

THE ASSOCIATION BETWEEN ACADEMIC SITTING POSTURES AND PIRIFORMIS SYNDROME IN ALLIED HEALTH SCIENCES STUDENTS: A CROSS-SECTIONAL STUDY IN PESHAWAR

Sadaqat Ali Khan^{*1}, Ameer Waqar Ahmed², Alizah Khan³, Jalil Ahmad⁴, Sadaf Naveed⁵, Adeeba Tabassum⁶, Mian Waleed Ahmed⁷

^{*1}Riphah International University, Malakand Campus

²Fauji Foundation Hospital Peshawar

³Physiotherapist

⁴Riphah International University, Malakand Campus

⁵Physiotherapist at Active life Wellness Hub, Kohat

⁶Lecturer at Women Institute of Rehabilitation and learning sciences

⁷Senior Physiotherapist Pak-Austria Fachhochschule: Institute of Applied Science and Technology, Mang, Haripur

^{*1}myemail0944@gmail.com, ²ameerawqr@gmail.com, ³aleezahkhan441@gmail.com, ⁴drphysio14587@gmail.com, ⁵sadafd898@gmail.com, ⁷mianwaleed50@gmail.com

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Corresponding Author: *

Sadaqat Ali Khan

Abstract

Background: Piriformis syndrome (PS) is a neuromuscular condition caused by compression or irritation of the sciatic nerve by the piriformis muscle. It is an important yet underdiagnosed cause of low back and buttock pain, especially in populations exposed to prolonged sitting and poor postural habits. University students, particularly those in health sciences, are at increased risk due to extended academic sitting hours and inadequate ergonomic facilities.

Objective: To determine the prevalence of piriformis syndrome and its association with prolonged sitting and cross-legged sitting among allied health sciences students in Peshawar, Pakistan.

Methodology: A cross-sectional study was conducted from May to November 2023 among 198 allied health sciences students selected through random sampling. Data were collected using a self-structured questionnaire (Cronbach's alpha = 0.72), Visual Analogue Scale (VAS), and the FAIR test for piriformis syndrome diagnosis. Data were analyzed using SPSS version 25.

Results: The overall prevalence of piriformis syndrome was 61.61%. Females showed a higher prevalence (32.92%) compared to males (18.68%). Cross-legged sitting aggravated pain in 80.8% of participants. Nearly half (47.97%) of the students could not sit for more than 30 minutes, and 47.47% used wooden chairs. Moderate to severe pain (VAS 6–10) was reported by 77.77% of affected students. Pain interfered with daily activities in 30.30% of participants.

Conclusion: Piriformis syndrome is highly prevalent among allied health sciences students in Peshawar. Prolonged sitting, cross-legged posture, and poor seating ergonomics are strongly associated with PS. Preventive strategies, ergonomic interventions, and awareness programs are urgently required.



Introduction

Piriformis syndrome is a medical condition or disease in which the sciatic nerve in our piriformis muscle gets compressed and as a result, we experience this problem. The longest and most spacious part nerve in the human body is the sciatic nerve. The width of the sciatic nerve in our body is two centimeters while its thickness is 0.5 centimeters. The sciatic nerve shapes the roots of lumbar-4 to sacrum-3 segments of the lumbosacral plexus. This nerve passes inferiorly to the piriformis muscle, in the direction of the lower limb where it divides into common tibial and fibular nerves [1].

Low back pain is a very serious problem worldwide due to piriformis syndrome in which the piriformis muscles become very hard. According to research studies, low back pain is increasing rapidly in people worldwide due to piriformis syndrome, with prevalence ranging from 5 percent to 40% worldwide. Piriformis muscle arises from the pelvic rise up of the sacrum in the midst of the first via the fourth pelvic sacral foramina, border of the greater sciatic foramen, and the pelvic surface of the sacrotuberous ligament and embedded to the superior boundary of the greater trochanter of the femur by way of a round tendon that, in many people, is integrated with the tendons of the obturator internus and Gemelli's muscles and it is supplied by sciatic nerve [2]. Research studies also show that piriformis syndrome is caused by prolonged sitting or cross-legged seating. From research studies, we also find that under normal conditions, sitting does not cause piriformis syndrome, but its prevalence is much higher in people who sit cross-legged or spend a lot of time sitting. Cross-legged sitting or standing in one place for long periods of time increases inflammation in the piriformis muscle that causes us to experience PS and studies show that 12% of people who used prolonged setting or prolonged standing have PS and 22% are found in people who sit in one place for long periods of time [3]. PS should be treated on time and if it is delayed even a little, we may face various consequences [4].

