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Original Research

Predisposing factors of Piriformis tightness and its association with low back pain in office workers - a cross sectional study

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Abstract

Piriformis tightness causes restricted range of motion and decreased flexibility. It interferes with the physical and social functioning of people and leads to piriformis syndrome if not diagnosed in initial stages. To identify the predisposing factors that may cause Piriformis tightness and to check its association with low back pain in office workers. It was a cross-sectional study and convenient sampling technique was used to collect data from the study participants. Sample size was 250, office workers were selected through defined inclusion criteria. Selection criteria include subjects of 26 to 50 years working from at least of 2 years. Seated Piriformis test was used to check the presence of Piriformis muscle tightness. Visual analogue scale was used for pain assessment and a structured questionnaire was used to check the predisposing factors. After collecting data from study participants it was analysed through SPSS version 22. Piriformis tightness was found in 76% office workers. About 58% of the study participants reported to work in office for 6 to 8 hours. 88% of workers reported to sit in slouched posture while 78% reported not to have any foot support. Almost 80% of office workers reported work related back pain. Chi square test resulted a significant association of Piriformis tightness with low back pain ($p<0.05$). Piriformis tightness was frequent in office workers. Predisposing factors included prolong working hours, uncomfortable chairs without appropriate foot support, poor posture, and work related back pain. Study also concluded the significant association between low back pain and Piriformis tightness.

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Keywords:office workers, low-back pain, Piriformis tightness,predisposing factors

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Introduction: Piriformis tightness causes restricted range of motion and decreased flexibility [1]. It interferes with the physical and social functioning of people and leads to Piriformis syndrome if not diagnosed in initial stages [2]. It is frequently misdiagnosed, because of its symptoms resemble with an inter-vertebral disc herniation, radiculopathy, sacroiliac joint dysfunction, orsacrolitis [3]. But most of the patients of low back pain also exhibits Piriformis tightness [4]. One of the most well-known causes of low back pain is Piriformis muscle stiffness [5]. The range of the frequency for Piriformis conditions is between 5 to 36%. Piriformis disorders are more common in women than males [2]. The most common signs and symptoms related to Piriformis muscle syndrome include painful sitting, tenderness on muscle, tightened muscle, muscle spasms and pain while rectal examination. The delayed diagnosis of the Piriformis disorder leads to pain, paresthesia, hyper-paresthesia, and muscle weakness. When muscles are subjected to abnormal stress, type-1 filaments of the Piriformis muscle may tighten, putting strain on the sciatic nerve, which affects almost 80% of people. Previous literature found that sitting for eight hours or more can aggravate pain in the joints and make it more uncomfortable, especially if you adopt a bad contracted position while sitting [6].

Sciatic pain begins in the middle or lower buttock and is acute, dull or radiating in nature. Anterior pain is experienced when the S1 nerve is compressed. Pain is felt on the dorso-lateral side if the L5 nerve is compressed [7]. The link between the Piriformis muscle and sciatica has long been known. Piriformis syndrome (PS) may result in sciatica-related LBP and buttock discomfort. If the pain is radiating from back to the leg region, Piriformis syndrome should also be considered in differential diagnosis [8].

With the purpose of determining the prevalence and risk factors of Piriformis syndrome in online motorcycle taxis in Denpasar, Ni Made Wira Tania Astarini *et al.*, conducted a study in 2020. According to the findings, 44.8% of respondents with less than 8 hours of work per week had Piriformis syndrome, compared to 55.2% of respondents with more than 8 hours. About 37.9% of study participant reported to place their wallets in back pocket, which is also a contributing factor of Piriformis tightness [9]. A descriptive study by YM. Tua Siahaan *et al.*, in 2019 investigated the predisposing factors of Piriformis syndrome. Result revealed that most of the participant had history of micro-trauma like sitting on hard surfaces (36.9%), sitting cross-legged (10.8%) and walking or running to long distances (18.5%)[10].

A study was conducted in 2020 by Pradip B., *et al.*, with the goal of assessing and screening 120 middle-aged male desk jobs for tightness of muscles around the hip joint.Study concluded that the majority of professionals having desk jobs, might experience tightness in hip muscles including hamstrings, iliopsoas and Piriformis, making them more susceptible to low back pain or other hip- or back-related symptoms[11].

