

How to Cite:

Dahiya, T., Verma, T., Fatima, A., Verma, R., & Bhushan, B. (2022). Incidence of Piriformis Tightness and to determine correlation with gluteus medius weakness in Indian IT – Professionals: A cross sectional study. *International Journal of Health Sciences*, 6(S6), 4137–4146. <https://doi.org/10.53730/ijhs.v6nS6.10578>

Incidence of Piriformis Tightness and to determine correlation with gluteus medius weakness in Indian IT – Professionals: A cross sectional study

Trived Dahiya

BPT student, Galgotias university, Greater Noida India

Dr. Taruna Verma (PT)

Assistant professor Galgotias University (MPT), Greater Noida, India

Dr. Ambreen Fatima (PT)

Assistant Professor Galgotias University (MPT), Greater Noida, India

Dr. Rituraj Verma (PT)

Professor Galgotias University (MPT), Greater Noida, India

Dr. Bharat Bhushan(PT)

Associate Professor G. D. Goenka University, India

Abstract--Background: The usage of computers is rising in every field of work, mainly in IT professionals where a professional sit in a computer for long period of time. This increases the prevalence of musculoskeletal disorders, like low back pain and neck pain. Continues sitting for long period of time can cause tightness in piriformis muscle and can lead to piriformis syndrome and it can also affect the other hip muscles to become weak, and ultimately it can cause low back pain. Weak Gluteus Medius muscle was also found in the peoples suffering from low back pain and continues sitting. This study aims to identify the incidences of piriformis muscle tightness and to determine correlation with gluteus medius weakness. This study is based on an observational based design, 100 IT professionals were taken randomly. Method: IT professionals (n=100) registered during this study & on the basis of inclusion & exclusion criteria they are evaluated. The collected data is obtained by performing piriformis stretch test for checking tightness of piriformis & Manual muscle testing of Glutes Medius. Result: Out of 100 subjects 68% of the subjects are clinically diagnosed with piriformis muscle tightness & 37% subjects are having weak

gluteus medius muscle. Both piriformis muscle tightness & gluteus medius weakness was found in 31% of the subjects. Conclusion: It concludes that IT professionals are at higher risk of developing piriformis muscle tightness due to continuous sitting during their job & this could lead to low back pain & gluteus medius weakness.

Keywords---piriformis tightness, determine correlation, gluteus medius.

Introduction

Low back pain is a common concern. As many as 90% of people are affected at some stage in their lives, and as many as 50% have more than one episode (Mondal M. et al, 2017). It is defined as the pain that occurs anywhere from the bottom of the ribs to the lower hip fold, with or without a shunt of the lower extremities (Cooper, Nicholas A et al, 2017). Sitting for long period of time is the primary cause of piriformis syndrome. It is one of the main causes of low back pain which can result from tightness in piriformis muscle (Mondal M. et al, 2017). It mainly occurs in women in a ratio 3:1 & the cause behind this is likely to be wide quadriceps muscle (Cooper, Nicholas A et al, 2017, Neha et al, 2022). The action of the piriformis muscle is to rotate the hip externally; it also weakly adducts & flexes the hip.

While standing & sitting it also provides stability to the posture (Lori A. Boyajian O Niel et al, 2008). During daily activities, piriformis muscle plays an extremely crucial role in dynamic hip stabilization. In piriformis syndrome the kinematics of the hip joint is also altered during walking and the hip's flexion and extension peak angle changes significantly (Ebrahimi Takamjani Ismail et al, 2020). Shortening of the piriformis can also occur due to the disturbed biomechanics of the pelvic region, lower back and lower extremities (Cynthia Chapman DC et al, 2012). The piriformis muscle arises from sacral foramina 1 to 4, margin of the greater sciatic foramen and Sacro tuberos ligament and inserts into the greater trochanter's superior border. This muscle is innervated by sciatic nerve (Mondal M et al, 2017). In some cases, it was also observed that the tendon of the piriformis muscle fuses with the gluteus medius and obturator internus muscle before inserting to the greater trochanter (Daniel Probst et al, 2019). There are several risk factors that contributed to piriformis muscle tightness and piriformis syndrome, like females are at more risk to develop piriformis syndrome, obese people, people with piriformis atrophy, work related to heavy weight carrying, microtraumas or direct injury to the gluteal region and the activities which require bending are at greater risk (Ida Kartini Othman et al 2020, sharma et al 2020). It was also observed that there is external tenderness over the region of the piriformis muscle, while sitting there is aggravation of pain and pain at the area of buttocks (Kevork Hopayian et al, 2010). Decreases gluteus medius strength & reduced force output of the hip abduction is also seen in the patients with low back pain (Subhasis Ranjan Mitra et al, 2014). The action of gluteus medius is hip abduction,