The sciatic nerve virtually frequently drives beneath the piriformis, the nerve traveling from your spinal cord, via your bottom, down the back of each leg, to your feet. It's the longest, major nerve in your body.

Earlier papers display that sitting in a chair for eight hours or longer may draw up constriction of back muscle and cause strain on joints which residue so long in a steady position, notably when the muscles are under steady low-grade constriction in command to hold and sustain the sitting positioning. The desk-bound people often complain of low back pain resulted by muscular unevenness and if it is left uncontrolled, this inequality may develop a persistent pain condition in the lower back [5]. When the muscles in the back of the body shorten or contract as a result of injury or excessive use of the muscles, it compresses or strangles the nerves beneath the muscles. These conditions are commonly referred to as nerves entrapment and nerves perforation neuropathy. A more specific condition called piriformis syndromes refers to symptoms of sciatica that are not caused by spinal roots and / or disc compression but instead affect the muscles that are overlying the sciatica. Only about 17% of what is considered the normal population has a sciatic nerve that passes through the muscles of the back rather than beneath them. However, when patients were operated on for suspicion of this disorder, the anomaly was only found in 16.2 percent of cases. This raises the question as to whether this anomaly is a trigger for the syndrome [6]. MRI findings show that the supposed condition is related to hypertrophy as well as atrophy. It may also be related to direct trauma, such as a fall or knife wound. Piriformis syndrome is caused by compression or pinching of your sciatic nerve by your hip's piriformis. It usually affects only one hip at any one time, but both hips can develop it at any time in your life. Having it once increases the risk of it developing in another hip or another hip at some future time unless something is done to prevent it from happening. Signs and Symptoms If you have sciatica, a physical exam may find tenderness in your sciatic notch area. If your sciatica muscle can be found under your other glutes, it should feel cord-like. It will be painful when compressed or massaged. The pain will be exacerbated with any flexion of your hip, such as lifting, sitting for long periods of time, or walking [7]. Wallet neuritis is a type of sciatic nerve neuropathy that is mostly found in men. When you sit on a heavy wallet in your back pocket, there is uneven pressure in your hip area that puts pressure

on your piriformis muscle, and/or your sciatic nerve. When you have wallet neuritis, your sciatic nerve constricts due to the weight of your wallet. You may experience chronic sciatic nerve pain caused by wallet neuritis. You may also experience tingling and burning sensation in your glutes and ipsilateral areas of your lower extremities [8]. Ultrasound Imaging, Magnetic Resonance Imaging (MRI), CT scan, and Electromagnetic Scans (EMG) are mostly used to exclude other conditions. The increased thickness and increased cross-sectional area of piriformis muscle can be demonstrated by ultrasound imaging and magnetic resonance imaging (MRI). Magnetic resonance neurography (MRI) is a medical imaging technology that can detect the presence of sciatic nerve irritation at the level where the nerve passes beneath the piriformis muscles. However, some insurance companies consider MRI “investigational” or “not medically necessary.” MRI can determine whether a patient has a partial or total sciatic nerve or whether they have a split sciatic muscle. This may be important in achieving a good result from the injections or surgery. Image guided injections carried out by an open MRI scanner or other 3D Image Guidance can accurately relax a patient’s piriformis muscle in order to test for the diagnosis. However, other injection methods such as Blind injection, Fluoroscopic guided injection, Ultrasound or EMG guidance may not be as reliable as MRI and have other drawbacks [9]. the most common cause of this condition is that it is a result of a traumatic injury that occurred in the past. Major traumas involve trauma to the buttock, while micro traumas are caused by small repeated bursts of stress to the pectoralis muscle. As long as the cause of pectoralis is some kind of trauma rather than neuropathy, these secondary causes are thought to be preventable, particularly those that occur during daily activities. In this theory, sitting for long periods of time (especially on hard surfaces) causes minor stress that is relieved by standing for short periods of time [10].

