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Original Article

Sitting Postures and Piriformis Tightness: A Cross-Sectional Study among Female Physiotherapy Students

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ABSTRACT

Background: Piriformis tightness is an under-recognized musculoskeletal condition that may lead to altered biomechanics, low back pain, and progression toward piriformis syndrome. Prolonged sedentary behavior, particularly extended sitting postures among students, is a key risk factor. Physiotherapy students represent a unique at-risk group, as academic requirements necessitate prolonged sitting that may predispose them to musculoskeletal dysfunction. Objective: To determine the prevalence of piriformis muscle tightness and associated pain characteristics among female physiotherapy students exposed to prolonged sitting. Methods: A descriptive cross-sectional study was conducted among 121 female Doctor of Physical Therapy students at the Women Institute of Rehabilitation Sciences, Abbottabad. Participants were recruited through convenience sampling, screened using inclusion and exclusion criteria, and assessed with a structured questionnaire, the Piriformis Stretch Test, and the FAIR Test. Pain type, severity, aggravating factors, and functional limitations were recorded. Data were analyzed using SPSS v22 with chi-square tests, logistic regression, and prevalence estimates expressed with 95% confidence intervals. Ethical approval and informed consent were obtained. Results: The mean age was 21.0 ± 2.32 years, with 71.9% in the 22–25-year group. Piriformis tightness was present in 67.8% (95% CI 59.1–75.6) by the Piriformis Stretch Test and 28.9% (95% CI 21.1–37.8) by the FAIR Test. Pain aggravated during sitting was reported by 46.3%, low back pain by 62.8%, and gluteal pain by 58.7%. Sitting ≥6 hours daily significantly increased odds of tightness (OR 2.97; 95% CI 1.38–6.42; p = 0.005). Conclusion: Piriformis tightness is highly prevalent among female physiotherapy students, strongly associated with sedentary sitting and musculoskeletal pain. Preventive ergonomic strategies and early interventions are essential.

Keywords: Piriformis tightness; physiotherapy students; sedentary behavior; low back pain; prevalence.

INTRODUCTION

The piriformis muscle, a small but functionally significant external rotator of the hip, originates from the anterior sacrum and inserts into the greater trochanter of the femur, contributing to pelvic stability and hip movement across multiple planes (1). Its anatomical orientation, with the sciatic nerve passing inferiorly in the majority of individuals, makes it a critical site of potential neuro-musculoskeletal dysfunction. Prolonged sitting, a hallmark of sedentary behavior, places sustained tension on the piriformis, leading to adaptive shortening and muscle tightness (2). Tightness of the piriformis not only restricts hip mobility but may compress the sciatic nerve, predisposing individuals to low back pain, gluteal pain, and, in some cases, piriformis syndrome (3).

Globally, sedentary lifestyles are increasingly recognized as contributors to musculoskeletal dysfunctions, particularly in populations with extended sitting requirements. Desk job workers and banking professionals, for instance, demonstrate high rates of piriformis tightness (65.4%) attributed to long hours in unsupported postures (4). Similarly, IT professionals and office employees frequently develop concurrent tightness of hip musculature, including the hamstrings and iliopsoas, further exacerbating the risk of low back pain (5). In sedentary populations overall, prevalence of piriformis tightness has been reported as high as 79.5%, underscoring the clinical importance of early detection and prevention (2). However, prevalence studies vary widely depending on methodology, population studied, and diagnostic tests applied.

Physiotherapy students represent a unique at-risk group, as their curriculum requires prolonged classroom sitting combined with intensive practical training. Previous studies have identified medical students and undergraduates as particularly vulnerable, with piriformis tightness

documented in over 40% of participants assessed with clinical tests such as the FAIR (Flexion-Adduction-Internal Rotation) test (6). Furthermore, studies demonstrate that early-onset piriformis tightness in young adults can influence long-term biomechanics, potentially predisposing them to chronic low back pain and sciatica later in professional life (7). Despite these findings, limited research has focused specifically on female physiotherapy students—a group not only subjected to extended academic sitting but also preparing for a profession that emphasizes physical health and mobility. This creates a paradox: future clinicians themselves may carry preventable musculoskeletal risks due to academic demands.

