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PREVALENCE AND SEVERITY OF HAMSTRING TIGHTNESS WITH ASSOCIATED FACTORS AMONG STUDENTS AT IQRA NATIONAL UNIVERSITY, SWAT CAMPUS

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ABSTRACT

Background: *Hamstring muscle tightness is one of the most common musculoskeletal issues that significantly affects posture, flexibility, and daily activities. University students are at a high risk for the disorder due to prolonged sitting during lectures, limited physical activity, and a lack of regular stretching exercises that may contribute to hamstring tightness.*

Objective: *The purpose of this study is to determine the prevalence of hamstring tightness among students, including both males and females, from all departments at Iqra National University, Swat Campus.*

Methodology: *The study was conducted during the spring 2025 session using Stratified Random Sampling as the sampling method, and a total of 313 students were included in the study, who met the inclusion and exclusion criteria. An outcome physical test known as the Passive Knee Extension (PKE) test was used to assess hamstring tightness.*

Results: *The study results showed that the prevalence of hamstring tightness in the right leg was 285 (91.1%), and in the left leg, it was 282 (90.1%). The prevalence of gender was higher among females, at 96 (92.3%) in the right leg, while it was 92 (88.5%) in the left leg. Males showed 189 (90.4%) in the right leg and 190 (90.9%) in the left leg. In terms of severity, Normal were (8.9%), Mild was (17.6%), Moderate were (32.6%) and Severe were (40.9%). Department-wise prevalence was highest in English and BBA departments (100%), and was lowest in DPT department (80.8%). Prolong sitting was highly associated with hamstring tightness. In the bottom line, overall prevalence was observed 92%.*

Conclusion: *The study concluded that the prevalence was higher in the right leg than in the left leg. Female participants showed a higher prevalence than male participants. In terms of severity right leg is prone to severe severity while left leg has moderate severity. Most departments showed a higher prevalence, while the lowest prevalence was observed in the DPT and BS CS department and Prolong sitting was highly associated with hamstring tightness.*

Keywords: *Hamstring tightness, Prevalence, Undergraduate students, Passive Knee Extension.*

INTRODUCTION

Background

Hamstring tightness is a prevalent musculoskeletal issue often experienced by individuals who engage in prolonged sitting, including students, office workers, and healthcare professionals (Jamil et al., 2024). The hamstrings are a group of three thigh muscles, including biceps femoris, semi-tendinosus, and semi-membranosus, that cross both the hip and knee joints and are responsible for hip extension and knee flexion (Narkhede et al., 2024). During

prolonged sitting, these muscles remain shortened, leading to adaptive shortening and reduced range of motion over time due to the tightness of the vessels that supply the hamstring muscles (Jabbar et al., 2021). Adaptation from prolonged sitting also contributes to changes in pelvic tilts, such as posterior pelvic tilt (PPT) and flattening of the lumbar spine, which increases strain on intervertebral discs and reduces lumbar lordosis (Yadav & Basista, 2020). This postural stress can result in pain, spinal dysfunction, and muscular imbalance (Mane & Yadav, 2024). The Knee Extension Angle (KEA) is a clinical tool used to assess the severity of hamstring tightness, classifying it as mild (21 – 30 degrees), moderate (31 – 40 degrees), or severe (>40 degrees) (Sareen & Prakash, 2021). Flexibility loss also affects strength, stability, and proprioception, increasing the risk of soft tissue injuries and poor neuromuscular coordination (Pusegaonkar, 2023). A study reported that 85.7% of healthcare workers exhibited signs of hamstring tightness, with dominance in the right leg (Jamil et al., 2024). Similarly, the study investigated adolescents aged 13 to 17. They reported an 83.8% prevalence of hamstring tightness based on the Passive Straight Leg Raise (PSLR) test, with a statistically significant association to prolonged sitting hours ($p = 0.004$) (Ilyas et al., 2025).

Hamstring muscle tightness is increasingly prevalent among university students aged 18 to 25 years, a population characterized by long study hours and sedentary routines (Liyanage et al., 2024). In a study conducted on medical and allied health students, the prevalence was reported to be 68%, with a significantly higher occurrence in females (96%) compared to males (4%) (Liyanage et al., 2024). The difference between genders may be attributed to variations in muscle mass, flexibility habits, and posture awareness (Khalil et al., 2022). It has been found that prolonged sitting causes severe hamstring muscle tightness, leading to pelvic rotation abnormalities and decreased lumbar curvature (Tiwari et al., 2023). Such muscular imbalance results in changes to the lumbar-pelvic rhythm, distorts normal spinal alignment, and increases the chances of musculoskeletal dysfunction (Jori & Jeswani, 2023). As the hamstring muscles remain tight, they restrict hip mobility, leading to compensatory stress on the lower back and knees (Ayeni et al., 2024). While hamstring tightness might initially seem harmless, its long-term impact can limit range of motion, lead to poor dynamic balance, and reduce physical performance (Pusegaonkar, 2023). Despite its high prevalence, many students remain unaware of their flexibility deficits until they develop symptoms such as tightness, discomfort, or functional limitations during activities like walking, squatting, or stretching (Ishaque et al., 2022). Furthermore, improper chair ergonomics, inadequate movement during study sessions, and poor posture habits can accelerate the onset of muscle shortening and increase the risk of associated back pain (Mane & Yadav, 2024).

The identification of hamstring tightness and its contributing factors in university students is crucial for the early prevention of musculoskeletal disorders (Narkhede et al., 2024). Students commonly sit for 6 to 8 hours daily, especially during academic sessions and clinical postings, which places prolonged tension on the posterior thigh muscles and reduces flexibility over time (Behera et al., 2024). Tight hamstrings are known to reduce the range of motion (ROM) at both the hip and knee joints, shifting pelvic alignment, and impairing normal lumbar curvature (Khalil et al., 2022). Hamstring muscle injuries are classified into three grades based on the severity of the injury: mild strain or pull of a muscle (grade 1), partial muscle tear (grade 2), and complete muscle tear (grade 3). Inflexible muscles are one of the major contributing risk factors (Ayeni et al., 2024). Such injuries may result in pain, reduced performance in physical activities, and long-term functional limitations, particularly in students and athletes (Ishaque et al., 2022). However, the current findings from research support those of previous studies, which specify an association between tight hamstrings and secondary issues, including lower back pain, patellofemoral syndrome, and poor posture (Mane & Yadav, 2024). By assessing hamstring tightness, prevalence, and severity, our study demonstrates how lifestyle factors, such as prolonged sitting duration and ergonomic settings, affect the musculoskeletal systems of young adults (Kamalakannan et al., 2020). The findings of this study could support the development of screening procedures, pre-awareness campaigns, and intervention programs, such as stretching routines, proprioceptive neuromuscular facilitation (PNF), electrotherapy, massage, dry

needling, and ergonomic adjustments, to treat hamstring tightness in university students (Liyanage et al., 2024)

AIM & OBJECTIVES

AIM:

This research aims to determine the prevalence of hamstring tightness among students both genders male, female and their departments of study at Iqra National University, Prof. Dr. Shah Jehan Campus, with associated lifestyle factors such as physically active or inactive, thigh pain or discomfort, prolonged sitting, and a sedentary lifestyle with the additions of age groups and finding the severity of the hamstring tightness.