Your environment, lifestyle, and physical activity all play a role in how susceptible you are to trauma of any kind. While empirical research on this has yet to be published, many people believe that taking reasonable precautions during high impact sports and in physically demanding environments can reduce the risk of developing piriformis syndrome by

preventing injury to the muscle or the nerve root that spasms. In this sense, proper safety and padding should be worn during any type of consistent, firm contact (for example, American football). In your workplace, you should make regular assessments of your environment and try to identify those things in your routine that could potentially cause micro or macro trauma. Unfortunately, no research has been conducted to prove the effectiveness of such a routine, and participating in one may only increase your concern about physical minutiae, while having no effect on reducing your likelihood of developing or re-developing piriformis syndrome [11]. A survey of the general population found that 12.2%-27% reported an annual occurrence of PS [12]. The common age of occurrence is between 30 and 40 years, and is rarely seen in patients under the age of 20. This has been observed in all lifestyles [13]. A specific test for this condition has not been developed yet, making it difficult to diagnose. The pain usually starts when sitting or walking for an extended period of time. In 2011, the majority of patients with this condition (53.3%) were women aged 45 to 84 years old. Females are twice as likely to develop this condition as men. In addition, women were more likely to stay in hospital than men in 2011 due to the high prevalence of this pain. In 2012, the percentage of patients with low back pain that were diagnosed as having this condition was 17.2%. Although this condition does not appear in children, it is more common in women aged 30 to 40. This is because of hormonal changes throughout their lives, particularly during pregnancy, when the muscles surrounding the pelvis stabilize the pelvis for birth. [14].

Rational of the study: Many research studies has been carried out over prevalence of piriformis syndrome and its association with prolonged and cross-legged sitting worldwide, in Pakistan and also in the public and private schools and colleges of Pakistan. Our researches studies about prevalence of piriformis syndrome and its association with prolonged and cross-legged sitting has different result from each other, because in some schools and colleges studies has knowledge and awareness about PS while other lack awareness and knowledge. According to our study Pakistan has a lot of PS cases



due to lack of awareness and knowledge among students. We need to improve the knowledge of students about the possible prevention and control about PS nationwide. Knowledge about physical health about students in Pakistan is not good like that of the well-grown nations, we must bring it up and the government needs to focus over the knowledge of students about PS.

Literature review: According to research studies, there have been a number of researches till date, globally over the prevalence and causes of piriformis syndrome among students inside Pakistan and throughout the world. In our country there is a lack of research exploitations over PS and by the same way, there is a lack of information and awareness about the sitting and standing positions followed by PS. Many of the research studies over piriformis syndrome have been carried in America and Europe because those nations care about their people and especially the young generation. We suggest an imperative requisite for the prevention and control of PS to ward up the burden of PS all over the world [18]. Students have the most cases of PS worldwide in such countries where there is lack of information and education about the prevention and control of PS and where there is a low quality of healthcare system [19]. According to a research study being conducted in Brazil, piriformis is has the highest frequency worldwide especially among the students and studies show that the prevalence of PS among students is 14% worldwide. Doctors and physiotherapists have remarkably reduced the frequency of PS with the help of medication and physiotherapy among students and the general population. In line with the same research study the prevalence of PS was 9% among students due to prolonged sitting [20].

According to a research study being conducted in Pakistan, there is a lack of information and knowledge among the students of allied health sciences about the prevention and control of piriformis syndrome. The students who contributed to our study aforementioned that there is no guidelines and information provided from our college to them about the PS, we suggest that every college and university students should be provided

with the best facilities by the organization to ward up the burden of PS among students [21].

A research study being conducted in Coimbatore over the prevalence of piriformis and its association with prolonged sitting and standing in the same positioning for a prolonged period of time, including 2900 students, 180 cases of piriformis was found in the age group of 20-70 years and most of the students were female who were suffering with the PS. In line with the study the prevalence of PS among the students were 6% and most of the students used to sit for a prolonged period of time in a same position [22]. A research study being conducted in Malaysia, including 4019 students, the piriformis syndrome was found in 160 students. According to the study, the prevalence of PS was 3.98% among both the male and female students; both the gender sharing the same prevalence of PS among them and the association of prolonged sitting and standing was found the main cause PS [23]. According to a research study being conducted in Romania, including 1632 students, the prevalence of piriformis syndrome was 36.7% among the students. Most of the study subjects were male i.e. 83% between the age group of 20-30 years and most of the students belong to urban areas i.e. 72%. The main cause of PS was prolonged sitting and standing among the students [24]. A research study being conducted in Pakistan, the prevalence of piriformis syndrome was 19% among 220 study participants. According to this study the prevalence of PS was higher among female as compared to males. The main cause of piriformis syndrome was noted as prolonged sitting, standing and using the same position [25].