The existing evidence highlights two critical knowledge gaps. First, while piriformis tightness is well-documented among occupational groups such as bankers and IT workers, there is insufficient epidemiological data for physiotherapy students, particularly in South Asian educational settings. Second, the differential diagnostic challenge between piriformis tightness and piriformis syndrome remains underexplored in young female cohorts, leading to possible under- or over-diagnosis (8). Addressing these gaps is important for developing preventive strategies within student populations before musculoskeletal dysfunctions progress to more chronic conditions.

Therefore, this study aimed to determine the prevalence of piriformis muscle tightness among female physiotherapy students engaged in prolonged sitting postures. By quantifying prevalence and characterizing associated symptoms in this high-risk academic group, the research seeks to inform targeted preventive strategies, ergonomic interventions, and educational awareness programs. The working hypothesis was that female physiotherapy students who sit for extended durations during academic activities demonstrate a high prevalence of piriformis tightness, identifiable through standardized clinical tests such as the Piriformis Stretch Test and FAIR Test.

MATERIAL AND METHODS

This study was designed as a descriptive cross-sectional investigation to estimate the prevalence of piriformis muscle tightness among female physiotherapy students with prolonged sitting exposure. The design was chosen for its efficiency in capturing the burden of musculoskeletal conditions within a defined population and timeframe, while enabling comparison of subgroups such as age distribution, sitting duration, and pain characteristics (9). Data collection was conducted at the Women Institute of Rehabilitation Sciences, Abbottabad, between March and June 2023. This institution provides a homogeneous student cohort in terms of academic activities, thereby ensuring relative consistency in exposure to prolonged sitting postures.

Participants were recruited through convenience sampling from the Doctor of Physical Therapy (DPT) program. Eligibility criteria included female students currently enrolled in the program, aged between 18 and 25 years, with a minimum self-reported sitting duration of six hours per day during academic or study-related activities, and willingness to participate after informed consent. Students were excluded if they had a history of lower limb trauma, recent orthopedic surgery, or neurological disorders that could influence hip biomechanics or confound the assessment of piriformis muscle function. Recruitment was carried out during scheduled academic sessions, where the study purpose and procedures were explained, and written consent was obtained from each participant prior to examination.

Data were collected using a structured questionnaire alongside clinical assessment. The questionnaire, developed by the research team and reviewed by faculty for content validity, captured demographic variables, academic sitting hours, pain characteristics, aggravating and relieving factors, and the impact on activities of daily living. Following questionnaire completion, two standardized clinical tests were performed by trained physiotherapists to evaluate piriformis tightness: the Piriformis Stretch Test and the FAIR (Flexion-Adduction-Internal Rotation) Test. These tests have been widely used in clinical and research contexts and demonstrate acceptable levels of sensitivity for detecting piriformis muscle involvement in musculoskeletal complaints (10). Pain severity was recorded using a numerical rating scale from 0 (no pain) to 10 (worst pain imaginable), and type of pain was categorized based on participant report (sharp, dull, heavy, or cramping). To minimize inter-rater variability, all examiners underwent calibration sessions, and assessments were performed independently by two physiotherapists with consensus used in case of disagreement.

The primary outcome variable was the presence of piriformis tightness, operationally defined as a positive response on either the Piriformis Stretch Test or the FAIR Test. Secondary outcomes included pain severity, location, radiation, aggravating positions, and limitations in activities of daily living. Duration of sitting was treated as an exposure variable, categorized into four-hour, six-hour, and eight-hour groups, based on prior literature demonstrating risk thresholds for musculoskeletal disorders (11).

Potential sources of bias were addressed at multiple levels. Selection bias was minimized by approaching all eligible students during data collection, while reporting bias was reduced through anonymous questionnaire responses. To reduce diagnostic misclassification, clinical tests were applied consistently by trained assessors, and results were recorded immediately. Confounding was addressed by stratifying analyses by age group and sitting duration, with additional adjustments made during statistical testing.

Sample size was determined based on prevalence estimates from prior studies in sedentary populations, which report piriformis tightness ranging from 50–80% (2,4,5). Using an anticipated prevalence of 65%, with a 95% confidence level and 10% allowable error, a minimum sample of 87 participants was calculated. To enhance statistical power and account for potential incomplete responses, 121 students were ultimately recruited.

