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Frequency of Iliotibial Band Tightness and Its Association with Anterior Knee Pain in Healthcare Workers

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Abstract

Purpose: Iliotibial band tightness can raise the risk of injury by altering biomechanics. ITB tightness leads to abnormal patellar alignment and tracking and causes pain and several other problems. To assess the frequency of iliotibial band tightness and its relation with anterior knee pain in health-care workers

Methodology: It was a cross-sectional research conducted from September 2021 to February 2022. Sample size of the study was 210. Study settings included the government and private hospitals of Faisalabad. In order to recruit healthcare providers, a convenient sampling technique was utilized. Inclusion criteria of the study were both male and female healthcare workers of age between 21 to 45 years working from at least 2 years. Ober's test was used to determine the tightness of the IT band. The anterior knee pain was evaluated by numeric pain rating scale (NPRS). Data was analyzed and interpreted by SPSS version 25. Data was presented in forms of tables and charts.

Findings: Out of 210 subjects, 64.76% were men and 35.23% were women. Iliotibial tightness was found to be present in 110(52.38%). On NPRS, 100(47.61%) participants reported mild to moderate pain and 30(14.28%) reported severe to worst pain in the anterior knee. Chi-square tests shows a statistical significant association ($p < 0.05$) between iliotibial band and anterior knee pain.

Recommendations: In conclusion, iliotibial tightness was found to be present in 52.38% of the health workers. Results of the study showed that anterior knee pain occurs in iliotibial band tightness. This study, grounded in biomechanical and anatomical theories, demonstrated a significant association between iliotibial band tightness and anterior knee pain. Healthcare workers should focus on proper body biomechanics and incorporate regular muscle stretching in their routine to prevent the muscle tightness and associated problems.

Keywords: *Anterior Knee Pain, Iliotibial Band Tightness, Healthcare Workers, Prevalence*

1.0 INTRODUCTION

The iliotibial band is a fibrous tissue developed proximally by the convergence of fascia from hip abductors, flexor and extensor muscles. It is a long and non-elastic fibrous structure that runs along the outer thigh and connects the knee and hip joints (1). After convergence from the gluteus maximus muscle at posterior side and the tensor fascia lata antero-laterally, the band initiates proximally from the iliac-crest and merges into tissue. This thick band with separate fibres runs laterally down the thigh. Deep fibers extend and adhere to the femur's linea aspera. Some superficial fibres connect to the lateral condyle of femur whereas others, as part of the lateral retinaculum, enter into the lateral patella. The band is inserted into Gerdy's tubercle on the antero-lateral condyle of the tibia at its most distal point (2).

Iliotibial band syndrome develops by repetitive knee flexion and extension movements, which causes rubbing and possibly irritation of the distal iliotibial band as it passes across the lateral epicondyle of femur. Iliotibial band syndrome has been associated to a number of potential risk factors, such as, previous iliotibial band tightness, long distance travelled, prolonged walking or running on a track, interval workouts, and weak knee extensor, knee flexor and hip abductors muscles. Iliotibial band syndrome appears to be influenced by weak hip abductors (3).

A high rate of muscular tightness might be caused by a shortage of oxygen. When sitting, people's shoulders may round subconsciously, cause shallow breathing and, as a result, lacks of oxygen flow to muscular tissues, resulting in ITB stiffness. Neuromuscular symptoms may develop as a result of inadequate flexibility, which can gradually diminish strength, endurance, and stability. ITB tightness can raise the risk of injury by altering biomechanics. ITBFS and patella-femoral dysfunction might result from its lateral patellar insertion. Ober's test is a well-known specific test for ITB tightness (4). ITBS has been identified in a variety of athletes, including 1.6 - 12% of runners, 15 - 24% of cyclists, and athletes from a variety of other sports (5). ITBS accounts for 22.2% of all lower limb injuries among runners (6).

Anterior knee pain is prevalent in orthopedics and patellar misalignment is a typical ailment that causes this pain. Patellar tracking is most typically hampered by aberrant patellar supporting structures. Patellar malalignment is most commonly observed as lateral tilting or lateral subluxation of patella, which is caused by weakness of medial soft tissues or tight lateral connective tissue around the patella (7). Patellar tracking is also affected by the iliotibial tract. Aberrant patellar orientation and tracking have been linked to tightness of the IT band. Because ITB sends slippage to the patella bone, which fuses with the lateral retinaculum at the knee, adaptive reduction of these tissues fosters IT band tightness and interferes with patellar stability. When the knee is flexed, a tight IT band drags the patella at outer side and cause lateral rotation of tibia, which can increase the knee's valgus orientation and exacerbate the patella's excessive lateral tracking (8).

