

Prevalence of Piriformis Muscle Tightness among Undergraduate Medical Students

ATTA MUHAMMAD¹, MUHAMMAD RIZWAN RANA¹, TOOBA AMIN², CHRISTINA ANGELA³, FELICIANUS ANTHONY PEREIRA⁴, MAZHAR ALI BHUTTO⁵

¹University Institute of Physical Therapy, University of Lahore, Lahore

²Fatima Memorial College of Medicine and Dentistry, Lahore

³United College of Physical Therapy, United Medical & Dental College, Karachi

⁴National Institute of Physical Therapy & Rehabilitation Sciences, Karachi

⁵Sindh Govt KMC Civil Hospital Khairpur Sindh

Corresponding author: Felicianus A. Pereira, Email: f.pereira93@hotmail.com, Cell: 03312333569

ABSTRACT

Objectives: To determine the prevalence of piriformis muscle tightness among allied health students, and its relationship with age, gender and year of study.

Methods: A cross sectional study was conducted. A sample size of 259 was calculated using Open Epi v3.01. Allied health students from physical therapy, occupational therapy and prosthetics & orthotics programs participated in this study, which lasted 4 months. After obtaining informed consent, data was collected through a self-developed questionnaire. Piriformis muscle tightness, and symptom recurrence, was determined using the FAIR test.

Results: Average age of participants was 21.94±1.81 years. Females comprised of 79.9% of the study population. High percentage (85.3%) were from the physical therapy program. Most common posture was crossed leg sitting (48.3%). Positive FAIR test was found in 41.7% of the population. Strong correlation between age-group with FAIR test was noted (p=0.036).

Conclusion: Piriformis muscle tightness is prevalent in those who engage in prolonged sitting postures. Furthermore, strong association of piriformis tightness with age is present, whereas no relationship with gender and year of study has been observed.

Keywords: Piriformis muscle tightness, Piriformis muscle syndrome, Low back pain, Sedentary individuals, FAIR test.

INTRODUCTION

Piriformis muscle tightness (PMT) results in a myriad of conditions that are related with hip, spine and pelvis. These can lead to issues such as low back pain, sacral dysfunction, sacroiliitis, piriformis syndrome and others. It occurs due to compression of the sciatic nerve by the piriformis muscles. As it is a type of entrapment neuropathy, symptoms may resemble that of truncal sciatica.^[1] PMT is likely to affect anyone, regardless of their sex, age, or occupation.^[2] Studies have shown association of PMT (5 to 36%) in low back pain patients. PMT is also prevalent in athletes, especially long-distance runners. Boyajian et al recognized piriformis as an important factor affecting physical fitness of healthy students; due to prolonged, uninterrupted sitting in class.^[3] A study by Jawish et al proposed spasm of the piriformis muscle was a probable cause of irritation of the sciatic nerve.^[4] Prevalence of PMT in inactive individuals was noted as 79.5%.^[5,6] Although PMT and piriformis syndrome are a disputed entity, and no single test can confirm the diagnosis, certain procedures are performed in clinical settings to confirm PMT.^[7] FAIR Test (flexion, adduction, and internal rotation) has displayed the greatest specificity among the tests used.^[8,9] A study determined that prolonged sitting during classes could result in overuse of piriformis muscle. Spending a major portion of time seated leaves students highly prone to developing PMT.^[10] Four symptoms are commonly reported among those who are diagnosed with PMT; these include pain in the buttocks, pain which increased with sitting, tenderness along the greater sciatic notch, and loss of range of motion in straight leg raise.^[11] The purpose of this study was to assess the prevalence of PMT in students, and educate them regarding corrective postures and appropriate management strategies. Many studies have been carried out to assess varying methods into the treatment of PMT, however to the author's knowledge; few studies evaluate its prevalence among students.

Aims: The aim of this study is to determine the prevalence of piriformis muscle tightness among allied health students, and its relationship with age, gender and year of study.