Flexion & internal rotation is facilitated by anterior fibers, extension & external rotation of hip is facilitated by the posterior fibers. The pelvic drop of the opposite side of the hip is also prevented by the gluteus medius muscle during the stance

phase of the gait cycle, also known as Trendelenburg gait. During gait & other activities gluteus medius also provides stability to the entire pelvic anteriorly (Laura Presswood et al 2008). Gluteus medius muscle also acts as a stabilizer for the pelvis and maintaining upright position of the trunk during standing on one leg, running, and walking when one foot is off the ground. This muscle is innervated by superior gluteal nerve (Aashin Shan et al, 2021). Gluteus medius syndrome can also cause lower back pain, leg pain and buttock pain. Trigger points develop over the gluteal region. Gluteus medius syndrome may be caused due to trochanteric bursitis and gluteus medius tendinopathy (Masahiro Kameda et al 2020).

Musculoskeletal discomfort is occasionally experienced by the sedentary occupations such as office workers. Mostly the sitting position is required to perform the most of the tasks in the office setting (Bridget Foley et al, 2016). This sitting for long period increases the chances of injuries by exerting maximum amount of load on the muscles (Pradip B. et al, 2018). Peoples with low back pain are found to have less muscle strength & endurance, & also with reduced motor control. But it is still not known that these deficits are cause or an effect of low back pain (Amy H. Amabile et al, 2017). The purpose of the current study was to spot the incidences of piriformis tightness & correlation with gluteus muscle weakness.

Methodology and Materials

This prospective cross-sectional study evaluates the incidence of piriformis muscle tightness & its correlation with gluteus medius weakness in IT Professionals. The subjects were selected randomly using inclusion & exclusion criteria. Ethical approval was obtained from the university and consent was obtained from the subjects before conducting the study. The subjects included are healthy IT professionals, both males & females of age group 22 to 45 years were taken in the study. Demographic data is collected & SF 36 questionnaire is used to determine the Quality of life of the subjects, only healthy subjects are included.

Inclusion criteria

Healthy individuals of age group of 22-45 years, employees working from last 1 year, minimum 5 hours of work.

Exclusion criteria

Subjects with Low back pain due to any back pathology, Spinal cord injury, Any spinal deformity, Subjects free from any physiological factors. E.g., Pregnancy. History of cardiovascular Disease, stroke or other cardiac disorders, History of lower spine and lower extremity surgery, Peoples suffered from low back pain within last 6 months.

Materials

Universal Goniometer, weighing machine, measuring tape, Clipboard and pen

Procedure

To all the subject's procedure of the study was explained. Demographic data was taken from the subjects. Prior to stretch test and MMT, all the subjects were instructed to march in their place for 8-10 minutes for the warm-up, under supervision of therapist.

Stretch Test for piriformis

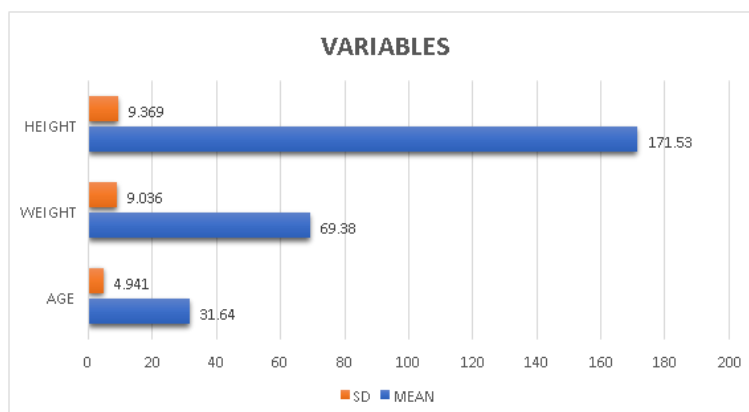
Subject is placed in supine lying position. The tested leg of the subject is flexed and hip is also flexed. Then the foot was placed outside the knee of the non-tested leg. The hip joint angle is kept at 60 degree and is measured by universal goniometer. Therapist's one hand stabilizes the ASIS of the subject and the other hand is kept on the test leg's knee and the stretch is applied. If the subject experiences pain or discomfort (greater trochanter) or the therapist observes reduced range on motion (Adduction) then the test is considered positive. Figure 3. Performing Stretch test for Piriformis muscle.