Piriformis tightness is a very common problem in individuals, but there is very little literature available in Pakistan. Office workers spend a significant amount of time sitting. Previous studies have frequently overlooked this specific population. The study's goal was to investigate the predisposing factors for Piriformis tightness and its association with low back pain in office workers. The findings of the study will assist healthcare professionals in developing preventive strategies for Piriformis tightness in this specific profession.

Materials and methods:

Study design was cross-sectional. A sample of 250 participants was selected through convenient sampling technique from various cities of Pakistan including Multan, Faisalabad and Lahore. Sample size was calculated through Open Epitool software. Study population was office workers, who were selected through defined inclusion and exclusion criteria. Duration of the study was about six months.

Inclusion criteria: The inclusion criterion of the study was the office workers of both genders, between the ages of 26 to 50 years. Participants who were working from at least two years were included in the study.

Exclusion criteria: Exclusion criteria included the workers with the history of any previous spinal or leg surgery, any known metabolic disease, history of trauma or fractures, participants with known psychological disorders and those workers who refused to sign the consent form or do not want to participate in the study.

After selecting participants using a convenient sampling technique, the purpose and procedure of the study were explained to them. All participants signed an informed consent form prior to data collection. The seated Piriformis test was used to determine Piriformis tightness. Manual palpation was used to assess the tenderness of the Piriformis muscle. The pain intensity in the back and buttocks was assessed using a Visual Analogue Scale. To identify the risk factors for Piriformis tightness in office workers, a structured questionnaire was used. That self-reported questionnaire was distributed to the study participants after the entire procedure was guided. The researchers assisted them in filling out the questionnaires, after which they were evaluated for Piriformis tightness and tenderness.

The Seated Piriformis Stretch Test had a sensitivity of 0.52 and a specificity of 0.90 [12]. The test carried out with the participants seated in the chair, backs straight, and feet flat on the floor. The affected leg was then crossed and the ankle of the affected leg was placed on the unaffected knee, performing a passive flexion, adduction, and internal rotation. The researcher placed one hand at the ankle to support it and the other on the lateral side of the knee to feel the deep Gluteal area. The therapist then asked the patient to bend forward or may pull the patient's knee up to their chest. Participant's complaints of pain in the buttock area were linked to Piriformis tightness [13].

Visual Analogue Scale is one of the valid and reliable tool for measuring pain. It is used to track patient's pain progression or intensity of pain. It is a 0 to 100 mm scale with 0 means no pain, and 100 mm means worst pain ever experienced [14]. The VAS had an inter-method reliability of 0.86 and estimated intra-method reliability was 0.86 with a 95% confidence interval of 0.81 to 0.90, indicating good reliability [15].

Statistical analysis:
SPSS version 22 was used to enter and analyse all of the collected data. Frequency and percentages were used to display descriptive statistics. The Pearson chi-square test was used to examine the association between Piriformis tightness and low back pain.

Ethical Consideration:
All ethical concerns were taken into account. A permission letter signed by the head of the department was used to get permission and collect data from specific settings. An informed consent form was signed by all study participants prior to data collection. Privacy and safety of the participants was prioritized.

Results:
Demographic statistics revealed that out of 250 participants, 130 (52%) were females and 120 (48%) were males. Most of the people 116 (46.4%) were between the age limit of 31 to 35 years, 22.8 percent were between age of 26 and 30 years. 121 (48.2%) participants had been working from 2 to 4 years, 69 (27.6) had job duration of 4 to 6 years, 44 (17.6%) had been working in office job for 6 to 8 years and 16 (6.4%) was working more than 8 years (Table 1). Piriformis Seated Test was found to be positive in almost 76% participants, which showed the presence of Piriformis muscle tightness in them. Piriformis Tenderness was assessed by manual palpating the Piriformis muscle and tenderness was present in almost 64% of the study participants (Figure 1). Majority of study participants 146 (58.4%) had been sitting for 6 to 8 hours while on office duty. 61 (24.4%) were sitting for 4 to 6 hours. The types of chairs that were used by office workers included, hard seat with back support 65 (26%), use of stool or chair with no back support 40 (16%), foam seat with back support 125 (50%) and ergonomic chair 20(8%). Foot support was available to 55 (22%) participants. 219 (87.6%) adopted stoop posture while sitting. On asking about work related back pain, 205 (82%) reported to had a history of back pain in recent days intermittently. 144 (57.6%) participants rarely take breaks from interrupted sitting while working due to busy office schedule. 20 (8%) had history of trauma or accident. While asking to participants about whether they were doing any home exercises, yoga or muscle stretching, only 49 (19.6%) were engaged in this type of physical activity (Table 2).
Buttock and back pain intensities are shown in Figure 2. In most of the participants the pain intensity was mild in both Back (58%) and Buttock (62%) region. 18% of the subjects had moderate back pain and 14% had moderate Buttock pain.Table 3 showed the test finding of Pearson Chi-Square test. Results showed a p value of less than 0.05, which indicated the association of Piriformis tightness with back pain.