OBJECTIVES:

1. To find the prevalence and severity of hamstring tightness among university students.
2. To compare the prevalence and severity of hamstring tightness between males and females.
3. To find department-wise variations in the prevalence and severity of hamstring tightness.

METHODOLOGY

3.1 Study Design:

Regarding the study design, this is a cross-sectional research study aimed at determining the prevalence of hamstring tightness among students at Iqra National University, Prof. Dr Shah Jehan Campus. This study design is used to gather data in a single time frame. It is, therefore, the most suitable for establishing frequency and distribution of hamstring tightness in the specified population.

3.2 Study Setting:

This cross-sectional study was conducted at Iqra National University, Prof Dr Shah Jehan Campus. Participants were taken from all the departments to collect and analyze the data comprehensively.

3.3 Study Duration:

This study took 4 months, commencing after the proposal was accepted, including data collection, thesis writing, statistical analysis, and the presentation of final reports.

3.4 Sample Size:

Sample size is calculated using the Taro Yamane formula (n = N / (1 + N * e^2) where n = sample size, N = total population, and e = 5% margin of error and 95% confidence rate. The study included 313 subjects, which enabled proper statistical analysis to ensure a precise representation of the participants.

3.5 Sampling Technique:

A stratified random sampling technique is used for this study. Each university department was divided into strata, ensuring equal representation from each department. The sample size for each department (stratum) is also calculated by the Cochran formula for proper allocation, ni = (Ni × n / N), where ni = Sample size for the department, Ni = Total students in the department, N = Total university population, and n = Total sample size. This method ensured proper proportional allocation of sample size for each department.

Department	Total Students (Ni)	Calculation (Ni × n / N)	Sample Size (ni)
DPT	117	117 × 313 / 1432	26
BS Radiology	422	422 × 313 / 1432	92
BS MLT	60	60 × 313 / 1432	13
BS Anesthesia	104	104 × 313 / 1432	23
BS Surgical	61	61 × 313 / 1432	13
BS Dental	293	293 × 313 / 1432	64
BS English	32	32 × 313 / 1432	07
BB Administration	88	88 × 313 / 1432	19
BSN (Generic)	100	100 × 313 / 1432	22
BS CS	155	155 × 313 / 1432	34
Total	1432		313

3.6 Sampling Selection:

3.6.1 Inclusion Criteria:

- Students enrolled at Iqra National University, Swat Campus.
- Age 18 to 30.
- Both Male and Female.

3.6.2 Exclusion Criteria:

- Students with any hamstring injury within the last 2 years.
- Low back pain for the past 2 months.
- Lower limb neurological conditions.
- History of lower limb fracture.
- Any spine fracture in the last 2 years.
- Students who come to university less than 4 days a week.

3.7 Assessment Tools:

A Goniometer is used to measure the knee extension angle. The round immovable axis, also known as the stationary arm of the goniometer, is placed at the lateral epicondyle of the femur and pointed towards the greater trochanter of the femur. In contrast, the moving arm of the goniometer should be pointed toward the lateral malleolus of the ankle joint. A Clinical couch was used to perform a Passive knee extension test (PKE). Several physical tests are used to assess hamstring tightness, including the Passive Straight Leg Raise (PSLR) test, Sit and Reach (SR) test, Finger Floor Distance (FFD) test, and Active Knee Extension (AKE) test. Still, among all these physical tests, the Knee Extension Angle (KEA) has an Intra-Tester reliability of 0.99, and the Passive Knee Extension (PKE) test has an Intra-Tester reliability of 0.97-0.98. These tests are considered the gold standard measures for assessing hamstring tightness. The self-structured questionnaire and Excel sheet was used to gather the subject demographic, physical activity, lifestyle data, and test angles.

3.8 Ethical Consideration:

In light of this, the study adhered to the ethical guidelines established by the Iqra National University Ethical Committee. Before data collection, informed consent forms were obtained from participants. Throughout the study, participant data, anonymity, and confidentiality were maintained and were not published in an article or on other websites to ensure privacy.

3.9 Data Collection Procedure:

Departments were selected using the stratified random sampling method. The subjects underwent a physical assessment and passive knee extension (PKE) test to find the knee extension angle (KEA). A self-structured questionnaire, including demographic, physical activity, lifestyle, and test angle results, was collected as part of the data.

A (Starting Position):

The subject is lying supine (on their back).
One hip is flexed to 90° and stabilized in that position by the examiner.
The opposite leg remains flat on the table to prevent pelvic tilt or compensation.

B (Movement):

From this 90° hip flexion position, the examiner passively extends the subject's knee.
The examiner stabilizes the thigh to maintain hip flexion at 90°, ensuring that any restriction is due to the hamstring, not hip movement.

C (Measurement):

The hip is still fixed at 90° flexion.
The examiner has extended the knee to the maximum possible without forcing.
At this point, the subject feels tightness or mild discomfort in the back of the thigh. This is the endpoint of the test.
The angle (26°) is the extension deficit, meaning the leg could not reach full straightening (0°).

3.10 Data Analysis:

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS, version 27.0). Descriptive statistics were performed to calculate frequencies and percentages of the categorical variable. Cross-tabulations have been conducted to identify the pattern of hamstring tightness by gender, academic department, and other related behavioral factors, including duration of sitting, physical activity, and stretching habits. Furthermore, Chi-square tests made the direct observations statistically meaningful. These findings were presented in tables and graphs to facilitate comparison and better understanding of their meaning.

1) Physical Activity and Lifestyle Factors by Age

Regular physical activity was common in the 18-22 age group (n = 257), at 79.0%, slightly higher in the 23-26 group (n = 54), at 83.3%, and lowest in the 27-30 group (n = 2), at 50%. Despite these, many participants will experience symptoms of hamstring tightness. Muscle stiffness after sitting was a key indicator reported by 45.1% (18-22), 42.6% (23-26), and 100% (27-30), suggesting that age may contribute to its development. Stretching habits were poor, with only 27.2% of 18-22-year-olds practicing regular stretching, dropping to 0% in the 27 - 30 group. Most students spent long hours daily, with 38.1% of 18-22-year-olds sitting for 4-6 hours per day.

RESULT

Table 1: This table shows that most subjects in the 18- to 22-year-old group were physically active, and muscle stiffness after sitting and frequent thigh pain were also higher in this group. Regular stretching exercises were low in the 18 to 22-year-old group.