Gluteus medius muscle (Manual muscle testing)

The strength of the gluteus medius is assessed by placing the subject in a lateral position and the subject will slightly extend the hip and abduct the hip. The therapist will apply the resistance to the ankle joint. The test is performed using the rupture test described by Hislop and Montgomery (Hislop HJ et al, 2002). Grading is done on the basis of subject's ability to resist the resistance. Grade 5, if the subject is able to resist the maximum resistance provided by the therapist. Grade 4, if the subject is able to resist the minimal resistance provided by the therapist. Grade 3, if the subject is only able to perform against the gravity. Grade 2, if the patient is unable to perform against gravity but can perform with assistance to gravity. Grade 1, if only the movement of muscle is felt during palpation. Grade 0, no movement.

Result

Incidence of Piriformis muscle tightness was checked in 100 IT professional subjects. Age ranges between 22-45 years.



Graph 1. Mean age, weight & height

Total no of 59 male subjects & 41 female subjects were included in this study.

Table 1
Mean age, weight & height

VARIABLES	n	MEAN±SD
AGE	100	31.64±4.941
WEIGHT (kg)	100	69.38±9.036
HEIGHT (cm)	100	171.53±9.369

Table 2
Total no subjects

	MALE (n)	FEMALE (n)
FREQUENCY	59%	41%

Out 100 subjects 68 subjects were diagnosed with piriformis muscle tightness and 32 subjects had no tightness (Table 3) & 37 subjects had weakness in gluteus medius muscle. (Table 4). Out of these 100 subjects, 31 subjects are diagnosed with both piriformis muscle tightness & gluteus medius weakness.

Table 3
Tightness and no tightness in piriformis muscle

TOTAL NO OF SUBJECTS = 100	PERCENTAGE
PIRIFORMIS TIGHTNESS	68%
NO PIRIFORMIS TIGHTNESS	32%

Table 4
Subjects with & without gluteus medius weakness

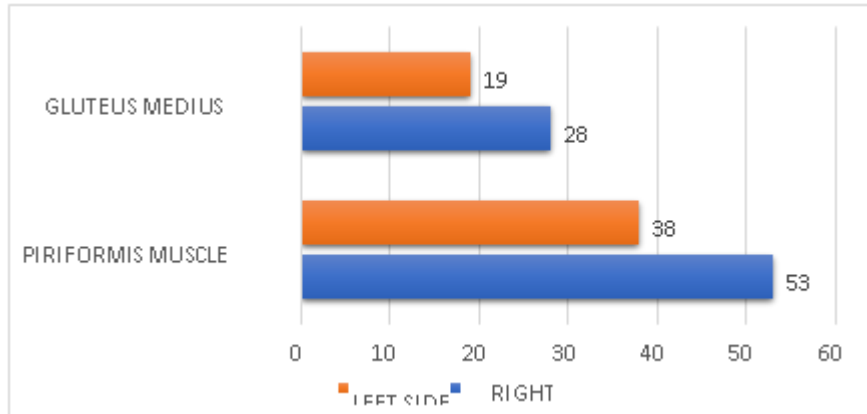
TOTAL NO OF SUBJECTS = 100	PERCENTAGE
GLUTEUS MEDIUS WEAKNESS	37%
NO GLUTEUS MEDIUS WEAKNESS	63%

Piriformis muscle tightness in right side was found in 53% subjects & in left side tightness was in 38% subjects. gluteus medius weakness in right side was 28% & 19% in left side. It was found that both piriformis tightness & gluteus medius weakness was more in right side, as compared to the left side. (Table 5)

Table 5
Comparison of Right & Left Side

	PIRIFORMIS MUSCLE TIGHTNESS	GLUTEUS MEDIUS WEAKNESS
RIGHT SIDE	53%	28%
LEFT	38%	19%

SIDE		
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Graph 2. Comparison of Right & Left Side

In the correlation piriformis muscle tightness right side with gluteus medius weakness rightside shows the positive correlation means there is significant effect of piriformis muscle tightness on gluteus medius weakness.piriformis muscle tightness left side with gluteus medius weakness left side show the positive correlation meansthat there is significant effectof piriformis muscle tightness on gluteus medius weakness. A complete negative correlation is seen when the value ranges equal to or more than -nd A positivecorrelation is seen when the value is equal to or less than 1.0. (Table6&7)