Discussion:
Piriformis tightness causes restricted range of motion and decreased flexibility [1]. The most common signs and symptoms related to Piriformis muscle syndrome include painful sitting, tenderness on muscle, tightened muscle, muscle spasms and pain while rectal examination [6]. The aim of the study was to identify the predisposing factors that may cause Piriformis tightness and to check its association with low back pain in office workers.
In the current study, out of 250 participants Piriformis tightness was found in 76% individuals. In line with these results a study by H Adiyatma *et al.*, in 2022 concluded that Piriformis syndrome mostly occurs in 4th and 5th decades of the person's life and is more common in females [16].
In the recent study, factors that was found to be involved in Piriformis tightness and associated low back pain was prolong working hours or prolonged sitting duration, poor sitting posture uncomfortable chairs with no foot support, insufficient breaks while working. In 2020, a systematic review by I.K. Othman *et al.*, revealed that in 10 high quality studies the determined risk factor of Piriformis tightness was gender, increase BMI, history of back pain and prolong sitting while working or driving. Other factors included were unhealthy lifestyle, strenuous physical activities and psychological stress [17].
In a previous study by Desai et al., Piriformis tightness was found in 135(51.92%) bankers [18]. While the study participant in the recent study were office workers but both occupations are related to prolong sitting. In the recent study Piriformis tightness was present in 76% of the participants. In line with the recent study another cross-sectional research revealed to have a frequency of Piriformis tightness in 65.4% of banker and resulted that prolong sitting jobs are a major risk factor of Piriformis muscle tightness [19]. A descriptive study by Pradip B *et al.*, in 2018 resulted that tightness in hip muscle was present in most of the individuals involved in prolonged desk jobs [11].
In 2020, a research found the risk factors of Piriformis syndrome in online motor taxis. Study concluded that prolong duration of working is one of the risk factor of Piriformis syndrome [9]. In recent study most of the study participants 146 (58.4%) were working of about 6 to 8 hours and 19 (7.6%) were working more than 6 hours.
In 2018, M. Mubashir *et al.*, check the association of Piriformis tightness with back pain. Findings of the study revealed that Piriformis syndrome was the leading cause of LBP [20]. The results of the recent study also showed the association of Piriformis muscle tightness and work related low back pain ($p<0.05$). In contrast to the current result, a study by F. Islam et al., in 2022, found that the frequency of Piriformis muscle syndrome in people with LBP was only 18.3% [5].
The study focused only office workers so the results may not be generalized to other occupations, study did not focus on the individual fitness level or other health issues of the participants. Further studies are recommended with larger sample size, including other professionals and focused to collect on objective assessment instead of self-reported data. The companies should take ergonomic measures by providing their employees comfortable chairs with foot support. Prolonged sitting can be avoided by taking frequent breaks, proper hydration and muscle stretching with appropriate technique.

Conclusion:
Piriformis tightness was frequent in office workers. Predisposing factors included prolong working hours and

prolonged sitting, uncomfortable chairs without appropriate foot support, poor posture, and work related back pain. Study also concluded the significant association between low back pain and Piriformis tightness.

Conflict of interest: None

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Table 1. Demographic Statistics

Demographic Statistics (n=250)		
		F (%)
Gender	Females	130(52)
	Males	120(48)
Age	26-30y	57(22.8)
	31-35y	116(46.4)
	36-40y	48(19.2)
	41-45y	19(7.6)
	46-50y	10(4)
Job duration/ experience	2-4y	121(48.2)
	4-6y	69(27.6)
	6-8y	44(17.6)
	>8y	16(6.4)

Table 2. Frequency and percentages of participant's responses

Frequency and percentages of participant's responses (n=250)		
Predisposing factors		f(%)
Working hours	2 to 4h	24(9.6)
	4 to 6h	61(24.4)
	6 to 8h	146(58.4)
	>8h	19(7.6)
Type of chair used	Hard seat with back support	65(26)