Variable	Category	18–22 years (n=257)	23–26 years (n=54)	27–30 years (n=2)
Regular Physical Activity	Yes	203 (79.0%)	45 (83.3%)	1 (50.0%)
	No	54 (21.0%)	9 (16.7%)	1 (50.0%)
Duration of Activity	<1 hour	93 (36.2%)	16 (29.6%)	1 (50.0%)
	1–3 hours	95 (37.0%)	29 (53.7%)	1 (50.0%)
	4–6 hours	52 (20.2%)	7 (13.0%)	0 (0.0%)
	>6 hours	17 (6.6%)	2 (3.7%)	0 (0.0%)
Muscle Stiffness After Sitting	Yes	116 (45.1%)	23 (42.6%)	2 (100.0%)
	No	141 (54.9%)	31 (57.4%)	0 (0.0%)
Frequent Thigh Pain	Yes	118 (45.9%)	26 (48.1%)	2 (100.0%)
	No	139 (54.1%)	28 (51.9%)	0 (0.0%)
Regular Stretching Exercises	Yes	70 (27.2%)	20 (37.0%)	0 (0.0%)
	No	187 (72.8%)	34 (63.0%)	2 (100.0%)
Sitting Duration	<2 hours	39 (15.2%)	7 (13.0%)	1 (50.0%)
	2–4 hours	80 (31.1%)	22 (40.7%)	0 (0.0%)
	4–6 hours	98 (38.1%)	21 (38.9%)	0 (0.0%)
	>6 hours	40 (15.6%)	4 (7.4%)	1 (50.0%)

2) Cumulative Prevalence of Hamstring Tightness

A cumulative prevalence of hamstring tightness has been observed including both legs, among 313 subjects 288 subjects had hamstring tightness and 25 subjects were in normal category which is equivalent to 92%.

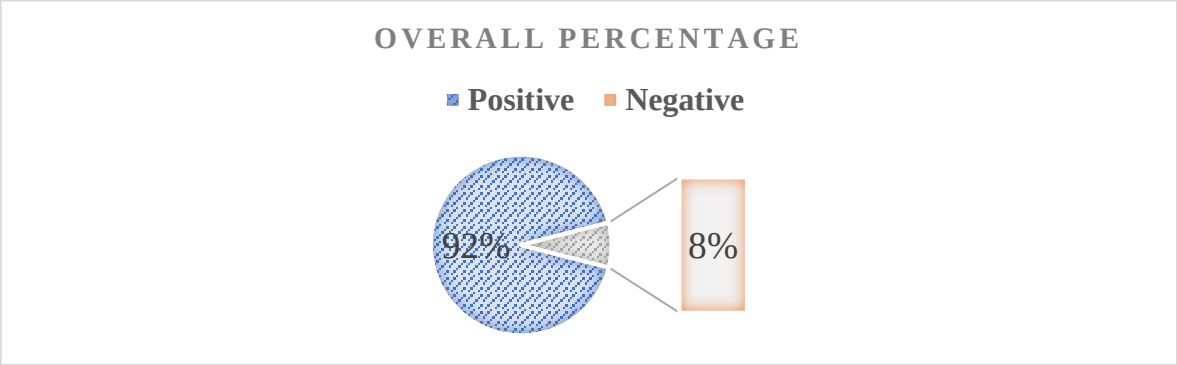


Figure 1: Overall hamstring tightness prevalence: 92% (288/313 subjects), with 8% normal.

3) Prevalence of the Right and Left Leg

Out of 313 subjects, 285 (91.1%) were right leg positive, 28 were left leg negative, and 282 (90.1%) were left leg positive, with 31 being left leg negative. These data show a high prevalence of leg dominance across both the right and left legs.

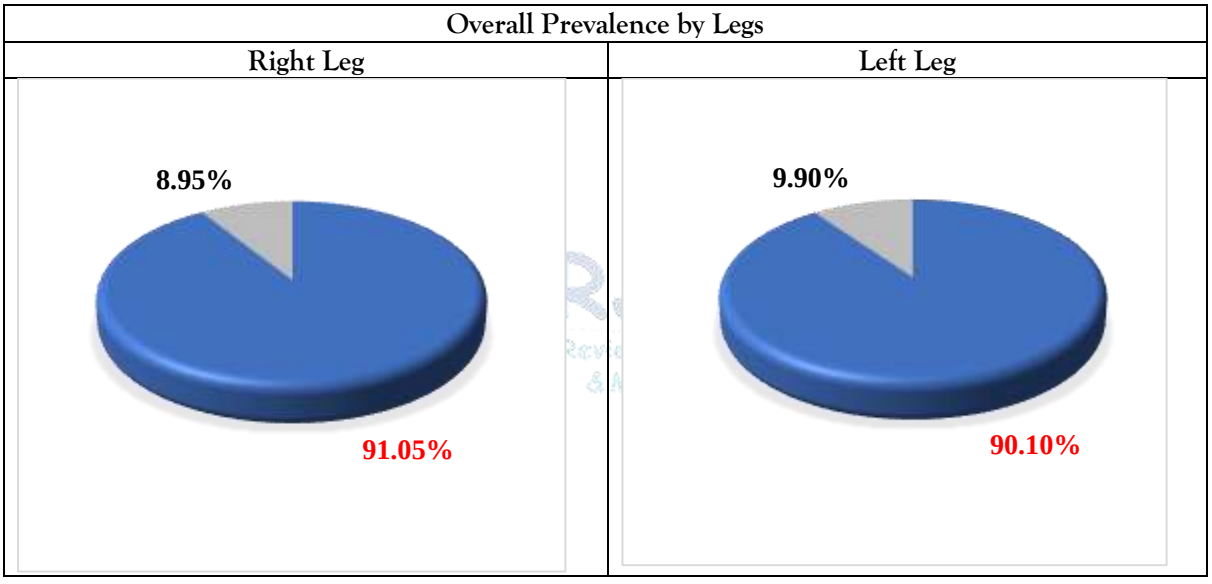


Figure 2: This figure shows the difference in the overall prevalence of hamstring tightness between the right and left legs among 313 participants. Hamstring tightness was observed (91.05%) in the right leg and (90.10%) in the left leg.

4) Hamstring Tightness Severity by Age Groups

The severity of hamstring tightness by age of the right and left legs. Among subjects aged 18-22 years (n = 257), those with the right leg were highly prone to severe hamstring tightness (n = 112, 43.6%), while those with the left leg had moderate hamstring tightness (n = 97, 37.7%), while 27-30 years (n = 2) were 1 mild and 1 severe.