Table 6

Correlation values of piriformis muscle tightness & gluteus medius weaknessright side, piriformismuscle tightness & gluteus medius weakness left side

CORRELATION	PIRIFORMIS MUSCLE TIGHTNESS RIGHT SIDE	PIRIFORMIS MUSCLE TIGHTNESS LEFT SIDE
GLUTEUS MEDIUS WEAKNESS RIGHT SIDE	0.230	0.20
GLUTEUS MEDIUS WEAKNESS LEFT SIDE	-0.055	0.146

Table 7

Main correlation table

Correlations	PIRIFORMIS MUSCLE TIGHTNESS	PIRIFORMIS MUSCLE TIGHTNESS	GLUTEUS MEDIUS WEAKNESS	GLUTEUS MEDIUS WEAKNESS

		RIGHT	LEFT	RIGHT	LEFT
PIRIFORMIS MUSCLE TIGHTNESS RIGHT	Pearson Correlation	1	.118	.230*	-.055
	Sig. (2-tailed)		.242	.021	.589
	N	100	100	100	100
PIRIFORMIS MUSCLE TIGHTNESS LEFT	Pearson Correlation	.118	1	.200*	.146
	Sig. (2-tailed)	.242		.046	.147
	N	100	100	100	100
GLUTEUS MEDIUS WEAKNESS RIGHT	Pearson Correlation	.230*	.200*	1	.266**
	Sig. (2-tailed)	.021	.046		.008
	N	100	100	100	100
GLUTEUS MEDIUS WEAKNESS LEFT	Pearson Correlation	-.055	.146	.266**	1
	Sig. (2-tailed)	.589	.147	.008	
	N	100	100	100	100
*. Correlation is significant at the 0.05 level (2-tailed).					
**. Correlation is significant at the 0.01 level (2-tailed).					

Discussion

IT professionals with prolonged sitting work are at greater risk of developing piriformis muscle tightness, this tightness in muscle can create pressure on the sciatic nerve & can also irritate the sciatic nerve, which can eventually cause low back pain, buttock pain & radiating pain. Due to long period of sitting and walking the piriformis muscle becomes short, it is also a postural muscle and can become overactive, hypertonic and weak (Mondal M et al, 2017). The sedentary behaviour develops tightness in the muscle and some muscle gets weak due to inactivity and the pressure. The weakness in the gluteus medius muscle can lead to chronic low back pain. This low back pain can affect the person's work efficiency and daily activity. Our study highlights the data which shows increasing risk of tightness in piriformis muscle and the subjects are also affected with gluteus medius weakness, this can lead to low back pain and other radicular symptoms in lower extremity. It also increases the chances of atrophy of the affected muscles and affects the person's daily working abilities.

In this study subjects with age 22-45 years were included and it was found that 68% of the subjects are having tightness in piriformis & 37% subjects are found to have weakness in gluteus medius muscle. Both piriformis muscle tightness & gluteus medius weakness was found in 31% of the subjects. Later this can develop into chronic low back pain. Peoples now spend their time sitting on desk job work & also in their home watching Television, using smartphones, attending online classes & lack of exercises, this creates a great risk of muscle tightness. So, including physical activities like daily exercises, stretching, participation in some sports activities, & yoga and decrease the risk of low back pain and muscle tightness. Peoples should include the physiotherapy rehabilitation if they experience any kind of pain at their back or buttocks. It could also help in improving quality of life & increasing work efficiency. This study highlights the increasing incidences of piriformis muscle tightness and its correlation with gluteus medius weakness.

Conclusion

This study aims to determine incidence of piriformis tightness and its correlation with gluteus medius muscle. Out of 100 subjects 68 subjects were clinically diagnosed with tightness in piriformis muscle, it shows the prevalence of piriformis muscle tightness in IT professionals. Correlation was also shown in the study between piriformis tightness and gluteus medius weakness. 37 subjects had gluteus medius weakness & 31 subjects are diagnosed with both piriformis tightness & gluteus medius weakness. Hence, it was concluded that IT professionals of India are at higher risk of developing piriformis tightness and gluteus medius weakness, which can lead to low back pain in future.

Limitation of study

Sample size was small in this study, large sample size would give more precise results. Gluteus medius muscle strength can be measured using dynamometer, it will show better evaluation of the muscle strength.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Acknowledgements

The authors thank all the participants who participated in this research study.

Research funding

This research did not receive any specific grant from any funding agency in the public, commercial, or non-profit sectors.

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