Health care professionals either actively treat people as physicians or nurses, or indirectly treat patients as staff members, technicians, aides, or medical waste handlers. Major physical injuries among health-care providers include musculoskeletal issues, which are more prevalent among nurses and orderly employees. It occurs over seven times more frequently in these professionals due to patient handling, positioning, making beds in extremely uncomfortable positions, and shifting to beds, chairs, and toilets for purposes of diagnosis and treatment. Muscle stiffness, sprains, and strains are often reported among healthcare professionals. Most affected body areas include the shoulders, low back, knee pain, and leg muscles (9).

Mane (2020) studies the occurrence of tightness in Ilio-tibial Band in people involved in sitting for longer hours. A total of 60 people working for seven hours or more per day, between the ages of twenty and sixty were included. Iliotibial band tightness has been identified to be 47% more common in research participants who sat for more than 7 hours each day. (10). Another study by I Arif et al.

reported 45.69% prevalence of iliotibial band in office workers (11). According to a narrative literature review on MSDs among female nurses, the knee and ankle/foot areas were the most commonly impacted. The incidence of MSDs varied between 7.2 and 77% in the knees and between 3.2 and 100% in the ankles. Between 8.5 and 10.5% of people had MSDs in their lower legs (the shins), while between 11 and 100% of people had them in their thighs and hips (12).

The goal of the study was to ascertain the prevalence of tightness in the iliotibial band and its relationship to anterior knee pain among healthcare providers. Despite the widespread nature of these issues, there is a significant void in the existing literature that fails to adequately evaluate their relationship, particularly among healthcare providers. Understanding the link between iliotibial band tightness and anterior knee pain is important clinically because it might lead to better preventative and management techniques, potentially enhancing the quality of life for countless people who suffer from this condition.

The study is grounded in the biomechanical and anatomical theories related to the musculoskeletal system. These theories suggest that tightness in the iliotibial muscle interferes with patellar stability and may lead to exacerbate the patella's excessive lateral tracking, potentially causing anterior knee pain. To validate this theoretical framework, the frequency of iliotibial band tightness and its relation with anterior knee pain was seen in health-care workers.

2.0 METHODOLOGY

It was a cross-sectional research performed from September 2021 to February 2022. Study duration was six months. Sample size of the study was 210, which was calculated by open Epitool software. The population of the study was the healthcare workers. In order to gather data from healthcare providers, a convenient sampling technique was utilized. Study setting included the government and private hospitals of Faisalabad.

Inclusion criteria of the study were both male and female healthcare workers of age between 21 to 45 years working from at least 2 years. Exclusion criteria were history of any recent trauma or lower limb operation, individuals with any reported systemic or metabolic disease, individuals with any congenial deformity and individuals not willing to sign the informed consent form.

All individuals were informed of the study's goal prior to data collection. Prior to data collection, all respondents signed an informed consent form. After collecting the demographic details and occupational history, Ober's test was used to determine the tightness of the iliotibial band. The anterior knee pain was evaluated by numeric pain rating scale (NPRS).

The Ober's test was performed with the subjects lying sideways with affected side up. The contralateral leg at hip and knee joints was flexed. The researcher stood behind the individual and used one hand to firmly stabilize the pelvis/greater trochanter. The therapist flexed the participant's effected leg to a right-angle at the knee by gripping the distal end with the other hand. The hip joint is then extended and abducted. Then researcher lowers the leg towards the table, adducting the hip, until mobility is limited. The hip joint was not allowed to medially rotate or flex while performing the test, and the pelvis was stabilized. The test was considered positive, if the leg remained in abducted position and the participant feel any lateral knee pain (13). The Ober test seems to be an valid way of determining IT band flexibility. There was a significant difference in ROM when testing with the afflicted knee flexed vs extended, with reliability coefficients of .90 and .91, respectively (14).

The NPRS is a segmental arithmetic variation of the VAS in which the subject selects a number from 0 to 10 that best indicates the degree of his or her discomfort. The 11 point numeric scale goes from '0' to '10,' with '0' signifying "no pain" and '10' denoting "worst pain" (15). The VAS and NRS had a significant positive association ($r = 0.92$, $p 0.001$), with excellent agreement as evidenced by the Bland-Altman approach (mean difference = 0.33) (16).