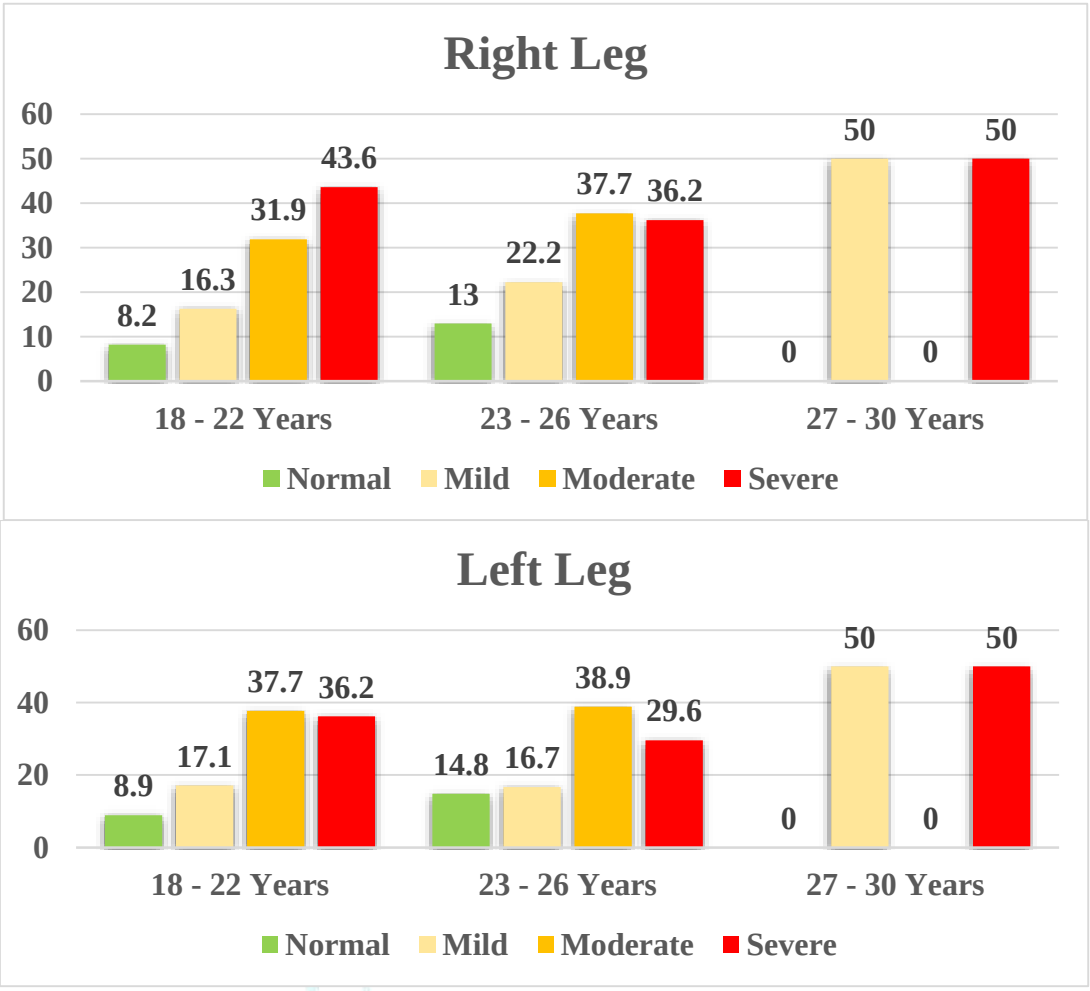


Figure 3 and 4: These Figures show hamstring tightness severity in right and left legs across age groups. The 18-22 years group had severe right leg tightness, while the 23-26 years group had moderate tightness in both legs. The 27-30 years group showed highest severity in both legs, but with only 2 subjects (1 mild, 1 severe).

5) Physical Activity and Lifestyle Factors by Gender

higher percentage of males (81.3%) than females (76.0%) engage in regular physical activity. Males were also more likely to be active for longer durations, with 49.3% exercising for 1-3 hours, compared to 45.2% of females who exercised for less than 1 hour. Muscle stiffness after sitting was more commonly reported by females (64.4%) than by males (35.4%), and frequent thigh pain was also higher among females (65.4%) compared to males (36.8%). Fewer females (17.35%) performed regular stretching exercises than males (34.4%). In terms of sitting duration, most participants sat for 2-6 hours daily, though a higher proportion of females (20.2%) reported sitting for over 6 hours compared to males (11.5%). Overall, males showed higher activity levels and lower sedentary-related complaints than females.

Table 2: This table shows the gender-wise distribution of physical activity and lifestyle factors. Regular physical activity was observed in 170 males and 79 females. Muscle stiffness was (35.4%) in males and (64.4%) in females.

Variable	Category	Male (n=209)	Female (n=104)
Regular Physical Activity	Yes	170 (81.3%)	79 (76.0%)
	No	39 (18.7%)	25 (24.0%)
Duration of Activity	<1 hour	63 (30.1%)	47 (45.2%)

	1–3 hours	103 (49.3%)	22 (21.2%)
	4–6 hours	32 (15.3%)	27 (26.0%)
	>6 hours	11 (5.3%)	8 (7.7%)
Muscle Stiffness After Sitting	Yes	74 (35.4%)	67 (64.4%)
	No	135 (64.6%)	37 (35.6%)
Frequent Thigh Pain	Yes	77 (36.8%)	68 (65.4%)
	No	132 (63.2%)	36 (34.6%)
Regular Stretching Exercises	Yes	72 (34.4%)	18 (17.3%)
	No	137 (65.6%)	86 (82.7%)
Sitting Duration	<2 hours	28 (13.4%)	19 (18.3%)
	2–4 hours	78 (37.3%)	23 (22.1%)
	4–6 hours	79 (37.8%)	41 (39.4%)
	>6 hours	24 (11.5%)	21 (20.2%)

6) Prevalence of the Right Leg and Left Leg Hamstring Tightness by Gender

The prevalence of hamstring tightness by gender. Among males (n = 209), 90.4% showed tightness in the right leg and 90.9% in the left leg. In comparison, 92.3% of females (n = 104) experienced tightness in the right leg, while 88.5% showed tightness in the left leg. Overall, out of the total 313 participants, 91.1% exhibited hamstring tightness in the right leg and 90.1% in the left leg.