	Stool/chair with no back support	40(16)
	Foam seat with back support	125(50)
	Ergonomic chair	20(8)
Sitting posture	Stooped	219(87.6)
	Sitting upright	31(12.4)
Foot support	Yes	55(22)
	No	195(78)
Work-related pain in Back	Yes	205(82)
	No	45(18)
Frequency of breaks or interrupt prolonged sitting	Every 30 min	7(2.8)
	After 1 to 2 h	18(7.2)
	After 2 to 3 h	66(26.4)
	Rarely	144(57.6)
	Never	15(6)
History of trauma/ accident	Yes	20(8)
	No	230(92)
Home exercises/ muscle stretching/ Yoga	Yes	49(19.6)
	No	201(80.4)

Table 3: Response of Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	197.917[a]	1	.000		
Continuity Correction[b]	192.743	1	.000		
Likelihood Ratio	196.134	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	197.125	1	.000		
N of Valid Cases	250				
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 12.00.					
b. Computed only for a 2x2 table					

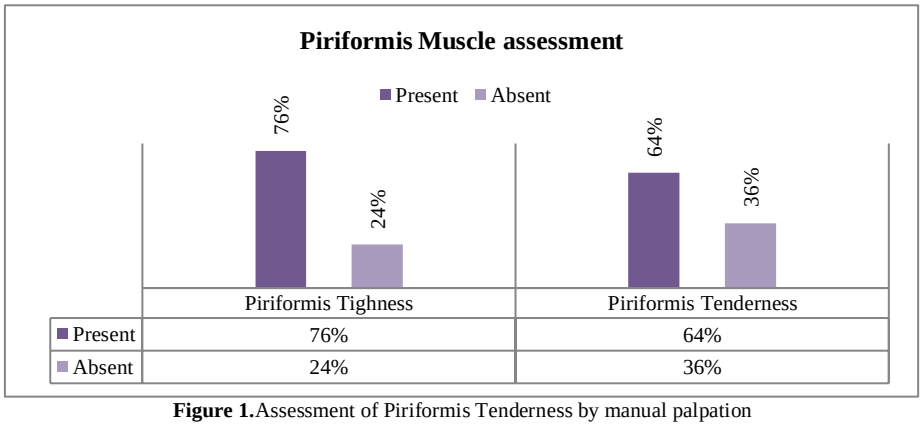

Figure 1. Assessment of Piriformis Tenderness by manual palpation

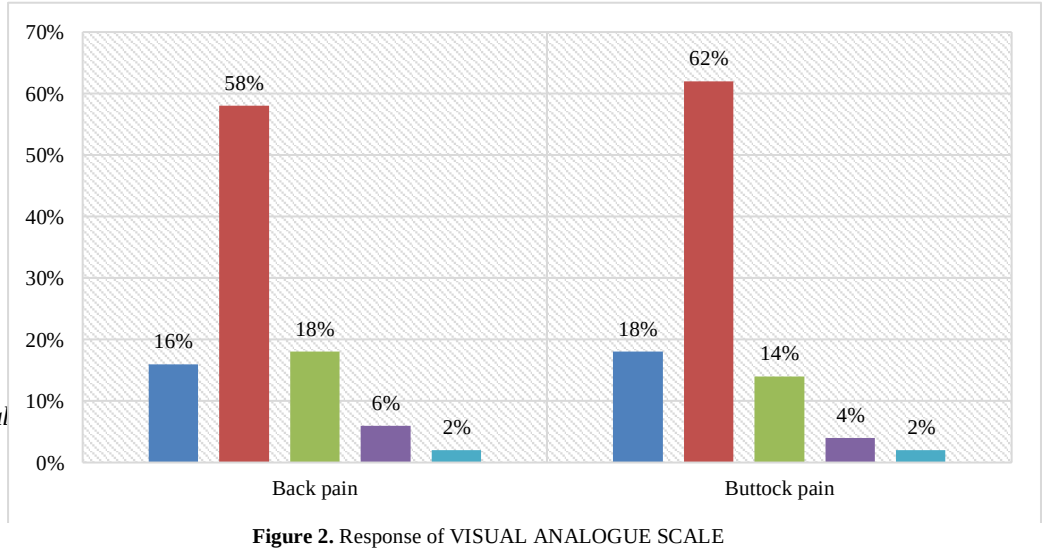

Figure 2. Response of VISUAL ANALOGUE SCALE