All ethical concerns were taken into account. A permission letter signed by the Head of department was used to get permission to all the desired hospital setups prior to data collection. Before recruitment in the research, all participants signed the informed consent form. Dignity and privacy of all participants were prioritized. All personal data was kept confidential.

After data collection, all the data was analyzed and interpreted by SPSS version 25. Descriptive statistics was illustrated in form of frequency and percentages. Chi-square test was applied to see association iliotibial-band tightness with anterior knee pain.

3.0 FINDINGS

Table 1 showed the frequency and percentages of descriptive statistics. Out of 210 participants, 64.76% were males and 35.23% were females. Age was divided into five categories, 6.19% were from the age of 21 to 25 years, 40.47% were from 26 to 30 years, 29.52% were from the age of 31 to 35 years and 5.23% were between the ages of 40 to 45 years. Out of total healthcare workers, 26.6% were physicians, 11.90% were physiotherapists, 34.28% were nurses, 3.33% were dentist and 19.04% were technicians and other staff. 30.95% of the healthcare workers reported to work from 6 to 8 hours per day, 60.47% had work from 9 to 11 h/day, 7.61% had work from 12 to 14 hours per day and 0.95% participants reported to work more than 15 hours per day.

Table 1: Frequency and Percentages of Descriptive Statistics

Descriptive statistics (n=210)		
Gender	Male	136(64.76%)
	Female	74(35.23%)
Age	21-25	13(6.19%)
	26-30	85(40.47%)
	31-35	62(29.52%)
	36-40	39(18.57%)
	40-45	11(5.23%)
Profession	Physicians	56(26.6%)
	Physiotherapist	25(11.90%)
	Nurses	72(34.28%)
	Dentist	7(3.33%)
	Technicians and other	40(19.04%)
Working hours/day	6-8h	65(30.95%)
	9-11h	127(60.47%)
	12-14h	16(7.61%)
	>15h	2(0.95%)

Ober's test was used to check the presence of tightness in iliotibial band. Out of 210 healthcare workers, iliotibial tightness was found to be present in 110(52.38%) participants and in 100(47.61%) participants' ober's test was negative (Figure 1).

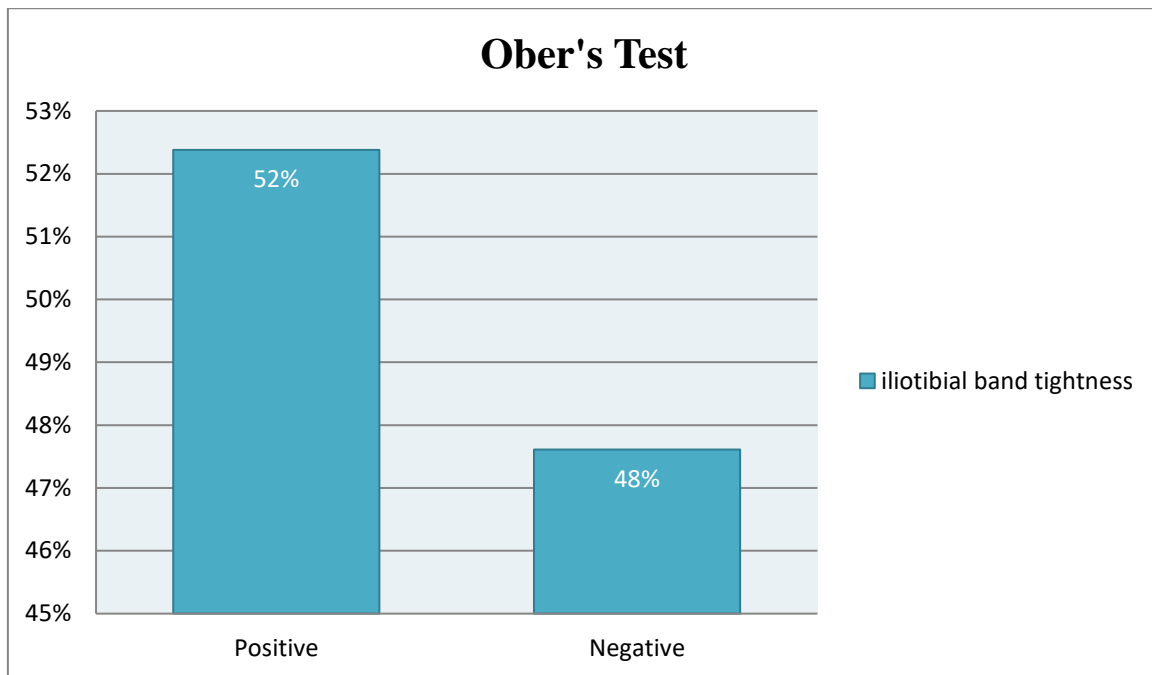


Figure 1: Bar Chart of Ober's Test

To evaluate the intensity of anterior knee pain, NPRS was used. 80(38.09%) of the participants reported to have no pain in anterior knee region, 100(47.61%) reported mild to moderate pain and 30(14.28%) reported severe to worst pain in the anterior knee (Figure 2).