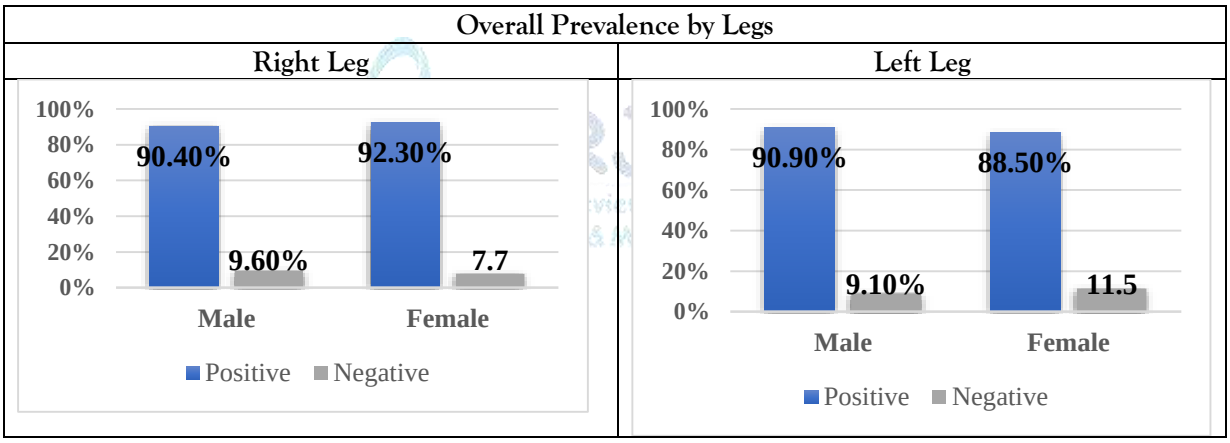
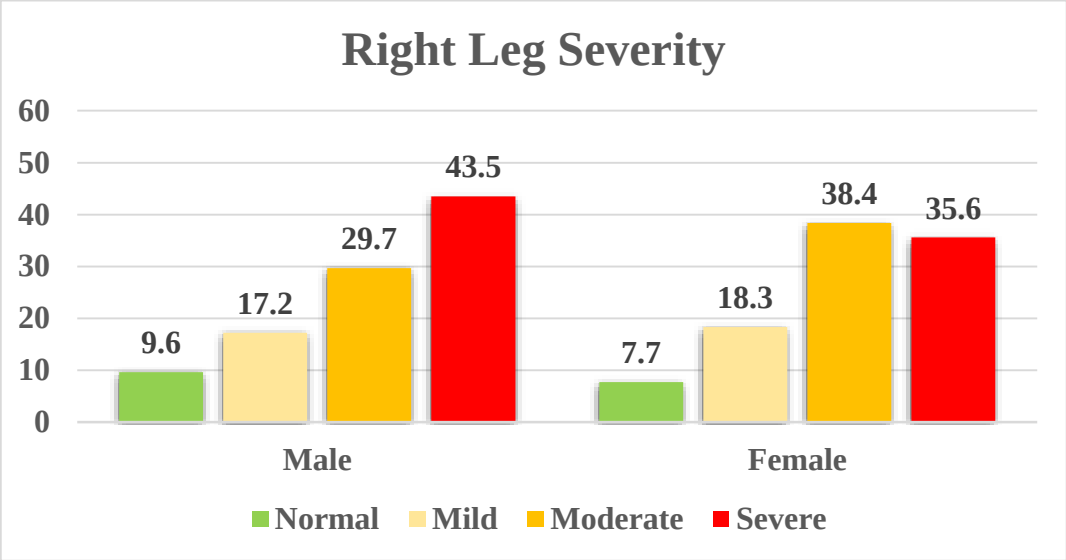


Figure 5 and 6: These figures show gender-wise prevalence of hamstring tightness. Females had slightly higher right leg tightness (92.3% vs 90.4% in males), but lower left leg tightness (88.5% vs 90.9% in males).

7) Hamstring Tightness Severity by Gender

The severity of right leg hamstring tightness across genders. Among males (n = 209), 43.5% experienced severe tightness, 29.7% moderate, 17.2% mild, and 9.6% reported normal levels. Among females (n = 104), 35.6% had severe tightness, 38.4% had moderate tightness, 18.3% had mild tightness, and 7.7% had normal tightness. Overall, out of 313 participants, 40.9% had severe tightness, 32.6% moderate tightness, and 17.6% mild tightness, while only 8.9% had a normal hamstring condition. This indicates that moderate to severe hamstring tightness was most prevalent in both genders.

The severity of the left leg hamstring tightness by gender. Among males (n = 209), 39.7% experienced severe tightness, 36.8% moderate, 14.4% mild, and 9.15% reported normal. For females (n = 104), 26.0% had severe, 39.4% had moderate, 23.1% had mild, and 11.5% were normal. Overall, out of 313 participants, 35.1% experienced severe tightness, 37.7% had moderate tightness, 17.3% had mild tightness, and 9.9% had normal tightness. Moderate tightness was most common across both genders.



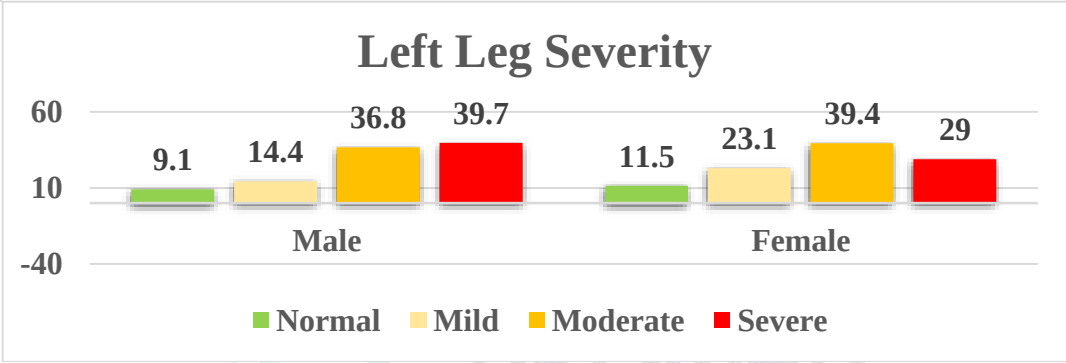


Figure 7 and 8: These Figures show hamstring tightness severity by gender. In both legs, males had more severe tightness (43.5% right, 39.7% left), while females had more moderate tightness (38.4% right, 39.4% left). Right leg was more prone to severe tightness (40.9%), left leg to moderate tightness (37.7%).

8) Physical Activity and Lifestyle Factors by Departments (DPT, BS CS, BS Dental, BS Radiology, BS Surgical)

The frequency of regular stretching, muscle stiffness, physical exercise, thigh pain, and sitting duration in five different departments. DPT, BS CS, BS Dental, BS Radiology, and BS Surgical. The table shows that high physical activity was observed in BS Surgical (100%), followed by BS CS (82.4%), and BS Radiology (80.4%). Regular stretching was less common across all departments. Muscle stiffness and frequent thigh pain were reportedly high in BS Radiology, which suggests a possibility of low stretching occurrence and increased musculoskeletal problems.

Table 3: This table shows department-wise distribution of physical activity and lifestyle factors: DPT, BS CS, BS Dental, BS Radiology, and BS Surgical showed the highest rate of physical activity, while BS CS had the highest rate of 4-6 hours sitting duration (41.2%). BS Radiology and BS Dental reported a high incidence of thigh pain (60.9% and 50.0%) respectively.