MATERIALS AND METHODS

The study design was a cross sectional survey. The rationale of this study was to assess the frequency of PMT among allied health students. A sample size of 259 was calculated using Open Epi

v3.01 and non-probability, convenient sampling technique was used. Confidence interval was set at 95%. The study was conducted in Institute of Physical Medicine and Rehabilitation, Dow University of Health Sciences Ojha campus and Jinnah Postgraduate Medical Centre. Ethical approval was obtained from Dow University of Health Sciences (Reference no. IPM&R/DUHS-17/897). Informed consent was obtained prior to data collection, with participants having been informed of the purpose of the study. Duration of the study was five months.

Inclusion criteria for this study were students of allied health sciences, within 18-28 years of age, and who were of good health status. Anyone with a past history of surgery, any trauma, radiculopathy issues, chronic low back pain (requiring clinical intervention), pregnant females, or those with any hip pathology were excluded from participating in the study.

Questionnaire used was self-designed, and comprised of questions regarding demographics, preferred sitting postures in class, and adaptations used to manage discomfort due to muscle tightness. FAIR test (sensitivity and specificity of 0.881 and 0.832 respectively) was then performed in supine lying, to check for PMT bilaterally. A positive result was indicated by pain experienced in the buttock.^[7,12,13]

RESULTS

Data was analyzed using SPSS v20.0 software. Frequencies and percentages were recorded for qualitative variables, and mean and standard deviation were recorded for quantitative variables. Chi-square test was applied to determine relationship of PMT with age, gender, year of study and preferred sitting posture, and correlation between preferred sitting posture and movement difficulties was also assessed. According to results, 61.8% were 21-23 years, with the average age as 21.94±1.81 years. Majority of the participants were females 207 (79.9%) (Figure 1) and overall 85.3% were from physical therapy program.

High percentages were from third and fifth year of study (30.5% and 28.2% respectively). Preferred sitting postures during lectures were as follows: crossed leg sitting (48.3%), upright sitting (47.5%), slouch sitting (40.9%) & low sitting posture (25.1%). (Table 1)

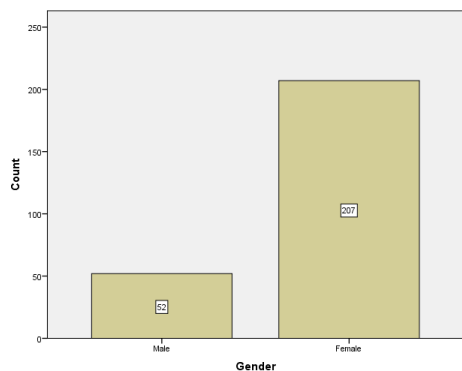


Figure 1: gender of participants

Table 1: Preferred sitting posture

Preferred sitting posture	Percentage (%)
Upright sitting	47.5
Low sitting	25.1
Crouched sitting	40.9
Cross-legged sitting	48.3

Analysis of movement difficulties indicated that 15.4% felt difficulty in activities besides sitting, 12.7% experienced issues in stair climbing, 5.8% in walking, and 7.7% in running. Inwards and outwards movement of legs was also difficult for some (22.4% and 15.1% respectively).

Regarding self-management of PMT, 30.5% overcame it by changing positions, 40.5% by exercising, 8.9% by maintaining the same position, 81.0% by changing position, 20.3% through use of medication, and 6.3% through use of thermotherapy. Application of FAIR test revealed that 41.7% had positive Piriformis muscle tightness. Chi-square association of FAIR test results with age group, gender and year of study were also assessed. Results

Table 4: Correlation of sitting posture and movement difficulties (p-values) *Statistically Significant

Movement issues	Difficulty in movements other than sitting	Difficulty in climbing stairs	Difficulty in walking	Difficulty in running	Tightness in moving leg inwards	Tightness in moving leg outwards
Sitting Posture						
Upright sitting	0.016*	0.082	0.551	0.487	0.011*	0.009*
Low sitting	0.439	0.462	0.886	0.992	0.879	0.933
Slouch sitting	0.001*	0.089	0.123	0.392	0.000*	0.000*
Cross leg sitting	0.021*	0.008*	0.511	0.872	0.136	0.271

