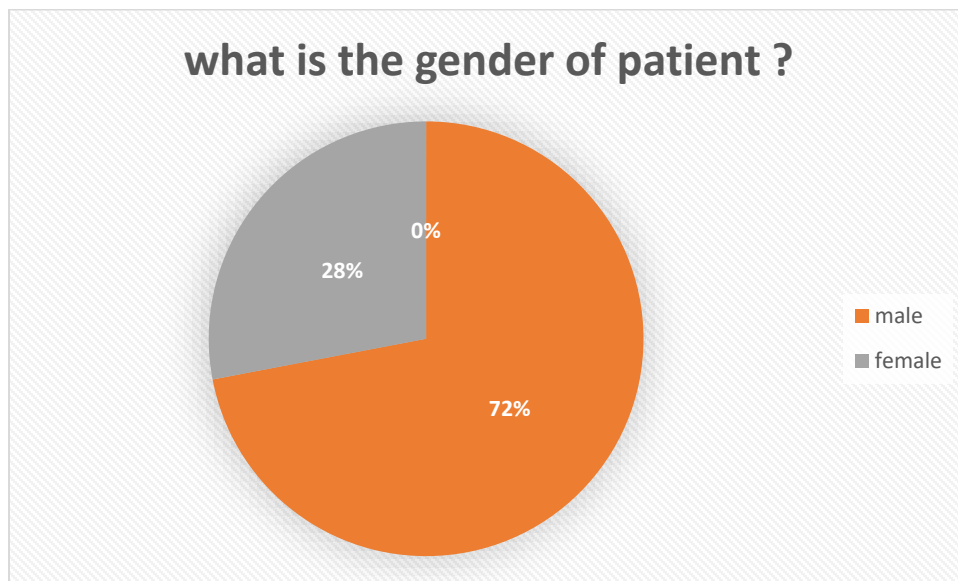


Fig.4.3. Pie chart of gender statistics

4.4. Descriptive statistics of Hamstring tightness Assessment Questionnaire

	Mean	Std. Deviation
Do you feel tightness or stiffness in the back of your thighs during daily activities?	1.88	0.79
How would you describe the stiffness in your hamstring when you wake up in the morning?	1.54	0.98
Do you feel a pulling sensation behind your knee when you try to sit with your legs straight on the floor?	2.00	0.89
When performing the active knee extension, how much resistance do you feel?	2.22	0.87
How much difficulty do you feel while bending forward to touch your toes?	2.35	0.78

Table 4.4 shows descriptive statistics of hamstring tightness assessment questionnaire among individuals with rounded shoulders. The great mean was for "difficulty while bending forward to touch your toes" (M = 2.35, SD = 0.78), followed by "resistance during active knee extension" (M =

2.22, SD = 0.87), indicating moderate to severe tightness during functional movements. The lowest mean was for "morning stiffness in hamstring" (M = 1.54, SD = 0.98), suggesting that hamstring tightness is more prominent during activity-based tasks rather than at rest.

4.5. Descriptive statistics of LEFS

	Mean	Std. Deviation
any usual work, housework or school activities	2.42	1.08
usual hobbies, recreational or sporting activities	2.49	1.10
getting into or out of the bath	3.04	1.24
walking between rooms	3.14	1.02
putting on shoes or socks	3.10	1.21
Squatting	0.97	1.26
lifting an object from floor	2.36	1.17
light activities around home	2.95	1.01
heavy activities around home	0.84	1.07
getting into or out of car	3.25	0.99
walking 2 blocks	3.21	0.93
walking a mile	1.25	1.31
going up or down stairs	1.14	1.37
standing for 1 hour	1.08	1.19
sitting for one hour	3.13	3.61
running on even ground	1.49	1.27
running on uneven ground	0.84	1.19
making fast turns while running fast	0.72	1.11
Hopping	2.58	1.23
rolling over in bed	3.28	1.03

Table 4.5 shows the descriptive statistics of the Lower Extremity Functional Scale (LEFS) among individuals with rounded shoulders. The great mean were for "rolling over in bed" (M = 3.28, SD = 1.03), "getting into or out of car" (M = 3.25, SD = 0.99), and "walking 2 blocks" (M = 3.21, SD = 0.93), minimal difficulty in low-demand daily

activities. The lowest mean were for "making fast turns while running fast" (M = 0.72, SD = 1.11), "heavy activities around home" (M = 0.84, SD = 1.07), and "running on uneven ground" (M = 0.84, SD = 1.19), indicating severe disability in high-demand activities.