Materials and Methods: A cross-sectional study was conducted to investigate the association between Piriformis Syndrome and prolonged sitting behaviors among Allied Health Sciences students. The study was carried out at Sarhad University Peshawar, Pakistan. The total duration of the study was six months, spanning from May 2025 to November 2025.

Null Hypothesis (H_0): Piriformis syndrome is associated with prolonged sitting and cross-legged sitting. Alternative Hypothesis (H_1): Piriformis syndrome is not associated with prolonged sitting and cross-legged sitting.

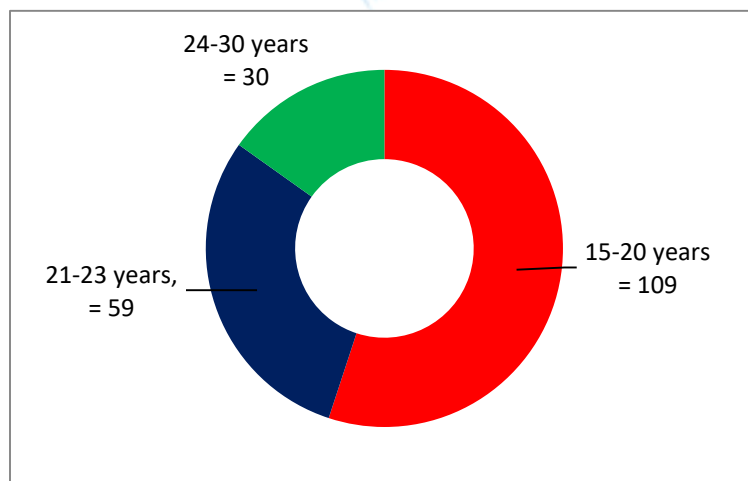
A calculated sample size of 198 participants was recruited using a convenience sampling method. Participant selection adhered to strict inclusion and exclusion criteria. The inclusion criteria comprised: being a student of Allied Health Sciences, being between 18 and 26 years of age and willing to participate. The exclusion criteria were designed to isolate the factor of sitting posture by ruling out other potential causes of similar symptoms. Individuals were excluded if they had pre-existing musculoskeletal conditions, a history of trauma or injury to the hip or lower back region, or other medical conditions known to influence pelvic or sciatic nerve function. Furthermore, exclusions applied to those with a history of recent relevant surgeries, diagnosed neurological disorders, or individuals undergoing specific treatments that could affect neuromuscular function.

Data collection tools: Sample size was measured by Rao soft, for the diagnostic purposes we use FAIR test and self-induced questionnaire. The reliability value of self-induced questionnaire in Cronbach alpha is 0.72. FAIR TEST (flexion + adduction+ internal rotation) is a physical test also known as piriformis test which specificity 83% and sensitive is 88%. Visual analogue scale is also used to determine intensity of pain.

Procedure: Position the patient in the side-lying with the tested hip on top. Passively move the patient’s lower extremity into flexion (90 degrees), adduction, and internal rotation. The examiner stabilizes the hip and applies downward pressure to the knee to internally rotate and adduct the hip, thus placing the piriformis on a stretch that compresses the sciatic nerve. A positive test occurs when pain is produced in the sciatic/gluteal area.