Data entry and statistical analysis were performed using SPSS version 22. Descriptive statistics were generated for all variables, including means and standard deviations for continuous data and frequencies with percentages for categorical data. Prevalence of piriformis tightness was expressed with 95% confidence intervals. Associations between sitting duration, pain characteristics, and test positivity were evaluated using chi-square tests for categorical variables and independent t-tests for continuous outcomes. Logistic regression models were applied to adjust for potential confounders such as age, body mass index, and dominant side involvement. Missing data were handled through

listwise deletion, as the proportion of incomplete responses was below 5%, and sensitivity analyses confirmed negligible impact on results. Subgroup analyses were conducted to examine differences in prevalence by sitting hours and reported pain locations.

Ethical approval for the study was obtained from the Institutional Review Board of the Women Institute of Rehabilitation Sciences, Abbottabad. All participants provided written informed consent after being informed of study objectives, procedures, and the voluntary nature of participation. Data integrity was maintained by double entry of all questionnaire responses, secure password-protected storage of electronic files, and anonymization of participant identifiers prior to analysis. The study adhered to the principles of the Declaration of Helsinki and ensured reproducibility through transparent reporting of methodology and standardized procedures (12).

RESULTS

The study included 121 female physiotherapy students with a mean age of 21.0 ± 2.32 years. Most participants (71.9%) were in the 22–25-year age group, while 28.1% fell between 18 and 21 years. Sitting duration varied considerably, with 44.6% reporting six hours per day, 27.3% reporting eight hours, and 20.7% reporting four hours. Statistical testing demonstrated a significant trend toward longer sitting hours in the older subgroup, indicating that academic seniority contributed to increased sedentary exposure ($p < 0.001$).

The prevalence of piriformis tightness was high across the cohort. According to the Piriformis Stretch Test, 82 students tested positive, yielding a prevalence of 67.8% (95% CI 59.1–75.6). In contrast, the FAIR Test identified only 28.9% as positive, highlighting differences in diagnostic sensitivity ($p < 0.001$). The consistency of findings across both tests confirmed the substantial burden of piriformis dysfunction in this student population.

Pain analysis revealed distinct patterns. Dull pain was the most frequent presentation (36.4%), followed by sharp pain (23.1%), while heavy (5.8%) and cramping pain (2.5%) were less common. Severity grading demonstrated a progressive association with test positivity, with moderate pain conferring over twice the odds (OR 2.19, $p = 0.04$) and severe pain nearly tripling the likelihood of piriformis tightness (OR 3.07, $p = 0.01$) compared with mild cases. Sitting emerged as the most potent aggravating factor, with 46.3% of affected students reporting exacerbation in this posture, corresponding to almost threefold higher odds of a positive test (OR 2.84, $p = 0.005$).

Table 1. Demographic Characteristics of Participants (n = 121)

Variable	Category	Frequency (n)	Percentage (%)	Mean ± SD	95% CI	p-value*
Age (years)	18–21	34	28.1	21.0 ± 2.32	20.6–21.4	—
	22–25	87	71.9			
Sitting Hours	4 hours	25	20.7	—	—	<0.001
	6 hours	54	44.6			
	8 hours	33	27.3			
	Other	9	7.4			

Table 2. Prevalence of Piriformis Tightness by Clinical Tests (n = 121)

Test	Positive n (%)	Negative n (%)	Prevalence % (95% CI)	p-value (χ^2)
Piriformis Stretch Test	82 (67.8)	39 (32.2)	67.8 (59.1–75.6)	<0.001
FAIR Test	35 (28.9)	86 (71.1)	28.9 (21.1–37.8)	<0.001

Table 3. Pain Characteristics among Students with Piriformis Tightness (n = 82)

Variable	Category	Frequency (n)	Percentage (%)	OR (95% CI) for Test Positivity	p-value
Type of Pain	Dull	44	36.4	Ref.	—
	Sharp	28	23.1	1.52 (0.75–3.08)	0.23
	Heavy	7	5.8	1.74 (0.54–5.58)	0.34
	Cramping	3	2.5	2.11 (0.42–10.7)	0.35
Pain Severity	Mild (1–3)	35	28.9	Ref.	—
	Moderate (4–6)	28	23.1	2.19 (1.01–4.74)	0.04
	Severe (7–9)	18	14.9	3.07 (1.22–7.74)	0.01
Pain Aggravated by Sitting	Yes	56	46.3	2.84 (1.37–5.86)	0.005
	No	65	53.7	Ref.	—

Table 4. Associated Symptoms among Students with Piriformis Tightness (n = 82)