Variable	Category	DPT (n=26)	BS CS (n=34)	BS Dental (n=64)	BS Radiology (n=92)	BS Surgical (n=13)
Regular Physical Activity	Yes	19 (73.1%)	28 (82.4%)	47 (73.4%)	74 (80.4%)	13 (100.0%)
	No	7 (26.9%)	6 (17.6%)	17 (26.6%)	18 (19.6%)	0 (0.0%)

Duration of Physical Activity	<1 hour 1-3 hours 4-6 hours >6 hours	5 (19.2%) 20 (76.9%) 1 (3.8%) 0 (0.0%)	10 (29.4%) 15 (44.1%) 8 (23.5%) 1 (2.9%)	29 (45.3%) 17 (26.6%) 15 (23.4%) 3 (4.7%)	34 (37.0%) 20 (21.7%) 28 (30.4%) 10 (10.9%)	1 (7.7%) 10 (76.9%) 2 (15.4%) 0 (0.0%)
Muscle Stiffness	Yes No	3 (11.5%) 23 (88.5%)	13 (38.2%) 21 (61.8%)	34 (53.1%) 30 (46.9%)	55 (59.8%) 37 (40.2%)	5 (38.5%) 8 (61.5%)
Frequent Thigh Pain	Yes No	12 (46.2%) 14 (53.8%)	6 (17.6%) 28 (82.4%)	32 (50.0%) 32 (50.0%)	56 (60.9%) 36 (39.1%)	5 (38.5%) 8 (61.5%)
Regular Stretching Exercises	Yes No	7 (26.9%) 19 (73.1%)	9 (26.5%) 25 (73.5%)	9 (14.1%) 55 (85.9%)	20 (21.7%) 72 (78.3%)	7 (53.8%) 6 (46.2%)
Sitting Duration	<2 hours 2-4 hours 4-6 hours >6 hours	2 (7.7%) 15 (57.7%) 9 (34.6%) 0 (0.0%)	2 (5.9%) 14 (41.2%) 14 (41.2%) 4 (11.8%)	9 (14.1%) 22 (34.4%) 26 (40.6%) 7 (10.9%)	15 (16.3%) 19 (20.7%) 35 (38.0%) 23 (25.0%)	4 (30.8%) 4 (30.8%) 5 (38.5%) 0 (0.0%)

Departments (BS MLT, BS Anesthesia, BBA, BS English, BS Nursing)

The department's associated factors variables for five departments: BS Anesthesia, BS MLT, BBA, BS English, and BS Nursing. Physical activity and stretching exercises are more commonly seen in BS Nursing (90.9%) and BS MLT (84.6%). From the table, it was observed that there was less stretching and more sitting duration noted in all departments.

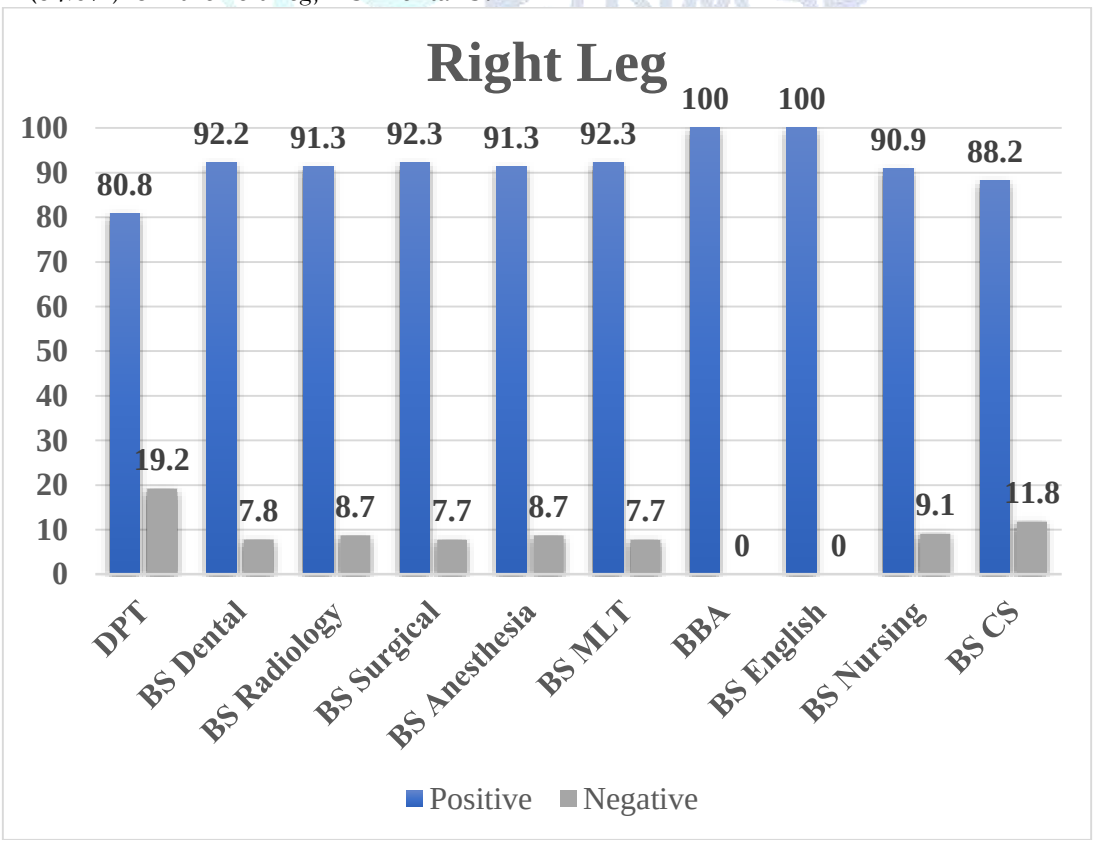
Table 4: This table presents the department distribution of physical activity and lifestyle factors, showing that BS MLT, BS Anesthesia, BBA, BS English, and BS Nursing had the highest rate of physical activity. At the same time, the absence of regular stretching habits was observed in BS Anesthesia (52.2%), BS MLT (53.8%), BBA (68.4%), BS English (57.1%), and BS Nursing (54.5%).

Variable	Category	BS Anesthesia (n=23)	BS MLT (n=13)	BBA (n=19)	BS English (n=7)	BS Nursing (n=22)
Regular Physical Activity	Yes No	18 (78.3%) 5 (21.7%)	11 (84.6%) 2 (15.4%)	16 (84.2%) 3 (15.8%)	3 (42.9%) 4 (57.1%)	20 (90.9%) 2 (9.1%)
Duration of Physical Activity	<1 hour 1-3 hours 4-6 hours >6 hours	9 (39.1%) 10 (43.5%) 2 (8.7%) 2 (8.7%)	5 (38.5%) 8 (61.5%) 0 (0.0%) 0 (0.0%)	7 (36.8%) 8 (42.1%) 2 (10.5% 2 (10.5%)	3 (42.9%) 4 (57.1%) 0 (0.0%) 0 (0.0%)	7 (31.8%) 13 (59.1%) 1 (4.5%) 1 (4.5%)