4.6. Frequency and Percentage Distribution of Hamstring Tightness Assessment Questionnaire

	Never	Rarely	Frequently	Constantly
Tightness during daily activities	11 (7.3%)	24 (16.0%)	87 (58.0%)	28 (18.7%)

	No stiffness at all	Mild stiffness	Moderate stiffness	Severe stiffness
Morning hamstring stiffness	34 (22.7%)	20 (13.3%)	76 (50.7%)	20 (13.3%)

	No pulling at all	Mild pulling	Moderate discomfort	Significant pain / inability
Pulling sensation behind knee	9 (6.0%)	33 (22.0%)	57 (38.0%)	51 (34.0%)

	No resistance	Slight resistance	Moderate resistance	Severe resistance
Resistance during active knee extension	8 (5.3%)	20 (13.3%)	52 (34.7%)	70 (46.7%)

	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty
Difficulty touching toes	5 (3.3%)	14 (9.3%)	54 (36.0%)	77 (51.3%)

These tables shows frequency and percentage distribution of hamstring tightness assessment questionnaire. Significant hamstring tightness during functional movements was indicated by the majority of participants' reports of "Severe difficulty touching toes" (51.3%) and "Severe

resistance during active knee extension" (46.7%). Additionally, 50.7% reported "Moderate stiffness" in the morning and 58.0% reported "Frequently" tightness during daily activities, indicating that hamstring tightness is a common problem, particularly during active tasks.

4.7. Frequency and Percentage Distribution of LEFS

	Extreme difficulty	Quite a bit difficulty	Moderate difficulty	A little bit difficulty	No difficulty
Any usual work / housework / school activities	7 (4.7%)	20 (13.3%)	55 (36.7%)	39 (26.0%)	29 (19.3%)
Usual hobbies / recreational activities	6 (4.0%)	22 (14.7%)	47 (31.3%)	42 (28.0%)	33 (22.0%)
Getting into/out of bath	14 (9.3%)	5 (3.3%)	14 (9.3%)	45 (30.0%)	72 (48.0%)
Walking between rooms	4 (2.7%)	4 (2.7%)	33 (22.0%)	34 (22.7%)	75 (50.0%)
Putting on shoes/socks	12 (8.0%)	4 (2.7%)	18 (12.0%)	38 (25.3%)	78 (52.0%)
Squatting	72 (48.0%)	34 (22.7%)	31 (20.7%)	7 (4.7%)	5 (3.3%)
Lifting object from floor	14 (9.3%)	19 (12.7%)	40 (26.7%)	52 (34.7%)	25 (16.7%)

Light activities at home	4 (2.7%)	7 (4.7%)	36 (24.0%)	48 (32.0%)	55 (36.7%)
Heavy activities at home	78 (52.0%)	33 (22.0%)	28 (18.7%)	6 (4.0%)	5 (3.3%)
Getting into/out of car	5 (3.3%)	3 (2.0%)	21 (14.0%)	41 (27.3%)	80 (53.3%)
Walking 2 blocks	3 (2.0%)	2 (1.3%)	29 (19.3%)	42 (28.0%)	74 (49.3%)
Walking 1 mile	55 (36.7%)	45 (30.0%)	23 (15.3%)	11 (7.3%)	16 (10.7%)
Going up/down stairs	69 (46.0%)	35 (23.3%)	20 (13.3%)	8 (5.3%)	18 (12.0%)
Standing for 1 hour	66 (44.0%)	32 (21.3%)	33 (22.0%)	11 (7.3%)	8 (5.3%)
Sitting for 1 hour	14 (9.3%)	9 (6.0%)	33 (22.0%)	21 (14.0%)	72 (48.0%)
Running on even ground	43 (28.7%)	36 (24.0%)	39 (26.0%)	18 (12.0%)	14 (9.3%)
Running on uneven ground	81 (54.0%)	40 (26.7%)	13 (8.7%)	4 (2.7%)	12 (8.0%)
Making fast turns while running	93 (62.0%)	26 (17.3%)	17 (11.3%)	8 (5.3%)	6 (4.0%)
Hopping	10 (6.7%)	20 (13.3%)	39 (26.0%)	35 (23.3%)	46 (30.7%)
Rolling over in bed	4 (2.7%)	6 (4.0%)	22 (14.7%)	30 (20.0%)	88 (58.7%)

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The table presents the frequency and percentage distribution of Lower Extremity Functional Scale (LEFS) items. The great "Extreme Difficulty" was reported for "Making fast turns while running" (62.0%), "Running on uneven ground" (54.0%), and "Heavy activities at home" (52.0%), indicating severe functional limitations in high-demand

activities. Most participants reported "No Difficulty" in low-demand tasks like "Rolling over in bed" (58.7%), "Getting into/out of car" (53.3%), and "Walking between rooms" (50.0%), suggesting that basic ADLs remain largely unaffected despite hamstring tightness.