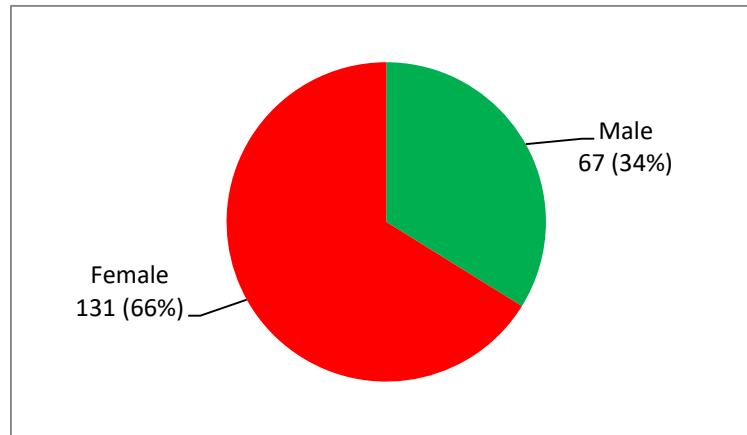
Result: A total of 198 students were included in our research study, most of them were female i.e. 131 (66%). The overall prevalence of piriformis syndrome was 61.61% among both the gender. On the basis of gender the prevalence of piriformis among female students were high as compared to male i.e. 32.92%. Most of the students were suffering with back pain i.e. 47.47%, 47.47% of the students were using wooden chairs, most of the students answered, that they can’t sit more than 30 minutes i.e. 47.97%, 160 students answered that cross-legged sitting increasing their pain and 30.30% of the students said that pain disturbs their daily life. When we asked the students about the relieving of their pain, 61 out of the total students, who were suffering with PS said that rest position can relieve their pain, 32.82% of the students said that pain don’t disturbs their study, and most of the students rated their pain on the scale level of 6-10 i.e. 77.77%.

Age of the students



Gender of the students

This figure shows the total number of male and female who participated in the study



Overall prevalence of piriformis syndrome among the students

This table shows the overall prevalence of piriformis syndrome among the study participants

| Positive and negative | Frequency | Percentage |
|-----------------------|-----------|------------|
| Piriformis positive | 122 | 61.61% |
| Piriformis negative | 76 | 38.39% |
| Total | 198 | 100% |

Prevalence of PS among male and female students

This table shows the prevalence of piriformis syndrome among both the gender i.e. male and female

| Gender | Frequency | Percentage |
|-------------------|-----------|------------|
| Male with PS | 37 | 18.68% |
| Male without PS | 30 | 15.15% |
| Female with PS | 85 | 32.92% |
| Female without PS | 46 | 23.23% |
| Total | 198 | 100% |

Questions interviewed
Part-I

| Sr. No | Question interviewed | Answer, frequency & percentage |
|-----------|---|---|
| 1 | Do you have any medical history of back pain? | Yes (f = 94) 47.47% No (f = 44) 22.22% Yes, but treated on time (f = 23) 11.61% Yes, untreated and suffering with pain (f = 37) 18.68% |
| 2 | What type of sitting chair do you use? | Wooden chair (f = 95) 47.97% Stool (f = 30) 15.15% Sofa (f = 49) 24.74% Soft-padded chair (f = 24) 12.12% |
| 3 | How long you can sit comfortably? | 30 minutes or less (f = 95) 47.97% 1 hour (f = 49) 24.74% More than an hour (f = 20) 10.10% More than 2 hours (f = 30) 15.15% |
| 4 | Which sitting position aggravates your pain? | Cross-legged (f = 160) 80.880% Slumped backward (f = 38) 19.19% |

Questions interviewed
Part-II

| Sr. No | Question interviewed | Answer, frequency & percentage |
|-----------|--|--|
| 5 | Does pain affects your daily life such as... | a. Walking (f = 60) 30.30% b. Standing (f = 50) 25.25% c. Sleeping (f = 40) 20.20% d. Doing chores (f = 48) 24.24% |
| 6 | How does your pain relieve? | a. Rest (f = 61) 30.80% b. Medicine (f = 50) 25.25% c. Changing position (f = 50) 25.25% d. Nothing can relieve my pain (f = 42) 21.21% |



| | | |
|---|---|--|
| 7 | Does pain affect your school or college life? | a. Not, at all (f = 65) 32.82% b. Yes, a little bit (f = 56) 28.28% c. Skipping once a week (f = 40) 20.20% d. Often skipping (f = 37) 18.68% |
| 8 | How do would you rate the intensity of your pain on a scale of 1-10 | a. 1-5 (f = 89) 44.94% b. 6-10 (f = 154) 77.77% |