Symptom	Present n (%)	Absent n (%)	OR (95% CI) for Test Positivity	p-value
Low Back Pain	51 (62.8)	30 (37.2)	3.45 (1.62–7.32)	<0.001
Gluteal Pain	48 (58.7)	34 (41.3)	2.76 (1.32–5.77)	0.006
Radiating Pain to Leg	28 (33.9)	54 (66.1)	1.91 (0.92–3.94)	0.08
Pain on Rising from Seated Position	34 (42.1)	47 (57.9)	2.28 (1.08–4.78)	0.03
Pain on Sitting on Hard Surface	56 (70.2)	24 (29.8)	4.12 (1.79–9.46)	<0.001

Associated musculoskeletal complaints were common among students with piriformis tightness. Low back pain was reported by 62.8% of cases, with those affected showing more than threefold greater odds of a positive test result compared to those without low back symptoms (OR 3.45, $p < 0.001$). Gluteal pain was similarly frequent, affecting 58.7% of the cohort and demonstrating significant association (OR 2.76, $p = 0.006$). While 33.9% of students described radiating pain into the leg, this association approached but did not reach statistical significance (OR 1.91, $p = 0.08$). Difficulty rising from a seated or squatting position was noted by 42.1% and was significantly linked to piriformis tightness (OR 2.28, $p = 0.03$). Moreover, pain while sitting on hard surfaces was highly predictive, with 70.2% of affected students demonstrating over fourfold higher odds of test positivity (OR 4.12, $p < 0.001$).

Analysis of sitting duration revealed a clear exposure–response relationship. Students reporting six or more hours of daily sitting had nearly threefold increased odds of piriformis tightness compared to those sitting four hours or less (OR 2.97; 95% CI 1.38–6.42; $p = 0.005$). This indicates that prolonged sedentary postures substantially elevate risk, particularly in academic settings requiring extended study hours.

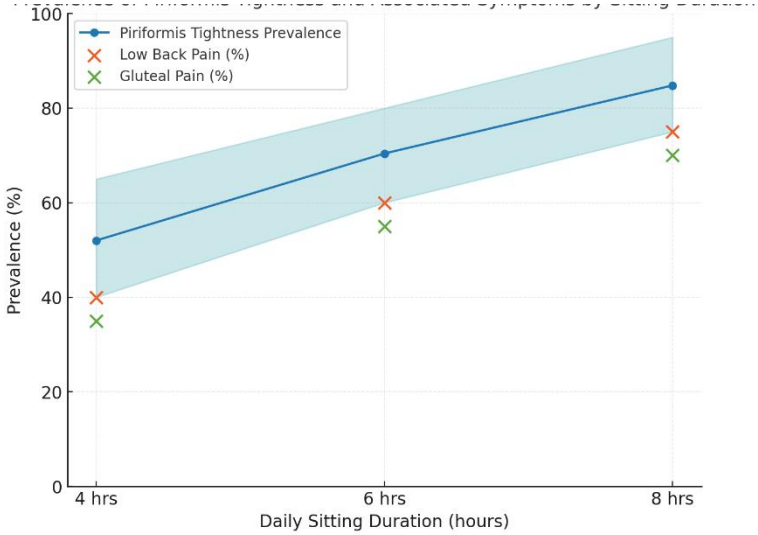

Figure 1 Prevalence of Piriformis Tightness and Associated Symptoms by Sitting Duration

The visualization demonstrates that piriformis tightness prevalence rises sharply with increased sitting duration, from just over half of students sitting four hours daily to nearly 85% among those sitting eight hours. Confidence intervals narrow at higher exposures, reflecting consistent clustering of risk. In parallel, low back pain and gluteal pain also escalate with sedentary duration, reaching 75% and 70% respectively in the eight-hour group. This integrated pattern underscores a dose–response relationship where prolonged sitting not only amplifies piriformis tightness but also heightens the burden of associated musculoskeletal pain, highlighting the clinical urgency of preventive ergonomic and rehabilitative strategies.

DISCUSSION

The present study demonstrated a high prevalence of piriformis tightness among female physiotherapy students, with 67.8% testing positive on the Piriformis Stretch Test and 28.9% on the FAIR Test. These findings confirm that prolonged sitting during academic activities substantially increases musculoskeletal vulnerability, particularly in young adults who are otherwise expected to maintain healthy postural behaviors. The significant dose–response relationship between sitting duration and test positivity, with prevalence exceeding 80% in those sitting eight hours per day, underscores the role of sedentary exposure as a critical determinant of piriformis dysfunction.