DISCUSSION

With PMT, as mentioned previously, studies present contrasting views regarding it. A study by Fishman et al highlighted how PMT is an underdiagnosed condition,^[14] whereas another study published in the same year highlighted that PMT is an over diagnosed condition.^[15] Whatever the stance that clinicians choose to take, the fact remains that this is a medical condition which causes discomfort among the general population, and as such should be studied and sought to prevent from occurring. The study results indicate that those who prefer cross legged and slouched sitting postures in prolonged sitting are likely to develop PMT. A study reported that sitting for more than fifteen to twenty minutes in poor postures caused pain, which reinforced the findings of this study.^[7] Sitting posture affects the loading of muscles, which will have a knock-on effect in performing daily activities. A review study on piriformis syndrome highlighted how cross leg sitting results in internal rotation, which will then cause discomfort when walking.^[16] Difficulty in stair climbing and walking was also experienced by study participants. This correlates with a case report by Sivrioglu et al, who describe presence of pain in piriformis during these activities.^[17] In this study, change of posture was the preferred management strategy; with medication use relatively low, as opposed to the majority use of muscle relaxants and non-steroidal anti-inflammatory drugs in other studies. Not all cases of PMT will

displayed a strong association with age (p=0.002), but not for gender and year of study (p=0.142 and p=0.149 respectively). (Table 2)

Table 2: Association of FAIR test with age, gender, and year of study

	FAIR Test (p-value)
Age	0.002
Gender	0.142
Year of study	0.149

FAIR test association with management strategies revealed that exercise, medication and change of position were highly significant (p-value=0.000). Upright sitting and slouch sitting had a strong association as well (p-value=0.000) and cross-legged sitting was also a factor (p-value=0.047). (Table 3)

Table 3: FAIR test association with preferred sitting postures and management techniques

Management Techniques	FAIR Test (p-value)	Preferred Sitting Posture	FAIR Test (p-value)
Exercise	0.000	Upright sitting	0.000
Same posture	0.065	Low sitting	0.402
Change of position	0.000	Slouch sitting	0.000
Medication	0.000	Cross-legged sitting	0.047
Thermotherapy	0.211		

Correlation analysis of preferred sitting posture with movement issues (Table 4) showed strong significance with slouch sitting and movement difficulties (p-value=0.001) and slouch sitting and inwards and outwards movements of leg (p-value=0.000 for both). Cross legged sitting caused difficulty in movements (p-value=0.021) and specifically difficulty in climbing stairs (p-value=0.008). Upright sitting also resulted in movement difficulties (p-value=0.016), specifically in inwards and outwards movements (0.011 and 0.009 respectively). No correlation was found in low sitting and movement difficulties.

resolve with conservative management. When all alternate management strategies fail, surgical treatment is considered. A study by Han et al studied efficacy of conservative and surgical managements of people who had PMT. Cases where conservative management failed to bring results in 3 months were treated through surgery.^[18] This serves to highlight how important prevention strategies are, in order to prevent the need for drastic treatment methods. Higher percentage of PMT was found in third and fifth year students. Variations in levels of activities may have been the reason for the discrepancy between the year of study, and PMT found. Piriformis muscle stretches, combined with strengthening of abductor and adductor muscles is effective in managing PMT.^[10] Although this study did not find any association between gender and PMT, a review study identified this as a notable risk factor.^[19] A study conducted among males students found that 30% of them reported localized pain due to PMT, with a further 5% reporting pain radiating from the buttocks.^[20] No comparative study was performed which assessed the prevalence of PMT in females.

CONCLUSION

This study concludes that PMT is common among allied health students, who are engaged in prolonged sitting postures. This could potentially cause absences, if discomfort were to worsen.

Moreover, a strong association of PMT with increasing age was found, whereas links with gender and year of study were weak.

A study on students of all disciplines, who have prolonged sitting postures, should be conducted. Such assessments would screen people at risk for developing musculoskeletal issues, and prevent them from missing out on valuable time at school. There is a need to develop awareness, and to teach preventive strategies to prevent onset of this disorder.