Discussion: Number of research studies have been carried out on the prevalence of piriformis syndrome and its association with prolonged and cross-legged sitting all over the world, on national and international levels. In line with the research studies, most of the research studies on PS have been carried out in the United States of America and Europe because they are well-developed nation and they care about their health system and their student's health. There is a lack of research studies in Pakistan over the PS. Pakistan is a low-income country and don't have such a good quality of health system as compared to US and Europe. In line with a research student being conducted in Coimbatore over the prevalence of piriformis syndrome and its association with prolonged sitting and standing in the same positioning for a prolonged period of time, including 2900 students, most of the students were female who were suffering with the PS. In line with the study the prevalence of PS among the students were 6% and most of the students used to sit for a prolonged period of time in a same position [28]. But female was more in number than male. In line with a research study being conducted in Malaysia, including 4019 students, the piriformis syndrome was found in 160 students. According to the study, the prevalence of PS was 3.98% among both the male and female students; both the gender sharing the same prevalence of PS among them and the association of prolonged sitting and standing was found the main cause PS [29]. The main reason was that their chairs were according to the proper ergonomics that's why there prevalence was low. According to a research study being conducted in Romania, including 1632 students, the prevalence of piriformis syndrome was 36.7% among the students [30]. But this study include majority of male students. A research study being conducted in Lahore, Pakistan, the prevalence of piriformis syndrome was 19% among 220 study participants. According to this study the prevalence of PS was higher among female

as compared to males. The main cause of piriformis syndrome was noted as prolonged sitting, standing and using the same position [31]. A cross-sectional study conducted in physical therapy female students of different institutes of Gujranwala. Data was collected from 195 students with Convenient sampling technique. The Diagnostic tools used was Visual Analogue Scale Piriformis syndrome diagnostic criteria. Results: Out of 195 female physical therapy students 72 (36.9%) had a high score and had a high probability of having piriformis syndrome. Only (4) 2.1% were unlikely of having piriformis syndrome while in majority of the participants 119 (61%) piriformis syndrome was not considered [32].

Conclusion: From this research study we concluded that the prevalence of piriformis syndrome among students in district Peshawar, Pakistan is alarming and female students are more prone to PS as compared to male students. Back pain was found was in a high ratio among the students and the main cause of PS was found to be the use of wooden chair. Cross-legged sitting was also found one of the main causes of PS among the students. We suggest that the government of Pakistan need to install good quality of chairs in their educational organizations. They must educate the students about the PS; avoid prolonged sitting and how to avoid PS. Piriformis syndrome is a serious danger to the physical health of students because it create other medical and physical conditions to them, especially in countries like Pakistan. Preventive measures should be taken to prevent the burden of PS among students worldwide. As per our study result, we found a high prevalence of PS among students, lack of education, awareness and training about PS. We suggest that every student should be educated, spread awareness, and give them virtue training for the prevention and control of PS among them. Every school and college should provide education, awareness and facilities to

students to ward-up the burden of piriformis syndrome.

Recommendations: The physiotherapists and the doctors need to work over the physiotherapy and treatment of piriformis syndrome, if a child is suffering with PS since childbirth. Timely treatment is necessary, Prolonged and cross-legged sitting should be avoided, good quality sitting chairs should be used, Regular exercise should be done, The students should be educated about the PS and how to avoid it

References

Hogan E, Vora D, Sherman JH. A minimally invasive surgical approach for the treatment of piriformis syndrome: a case series. *Chinese Neurosurgical Journal*. 2020 Dec;6:1-6.

Hashimoto H, Shibahara M, Mizuta Y, Mizushima K. Measurement of piriformis muscle stiffness in athletes with lower back pain and piriformis syndrome: A shear-wave elastography study with consideration of the onset of piriformis syndrome. *Journal of Physical Education and Sport*. 2022 Jul 1;22(7):1748-60.

Martin SD, Abraham PF, Varady NH, Nazal MR, Conaway W, Quinlan NJ, Alpaugh K. Hip arthroscopy versus physical therapy for the treatment of symptomatic acetabular labral tears in patients older than 40 years: a randomized controlled trial. *The American Journal of Sports Medicine*. 2021 Apr;49(5):1199-208.