4.8. Normality Tests of Hamstring Tightness Assessment Questionnaire and LEFS

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Do you feel tightness or stiffness in the back of your thighs during daily activities?	0.33	150	0.00	0.81	150	0.00
How would you describe the stiffness in your hamstring when you wake up in the morning?	0.32	150	0.00	0.81	150	0.00

Do you feel a pulling sensation behind your knee when you try to sit with your legs straight on the floor?	0.22	150	0.00	0.84	150	0.00
When performing the active knee extension, how much resistance do you feel?	0.27	150	0.00	0.78	150	0.00
How much difficulty do you feel while bending forward to touch your toes?	0.30	150	0.00	0.75	150	0.00
any usual work, housework or school activities	0.19	150	0.00	0.90	150	0.00
usual hobbies, recreational or sporting activities	0.17	150	0.00	0.90	150	0.00
getting into or out of the bath	0.26	150	0.00	0.74	150	0.00
walking between rooms	0.29	150	0.00	0.77	150	0.00
putting on shoes or socks	0.29	150	0.00	0.73	150	0.00
squatting	0.25	150	0.00	0.73	150	0.00
lifting an object from floor	0.21	150	0.00	0.89	150	0.00
light activities around home	0.21	150	0.00	0.84	150	0.00
heavy activities around home	0.30	150	0.00	0.76	150	0.00
getting into or out of car	0.30	150	0.00	0.73	150	0.00
walking 2 blocks	0.29	150	0.00	0.77	150	0.00
walking a mile	0.24	150	0.00	0.82	150	0.00
going up or down stairs	0.25	150	0.00	0.77	150	0.00
standing for 1 hour	0.25	150	0.00	0.81	150	0.00
sitting for one hour	0.39	150	0.00	0.29	150	0.00
running on even ground	0.17	150	0.00	0.88	150	0.00
running on uneven ground	0.29	150	0.00	0.70	150	0.00
making fast turns while running fast	0.36	150	0.00	0.68	150	0.00
hopping	0.18	150	0.00	0.88	150	0.00

rolling over in bed	0.34	150	0.00	0.72	150	0.00
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This table shows the normality tests of data. As p value is <0.05 is significant, after applying test data was not normally distributed.

4.9. Correlation of LEFS with HTAQ

		LEFS	HTAQ
LEFS	Correlation Coefficient	1.000	-.698**
	Sig. (2-tailed)	.	.001
	N	150	150
HTAQ	Correlation Coefficient	-.698**	1.000
	Sig. (2-tailed)	.001	.
	N	150	150

This table shows the relationship between lower extremity function scale (LEFS) and hamstring tightness assessment test (HTAQ). A statistically significant strong negative correlation was found between HTAQ and LEFS ( $r = -.698$ ,  $p = 0.001$ )

significant at the 0.01 level. This indicates that increase hamstring tightness is strongly associated with decreased lower limb functional ability in individuals with rounded shoulders.

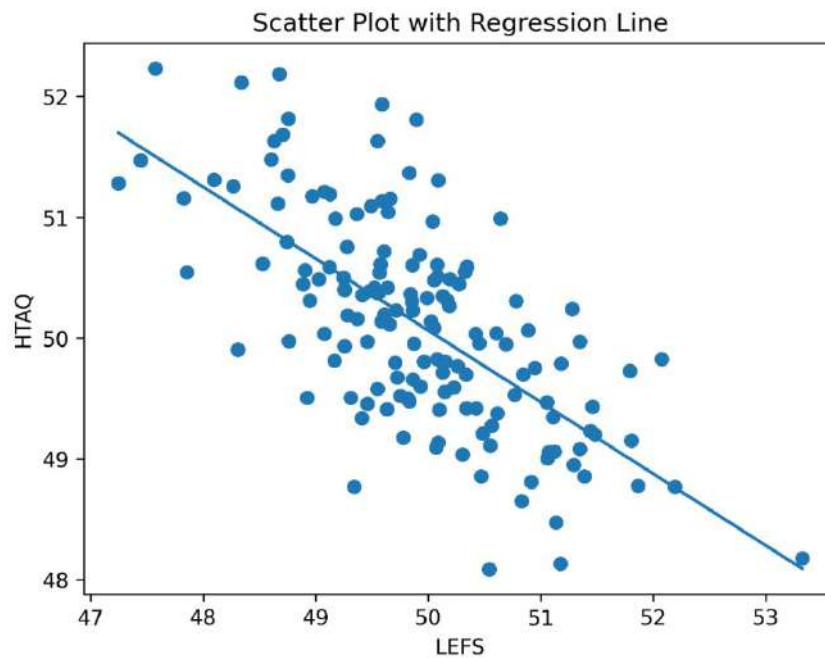


Fig.4.4. shows scatter plot of LEFS and HTAQ have a strong negative relationship

### 5.1. DISCUSSION

This study highlights the interconnected nature of musculoskeletal function, showing that hamstring tightness can contribute to posterior pelvic tilt, altered spinal alignment, and compensatory rounded shoulder posture. It emphasizes that postural deviations affect overall mobility and function, supporting the importance of addressing them to better understand their role in lower limb disability. By identifying the prevalence of hamstring tightness among individuals with rounded shoulders, we can better understand how these postural deviations contribute to lower limb disabilities.