Muscle Stiffness	Yes	9 (39.1%)	1 (7.7%)	7 (36.8%)	3 (42.9%)	11 (50.0%)
	No	14 (60.9%)	12 (92.3%)	12 (63.2%)	4 (57.1%)	11 (50.0%)
Frequent Thigh Pain	Yes	12 (52.2%)	1 (7.7%)	5 (26.3%)	5 (71.4%)	12 (54.5%)
	No	11 (47.8%)	12 (92.3%)	14 (73.7%)	2 (28.6%)	10 (45.5%)
Regular Stretching Exercises	Yes	11 (47.8%)	6 (46.2%)	6 (31.6%)	3 (42.9%)	10 (45.5%)
	No	12 (52.2%)	7 (53.8%)	13 (68.4%)	4 (57.1%)	12 (54.5%)
Sitting Duration	<2 hours	3 (13.0%)	2 (15.4%)	5 (26.3%)	3 (42.9%)	2 (9.1%)
	2-4 hours	12 (52.2%)	5 (38.5%)	2 (10.5%)	0 (0.0%)	9 (40.9%)
	4-6 hours	8 (34.8%)	6 (46.2%)	6 (31.6%)	2 (28.6%)	8 (36.4%)
	>6 hours	0 (0.0%)	0 (0.0%)	6 (31.6%)	2 (28.6%)	3(13.6%)

9) Prevalence of the Right Leg and Left Leg Hamstring Tightness by Departments

prevalence of hamstring tightness in both legs across all departments. BBA (n = 19) and BS English (n = 7) presented (100%) prevalence of hamstring tightness in the right and left leg followed by BS Surgical 12 (92.3%) on the right leg, 11 (84.6%) on the left leg, BS Dental 59 (92.2%) on both legs, BS MLT 12 (92.3%) on both legs, BS Anesthesia 21 (91.3%) both legs, BS Radiology 84 (91.3%) on the right leg, 82 (89.1%) on the left leg, BS Nursing 20 (90.9%) on both legs, BS CS 30 (88.2%) on both legs, DPT showed the lowest prevalence of tightness (80.8%) across all departments.



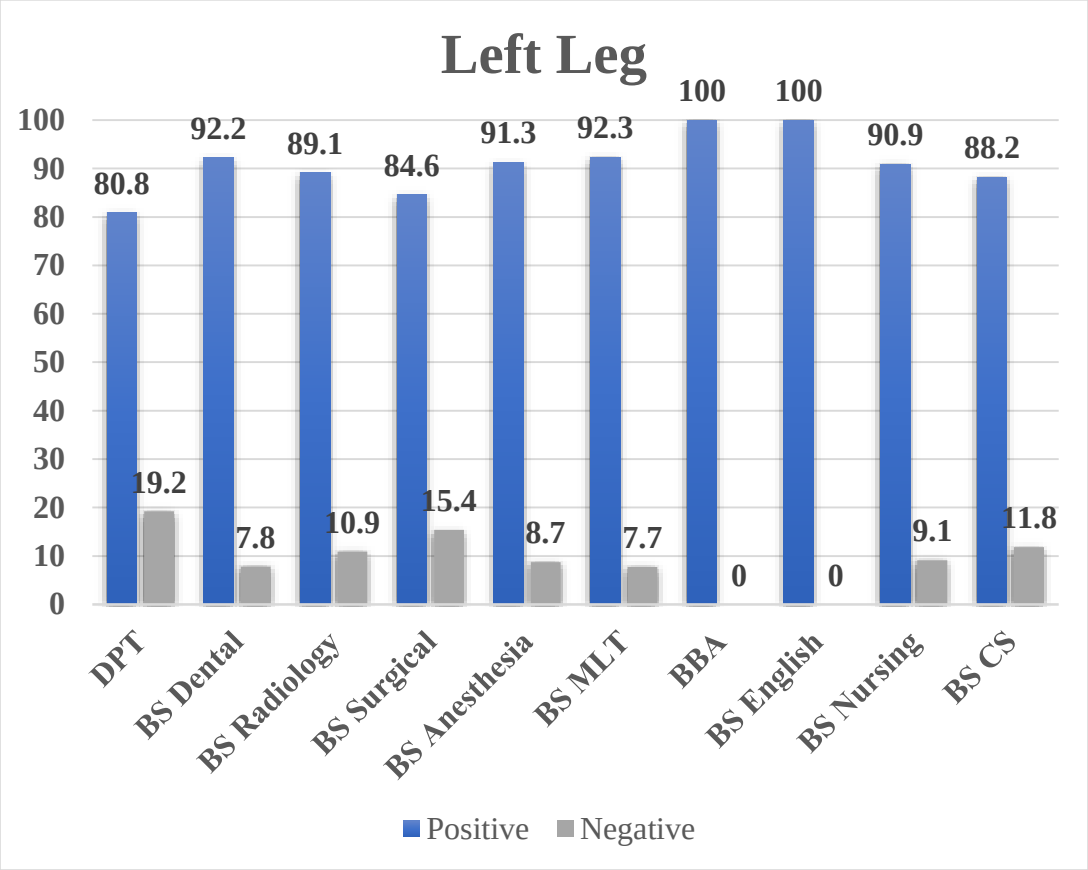


Figure 9 and 10: These figures show department-wise hamstring tightness prevalence. BS English and BBA had 100% prevalence in both legs. BS MLT had 92.3% prevalence (right) and 92.3% (left). DPT had the lowest prevalence in both legs.

10) Hamstring Tightness Severity by Departments

The severity of tightness in the right leg across all departments. Severe hamstring tightness is found in BS MLT (61.5%), followed by BS Anesthesia (47.8%), and BS Dental (46.9%). Surprisingly, the right leg is more prone to severe hamstring tightness (n = 128, 40.9%) in severe cases.

Table 5: This table shows the severity of hamstring tightness by Departments in the right leg. The right leg is prone to severe severity (40.9%). The highest severity was observed in BS MLT (61.5%) and BS English (57.1%), while the lowest severity was observed in BS Nursing (27.3%).

Department	Normal	Mild	Moderate	Severe	Total (n)
DPT	5 (19.2%)	4 (15.4%)	8 (30.8%)	9 (34.6%)	26 (100%)
BS CS	4 (11.8%)	6 (17.6%)	13 (38.2%)	11 (32.4%)	34 (100%)
BS Dental	5 (7.8%)	12 (18.8%)	17 (26.6%)	30 (46.9%)	64 (100%)
BS Radiology	8 (8.7%)	15 (16.3%)	34 (37.0%)	35 (38.0%)	92 (100%)
BS Surgical	1 (7.7%)	4 (30.8%)	2 (15.4%)	6 (46.2%)	13 (100%)
BS Anesthesia	2 (8.7%)	3 (13.0%)	7 (30.4%)	11 (47.8%)	23 (100%)
BS MLT	1 (7.7%)	1 (7.7%)	3 (23.1%)	8 (61.5%)	13 (100%)
BBA	0 (0.0%)	4 (21.1%)	7 (36.8%)	8 (42.1%)	19 (100%)
BS English	0 (0.0%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	7 (100%)
BS Nursing	2 (9.1%)	5 (22.7%)	9 (40.9%)	6 (27.3%)	22 (100%)
Total	28 (8.9%)	55 (17.6%)	102 (32.6%)	128 (40.9%)	313 (100%)

The severity of the left leg indicates that BS English (57.1%) and BBA (52.6%) fall into a severe category. BS Anesthesia shows (47.8%), BS CS (44.1%) of moderate tightness. The overall percentage indicates that the left leg has moderate hamstring tightness (n = 118, 37.7%) compared to the right leg.