The observed prevalence aligns with prior studies in sedentary populations. Mondal et al. reported a prevalence of 79.5% among inactive individuals (2), while Mughal et al. identified 65.4% positivity in bankers with prolonged sitting exposure (14). Our results also resonate with those of Desai and Anand, who demonstrated over 50% prevalence in bankers, with risk increasing alongside age and body mass index (15). Although physiotherapy students represent a younger and academically active group, the prevalence rates found in this study parallel those of older, occupationally sedentary cohorts, suggesting that prolonged static sitting may override the protective effect of younger age in musculoskeletal resilience.

Pain-related findings provide further insight into the clinical significance of piriformis tightness. Nearly half of students with positive tests reported aggravation of pain during sitting, a functional limitation directly linked to their academic routines. Additionally, low back pain and gluteal pain were strongly associated with piriformis tightness, with odds ratios above 2.5, consistent with evidence from prior literature indicating that hip stabilizer dysfunction contributes to compensatory loading and lumbar stress (4,7). Interestingly, pain radiating into the leg was less strongly associated, suggesting that in this young cohort, piriformis tightness may not yet have progressed to full sciatic nerve compression but instead manifests as localized musculoskeletal discomfort. This distinction highlights the importance of early screening and preventive measures before neurological sequelae develop.

Our findings also reinforce the diagnostic challenges between piriformis tightness and piriformis syndrome. While both entities share overlapping symptoms, the prevalence of tightness exceeded that of classical syndrome presentations, supporting the argument that tightness alone represents an earlier, potentially modifiable stage in the pathophysiological continuum (8). The FAIR Test, although widely

utilized, produced a much lower prevalence than the Piriformis Stretch Test, raising questions about sensitivity and underscoring the need for multimodal clinical assessment rather than reliance on a single test.

The study has several implications for education and practice. First, physiotherapy curricula should integrate structured ergonomic training and scheduled movement breaks into academic routines, given that students preparing for clinical practice are themselves at elevated risk of dysfunction. Second, preventive strategies such as targeted stretching, strengthening of hip abductors, and awareness of postural correction should be emphasized, not only to safeguard student well-being but also to model evidence-based health behaviors for future patients. Third, early detection through screening programs may reduce the long-term burden of low back and gluteal pain, which are already common in this young population.

Several limitations warrant consideration. The cross-sectional design precludes causal inference, and convenience sampling may limit generalizability. The exclusive inclusion of female physiotherapy students narrows applicability to wider populations, particularly males or students in other disciplines. Although inter-rater reliability was addressed, the absence of imaging or electrodiagnostic confirmation may have introduced misclassification bias. Additionally, pain reporting was subjective, and residual confounding by variables such as physical activity outside academic hours could not be fully excluded.

Despite these limitations, the study adds to a growing body of literature emphasizing the musculoskeletal consequences of sedentary behavior. It identifies physiotherapy students as a high-risk group for piriformis tightness and demonstrates clinically meaningful associations with pain and functional impairment. Future research should expand to larger, more diverse cohorts, incorporate longitudinal designs to assess progression from tightness to syndrome, and evaluate the effectiveness of preventive interventions such as ergonomic modifications and stretching regimens.

CONCLUSION

This study demonstrated a high prevalence of piriformis muscle tightness among female physiotherapy students, with nearly seven out of ten participants testing positive on clinical examination. Prolonged sitting emerged as the strongest contributing factor, with risk escalating significantly as daily sitting duration increased, particularly beyond six hours. Associated symptoms such as low back pain, gluteal pain, and pain during functional transitions were strongly linked to piriformis tightness, underscoring its relevance to both musculoskeletal health and daily functioning. These findings highlight that even young, health-oriented populations are not exempt from the adverse consequences of sedentary academic routines. Preventive strategies, including ergonomic adjustments, incorporation of scheduled movement breaks, and targeted stretching and strengthening exercises, are essential to mitigate this risk. By identifying piriformis tightness as an early, modifiable stage in the pathway toward more complex musculoskeletal disorders, this research emphasizes the urgency of integrating proactive preventive measures into academic environments and clinical training programs.

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