From a pathophysiological perspective, rounded shoulder posture is characterized by scapular protraction, increased thoracic kyphosis, and muscle imbalances, which can initiate a chain of biomechanical changes throughout the body. Increased thoracic kyphosis may lead to compensatory lumbar hyperlordosis and altered pelvic alignment, ultimately affecting the length-tension relationship of the hamstrings (Sepelri et al., 2024; Arif et al., 2022). Fascial continuity, as explained by the superficial back line, further enables the transmission of tension from the upper body to the posterior thigh, contributing to hamstring tightness (Baig et al., 2023). Additionally, prolonged sitting and poor ergonomics—common contributors to rounded shoulder posture—maintain the hamstrings in a shortened position, leading to adaptive tightness and reduced flexibility, while neural connections within the posterior chain, particularly via the dura mater, may also play a role in reinforcing this relationship (Kanishka et al., 2019; Baig et al., 2023).

The findings from the Hamstring Tightness Assessment Questionnaire (HTAQ) indicate a clear pattern of posterior chain restriction. Most participants reported frequent tightness (58.0%) and severe difficulty in the toe touch test (51.3%), reflecting reduced multi-segmental flexibility. The Active Knee Extension test (mean = 2.22, SD = 0.87) further identifies the hamstrings as a key site of limitation. The results of this study demonstrate a high prevalence of hamstring tightness among

individuals with rounded shoulder posture. Participants reported greater difficulty during functional movements such as forward bending and active knee extension, indicating moderate to severe tightness. These findings suggest that hamstring tightness is more evident during activity-based tasks rather than at rest.

LEFS results show a functional contrast: low-demand activities such as rolling in bed were performed easily (58.7% no difficulty), whereas high-demand tasks like fast turning while running (62.0%) and running on uneven surfaces (54.0%) were highly challenging. This suggests that hamstring tightness may be compensated during simple daily tasks but significantly limits performance during physically demanding activities, aligning with previous evidence Encarnación-Martínez et al. (2023), that reduced flexibility negatively affects dynamic stability and agility.

These findings are consistent with prior research. Baig et al. (2023) highlighted the structural and myofascial link between the cervical region and hamstrings via the superficial back line. Similarly, Sepelri et al. (2024) reported that postural deviations, including rounded shoulders, can trigger compensatory changes in distant body segments. In addition, Arif et al. (2022) noted that prolonged poor posture and sedentary behavior play a key role in the development of rounded shoulder posture and related musculoskeletal issues.

A key finding of this study is the strong inverse relationship between hamstring tightness and lower limb function, suggesting that greater tightness is associated with reduced functional ability. This aligns with earlier research indicating that limited hamstring flexibility can negatively affect physical performance and increase the likelihood of functional impairment (Liyana et al., 2024; Encarnación-Martínez et al., 2023).

A key limitation in the existing literature is the lack of studies that directly examine the relationship between rounded shoulder posture (RSP) and hamstring tightness as a primary focus. Most previous research has addressed either rounded shoulders or hamstring tightness

separately within specific occupational groups, without considering their biomechanical linkage. This gap is especially evident in the Pakistani population, where work routines often involve prolonged sitting without proper support and restricted postural positions. The present study helps bridge this gap by offering initial quantitative evidence of a meaningful functional association between these two conditions. It also emphasizes the importance of evaluating posture through a comprehensive, interconnected kinetic chain approach rather than treating body regions as isolated issues.

## 5.2. CONCLUSION

This study concludes that hamstring tightness is strongly and significantly associated with reduced lower limb function in individuals with rounded shoulder posture. The results indicate that greater hamstring restriction—potentially linked to upper body postural changes through interconnected myofascial pathways—contributes to noticeable difficulty in demanding lower extremity activities. These findings emphasize the importance of evaluating the body as an integrated kinetic chain rather than focusing on isolated postural issues in clinical practice.

## 5.3. LIMITATIONS

- The cross-sectional design limits causal inference.
- Non-probability convenient sampling reduces generalizability.
- Study conducted in a single region limits population diversity.
- Self-reported measures may introduce response bias.
- Confounding variables such as BMI, physical activity, and occupation were not fully explored.

## 5.4. RECOMMENDATIONS

- Future research should adopt longitudinal or experimental designs to better determine causal relationships.
- Studies with larger, multi-center samples are needed to improve generalizability.

- Clinical evaluations should consider both upper and lower body regions due to their interdependence.
- Early interventions focusing on postural correction are recommended.
- Rehabilitation programs should combine stretching, strengthening, and ergonomic adjustments.
- Further studies should investigate the influence of lifestyle and occupational factors.

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