REFERENCES

1. Michel F, Decavel P, Toussiro E, Tatu L, Aleton E, Monnier G, Garbuio P, Parratte B. The piriformis muscle syndrome: an exploration of anatomical context, pathophysiological hypotheses and diagnostic criteria. *Annals of physical and rehabilitation medicine*. 2013 May 1;56(4):300-11.
2. Siddi AB, Rasker JJ. Piriformis syndrome: still unsolved issues. *Int J Clin Rheumatol*. 2018;13(6):338-40.
3. Boyajian-O'Neill LA, McClain RL, Coleman MK, Thomas PP. Diagnosis and management of piriformis syndrome: an osteopathic approach. *The Journal of the American Osteopathic Association*. 2008 Nov 1;108(11):657-64.
4. Jawish RM, Assoum HA, Khamis CF. Anatomical, clinical and electrical observations in piriformis syndrome. *Journal of orthopaedic surgery and research*. 2010 Dec 1;5(1):3.
5. Siddiq MA, Hossain MS, Uddin MM, Jahan I, Khasru MR, Haider NM, Rasker JJ. Piriformis syndrome: a case series of 31 Bangladeshi people with literature review. *European Journal of Orthopaedic Surgery & Traumatology*. 2017 Feb 1;27(2):193-203.
6. Singh US, Meena RK, Singh CA, Singh AJ, Singh AM, Langshong R. Prevalence of piriformis syndrome among the cases of low back/buttock pain with sciatica: A prospective study. *Journal of Medical Society*. 2013 May 1;27(2):94.
7. Stewart JD. The piriformis syndrome is overdiagnosed. *Muscle & nerve*. 2003 Nov;28(5):644-6.
8. Cass SP. Piriformis syndrome: a cause of nondiscogenic sciatica. *Current sports medicine reports*. 2015 Jan 1;14(1):41-4.
9. Fishman LM, Hosseini M. Piriformis syndrome-a diagnosis comes into its own. *Muscle & nerve*. 2019 Feb 4;59(4):395-6.
10. Pradip B, Sudhir B, Nidhi B. Prevalence of tightness in hip muscles in middle aged Indian men engaging in prolonged desk jobs: A descriptive study.
11. Hopayian K, Danielyan A. Four symptoms define the piriformis syndrome: an updated systematic review of its clinical features. *European Journal of Orthopaedic Surgery & Traumatology*. 2018 Feb;28(2):155-64.
12. Mousa FM, Bakr ZA. The Piriformis Syndrome: Evaluation of Seven Cases. *Cihan University-Erbil Scientific Journal*. 2019 Jun 30;3(1):71-4.
13. Fishman LM, Dombi GW, Michaelsen C, Ringel S, Rozbruch J, Rosner B, Weber C. Piriformis syndrome: diagnosis, treatment, and outcome—a 10-year study. *Archives of physical medicine and rehabilitation*. 2002 Mar 1;83(3):295-301.
14. Fishman LM, Schaefer MP. The piriformis syndrome is underdiagnosed. *Muscle and Nerve*. 2003 Nov 1;28(5):646-9.
15. Stewart JD. The piriformis syndrome is overdiagnosed. *Muscle & nerve*. 2003 Nov;28(5):644-6.
16. Mitra SR, Roy S, Dutta AS, Ghosh A, Roy R, Jha AK. Piriformis syndrome: a review. *Journal of Evolution of Medical and Dental Sciences*. 2014 Apr 7;3(14):3804-15.
17. Sivrioglu AK, Ozyurek S, Mutlu H, Sonmez G. Piriformis syndrome occurring after pregnancy. *Case Reports*. 2013 Mar 26;2013:bcr2013008946.
18. Han SK, Kim YS, Kim TH, Kang SH. Surgical treatment of piriformis syndrome. *Clinics in orthopedic surgery*. 2017 Jun 1;9(2):136-44.
19. Othman IK, Mohamad N, Sidek S, Bhaskar RN, Kuan CS. Risk factors associated with piriformis syndrome: A systematic review. *Science, Engineering and Health Studies*. 2020 Oct 2:215-33.
20. Warner S, Munawar A, Ahmad A, Fatima M, Waqas M. Prevalence of piriformis syndrome among university of Lahore male students. *Rawal Medical Journal*. 2018 Apr 1;43(2):306-8.