Table 6: This table shows the severity of hamstring tightness by Departments in the left leg. The left leg is prone to moderate severity (37.7%). The highest moderate severity was observed in BS Anesthesia (47.8%) and BS CS (44.1%), while the lowest moderate severity was observed in BS Surgical (23.1%).

Department	Normal	Mild	Moderate	Severe	Total (n)
DPT	5 (19.2%)	4 (15.4%)	11 (42.3%)	6 (23.1%)	26 (100%)
BS CS	4 (11.8%)	5 (14.7%)	15 (44.1%)	10 (29.4%)	34 (100%)
BS Dental	5 (7.8%)	11 (17.2%)	24 (37.5%)	24 (37.5%)	64 (100%)
BS Radiology	10 (10.9%)	19 (20.7%)	33 (35.9%)	30 (32.6%)	92 (100%)
BS Surgical	2 (15.4%)	3 (23.1%)	3 (23.1%)	5 (38.5%)	13 (100%)
BS Anesthesia	2 (8.7%)	2 (8.7%)	11 (47.8%)	8 (34.8%)	23 (100%)
BS MLT	1 (7.7%)	2 (15.4%)	4 (30.8%)	6 (46.2%)	13 (100%)
BBA	0 (0.0%)	2 (10.5%)	7 (36.8%)	10 (52.6%)	19 (100%)
BS English	0 (0.0%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	7 (100%)
BS Nursing	2 (9.1%)	5 (22.7%)	8 (36.4%)	7 (31.8%)	22 (100%)
Total	31 (9.9%)	54 (17.3%)	118 (37.7%)	110 (35.1%)	313 (100%)

DISCUSSION

In the present study, cumulative hamstring tightness prevalence was 92%. Overall prevalence by leg, 91.05% in the right leg and 90.10% in the left leg. In terms of severity level, the right leg showed severe cases 40.9% in the right leg and 37.7% moderate severity in the left. By age group, prevalence in the right leg was 18-22 years: 236 participants (75.4%), 23-26 years: 47 participants (15.0%), and 27-30 years: 2 participants (0.6%). In the left leg, 18-22 years: 234 participants (74.8%), 23-26 years: 46 participants (14.7%), and 27-30 years: 2 participants (0.6%). Gender distribution in our study was relatively balanced, with males at 90% prevalence and females at 92%. However, females reported more pain and stiffness, and males had slightly higher severe right-leg cases.

When compared with (*Koli & Anap, 2018*), who studied 50 college students aged 18-25 years, our prevalence is similar overall. They reported 96% prevalence in females and only 4% in males. This extreme gender inequality differs from our balanced rates and is likely due to their purposive sampling of individuals already presenting with tightness and an imbalanced gender ratio. Both studies share a young adult population, in which the studies explain the high prevalence, but the difference in male prevalence reflects sampling design.

(Shirsat et al., 2023) with a limited sample size of 68 participants, 50 were included (25 males, 25 females) aged 25-40 years, and found an overall prevalence of about 90%, with females higher (76%) than males (64%). Our results closely match theirs, but the gender gap is smaller in our study. This may be because our larger sample (n = 313) reduces sampling error and balances male and female representation, whereas their very limited sample size their older sample may have cumulative tightness from prolonged work sitting, while in our younger student group, both genders are similarly affected by sedentary habits. *(Jori & Jeswani, 2023)* conducted among 912 school children aged 7-15 years, the overall prevalence was 86.5%. Males had 84.6% (right) and 80.5% (left). Females had 88.2% (right) and 80.6% (left). Females showed slightly higher rates than males, similar to our study; our prevalence is slightly higher. This difference is likely due to age-related decline in flexibility, as our participants (mostly 18-22 years) are less active and spend more time sitting compared to children. While their large sample size strengthens reliability, the younger, more physically active population likely contributed to their lower prevalence.

(Kanishka et al., 2019) studied 169 sewing machine operators reporting 83.4% prevalence, aged 18-60 years, using the PKE test, with males at 91.8% and females at 78.7%. Their male

prevalence is very close to ours, but their female prevalence is notably lower. This may be due to occupational patterns, where female operators may change posture or take short breaks, and the inclusion of older adults may reduce average prevalence compared to our younger, more sedentary sample.

(Sareen & Prakash, 2021) studied 82 orthopedic surgeons and found 71 (86.6%) prevalence among young orthopedic surgeons aged 24-35 years. The difference may be due to variations in occupational activity. Surgeons have physically demanding work with intermittent mobility, which may help maintain hamstring flexibility, whereas our student population spends long hours in static sitting. However, their smaller sample size limits generalizability, while our larger sample (n = 313) provides greater reliability in estimating prevalence across genders and age groups.

(Behera et al., 2024) studied 60 physiotherapy students by convenience sampling, aged 18–25 years. They did not provide an overall prevalence figure; they reported a significant correlation between sitting hours and hamstring tightness, with the 8-10 hours/day sitting group showing the greatest restriction. This mirrors our findings in the 18–22 years group, where high prevalence coincided with high sedentary time and low stretching frequency.

CONCLUSION

This study aimed to determine the prevalence of hamstring tightness among university students and identify potential contributing factors. The findings suggest that hamstring tightness is prevalent among students and is significantly related to prolonged sitting, a lack of physical activity, and infrequent regular stretching practice. These factor associations are characteristic of the impact of day-to-day academic routine and life factors on students' physical health. The study also identified differences in hamstring tightness between genders and fields of study, suggesting that flexibility may be influenced by gender and field of study. The Passive Knee Extension (PKE) test was also a valid and straightforward method for evaluating hamstring tightness, thus suitable for use within academic settings. Overall, this cross-sectional study recommends integrating musculoskeletal health into university settings. Promoting and encouraging physical activity, as well as educating students on proper posture and stretching techniques, can help prevent or minimize hamstring tightness.

6.2: RECOMMENDATIONS

- The addition of anthropometric variables, such as BMI, weight, and height, can be used to determine whether they affect muscle flexibility.
- Future studies should involve students from more than one university and other educational institutions to enhance the external validity and generalizability of the findings to multiple campus environments.
- Investigate how lifestyle patterns of physical activity and pre-university life influence flexibility entry into academic life among urban and rural students.

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