Siahaan YM, Ketaren RJ, Hartoyo V, Tiffani P. The predisposing factors of piriformis syndrome: Study in a referral hospital. *MNJ (Malang Neurology Journal)*. 2019 Apr 29;5(2):76-9.

Poutoglidou F, Piagkou M, Totlis T, Tzika M, Natsis K. Sciatic nerve variants and the piriformis muscle: a systematic review and meta-analysis. *Cureus*. 2020 Nov 17;12(11).

Park JW, Lee YK, Lee YJ, Shin S, Kang Y, Koo KH. Deep gluteal syndrome as a cause of posterior hip pain and sciatica-like pain. *The bone & joint journal*. 2020 May 1;102(5):556-67.

Chhabra A, Deshmukh SD, Lutz AM, Fritz J, Sneag DB, Mogharrabi B, Guirguis M, Andreisek G, Xi Y, Ahlawat S. Neuropathy Score Reporting and Data System (NS-RADS): MRI Reporting Guideline of Peripheral Neuropathy Explained and Reviewed. *Skeletal radiology*. 2022 Oct;51(10):1909-22.

Schembri E. Piriformis muscle syndrome, post discectomy: a comprehensive review of its diagnostic process and management, illustrated with the aid of a case report. *SN Comprehensive Clinical Medicine*. 2019 Feb;1(2):134-41.

Hegmann KT, Travis R, Belcourt RM, Donelson R, Eskay-Auerbach M, Galper J, Haldeman S, Hooper PD, Lessenger JE, Mayer T, Mueller KL. Diagnostic tests for low back disorders. *Journal of occupational and environmental medicine*. 2019 Apr 1;61(4):e155-68.

Marco C, Miguel-Pérez M, Pérez-Bellmunt A, Ortiz-Sagristà JC, Martinoli C, Möller I, Miguel SO, Agulló P. Anatomical causes of compression of the sciatic nerve in the pelvis. Piriform syndrome. *Revista Española de Cirugía Ortopédica y Traumatología (English Edition)*. 2019 Nov 1;63(6):424-30.

Chekroud SR, Gueorguieva R, Zheutlin AB, Paulus M, Krumholz HM, Krystal JH, Chekroud AM. Association between physical exercise and mental health in 1·2 million individuals in the USA between 2011 and 2015: a cross-sectional study. *The lancet psychiatry*. 2018 Sep 1;5(9):739-46.

Wu YY, Guo XY, Chen K, He FD, Quan JR. Feasibility and reliability of an ultrasound examination to diagnose piriformis syndrome. *World Neurosurgery*. 2020 Feb 1;134:e1085-92.

Biz C, de Iudibus G, Belluzzi E, Dalmau-Pastor M, Bragazzi NL, Funes M, Parise GM, Ruggieri P. Prevalence of chronic pain syndrome in patients who have undergone hallux valgus percutaneous surgery: a comparison of sciatic-femoral and ankle regional ultrasound-guided nerve blocks. *BMC Musculoskeletal Disorders*. 2021 Dec;22(1):1-5.

- AKBAŞ İ, Kocak AO, Alpaslan ÜN, Doğruyol S, Gur ST. A rare cause for sciatalgia: Piriformis syndrome. *Journal of Emergency Medicine Case Reports*. 2021 Aug 8;12(3):82-4.
- Kent L. Pain in the Buttocks when Sitting? Use these Tips to Manage Piriformis Syndrome.
- Harle CA, Danielson EC, Derman W, Stuart M, Dvorak J, Smith L, Hainline B. Analgesic management of pain in elite athletes: a systematic review. *Clinical Journal of Sport Medicine*. 2018 Sep 1;28(5):417-26.
- Jatua, D., Sarkar, B., Nandi, G., Bhandari, B., Karmakar, P.R., Goswami, S. and Basu, S.M., 2020. The effectiveness of piriformis injection under fluoroscopy and nerve stimulator guidance with local anaesthetic and steroid for management of piriformis syndrome among manual workers in Eastern India: A prospective interventional study. *Indian Journal of Pain*, 34(3), pp.183-183.
- Han MH, Kang JY, Do HJ, Park HS, Noh HJ, Cho YH, Jang DH. Comparison of clinical findings of congenital muscular torticollis between patients with and without sternocleidomastoid lesions as determined by ultrasonography. *Journal of Pediatric Orthopaedics*. 2019 May 1;39(5):226-31.
- Reynoso JP, De Jesus Encarnacion M, Nurmukhametov R, Melchenko D, Efe IE, Goncharov E, Taveras AA, Ramirez Pena IJ, Montemurro N. Anatomical Variations of the Sciatic Nerve Exit from the Pelvis and Its Relationship with the Piriformis Muscle: A Cadaveric Study. *Neurology International*. 2022 Oct 31;14(4):894-902.
- Alam F, Akter F, Parvez N. A patient with urinary incontinence and pelvic floor weakness managed by pelvic floor muscle strengthening exercise. *Recent Adv Clin Trials*. 2021;1(1):1-4.
- Larionov A, Yotovskii P, Filgueira L. Novel anatomical findings with implications on the etiology of the piriformis syndrome. *Surgical and Radiologic Anatomy*. 2022 Oct;44(10):1397-407.
- Muhammad A, Rana MR, Amin T, Angela C, Pereira FA, Bhutto MA. Prevalence of Piriformis Muscle Tightness among Undergraduate Medical Students. *Pakistan Journal of Medical & Health Sciences*. 2022 Apr 7;16(02):964.
- Yamuna AP. *The Effectiveness of Mulligan Mobilization Versus Stretching on the Management of Piriformis Syndrome: A Comparative study* (Doctoral dissertation, PPG College of Physiotherapy, Coimbatore).
- Rajendran S, Sundaram SS. The effectiveness of myofascial release over stretching on pain and range of motion among female college students with piriformis syndrome. *Malaysian Journal of Movement, Health & Exercise*. 2020 Jul 1;9(2):45
- Islam F, Mansha H, Gulzar K, Raza A, Raffique A, Haider S. Prevalence Of Piriformis Muscle Syndrome Among Individuals with Low Back Pain: Piriformis Muscle Syndrome Among Individuals with Low Back Pain. *Pakistan Journal of Health Sciences*. 2022 Sep 30:48-52.
- Nazir S, Asmat G, Ashfaq U, Saeed T. Frequency of Piriformis Syndrome among Female Physiotherapy Students of Gujranwala, Pakistan: Piriformis Syndrome among Female Physiotherapy Students. *Pakistan Biomedical Journal*. 2022 Jan 31:103-7.
- Astarini NM, Wahyuni N, Wibawa A, Indrayani AW, Widyadharma IP. Prevalence and risk factor of piriformis syndrome among online motorcycle taxis in Denpasar, Bali. *Bali Anatomy Journal*. 2020 Jun 1;3(1):24-7.
- Mughal S, Ahmad M, bin Malik K. Prevalence of Piriformis Tightness Due to Long Hours Sitting Among Bankers of Faisalabad City. *Independent Journal of Allied Health Sciences*. 2020;3(01):55-9.
- Yamuna AP. *The Effectiveness of Mulligan Mobilization Versus Stretching on the Management of Piriformis Syndrome: A Comparative study* (Doctoral dissertation, PPG College of Physiotherapy, Coimbatore).

- Rajendran S, Sundaram SS. The effectiveness of myofascial release over stretching on pain and range of motion among female college students with piriformis syndrome. *Malaysian Journal of Movement, Health & Exercise*. 2020 Jul 1;9(2):45
- Islam F, Mansha H, Gulzar K, Raza A, Raffique A, Haider S. Prevalence Of Piriformis Muscle Syndrome Among Individuals with Low Back Pain: Piriformis Muscle Syndrome Among Individuals with Low Back Pain. *Pakistan Journal of Health Sciences*. 2022 Sep 30:48-52.
- 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.
- Astarini NM, Wahyuni N, Wibawa A, Indrayani AW, Widyadharma IP. Prevalence and risk factor of piriformis syndrome among online motorcycle taxis in Denpasar, Bali. *Bali Anatomy Journal*. 2020 Jun 1;3(1):24-7.
- Mughal S, Ahmad M, bin Malik K. Prevalence of Piriformis Tightness Due to Long Hours Sitting Among Bankers of Faisalabad City. *Independent Journal of Allied Health Sciences*. 2020;3(01):55-9.