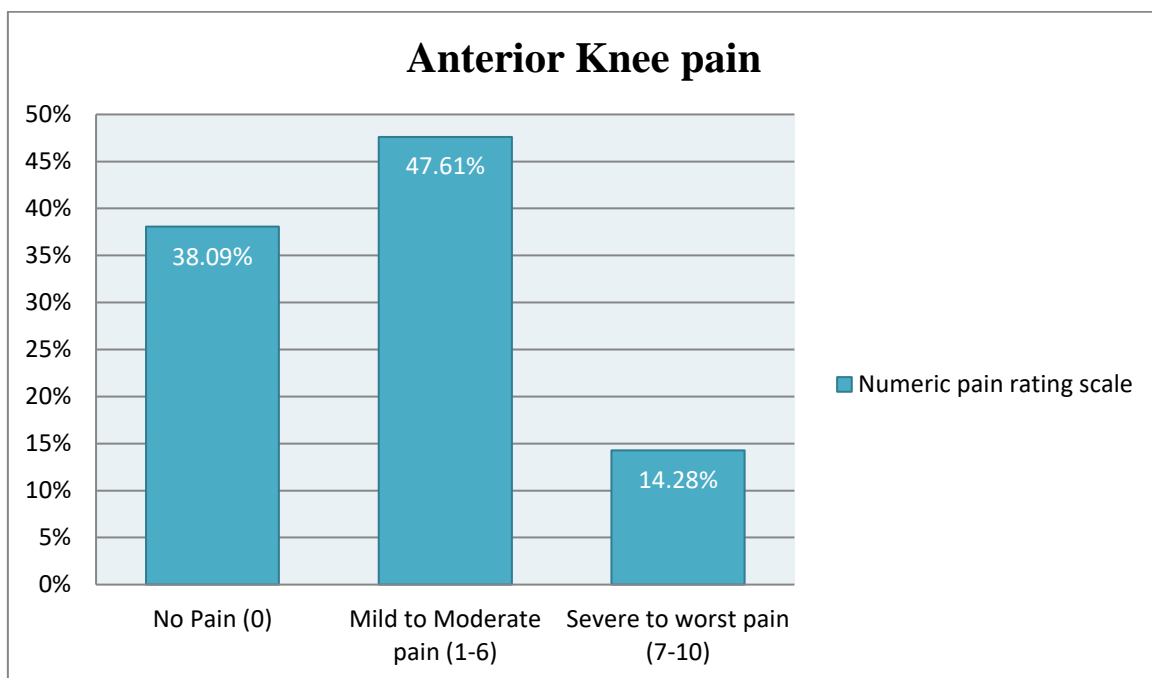


Figure 2: Bar Chart of Anterior Knee Pain on NPRS

Table 2 demonstrate the cross tabulation of ober’s test with anterior knee pain on NPRS. Out of 110 total participants having iliotibial band tightness, 2 participants reported no pain in anterior knee, 78 healthcare workers reported mild to moderate pain and 30 reported severe to worst pain in anterior knee. Out of 100 participants having negative ober’s test, 78 reported no pain in knee region and 22 healthcare workers reported mild to moderate pain.

Table 2: Ober's Test and Anterior Knee Pain (NPRS) Cross tabulation

		Anterior Knee pain (NPRS)			Total
		No pain	Mild to moderate	Severe to Worst	
Ober's test	Positive	2	78	30	110
	Negative	78	22	0	100
Total		80	100	30	210

Table 3 demonstrates the association of iliotibial band tightness with anterior knee pain. Chi-square tests shows a $p < 0.05$. A statistical significant association was found between iliotibial band tightness and anterior knee pain.

Table 3: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	133.386 ^a	2	.000
Likelihood Ratio	166.559	2	.000
Linear-by-Linear Association	119.446	1	.000
N of Valid Cases	210		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.29.

Discussion

Iliotibial band tightness can raise the risk of injury by altering biomechanics. Tightness of the ITB has been recognized as a mechanism causing aberrant patellar realignment and tracking (8). The study's goal was to determine the frequency of iliotibial band tightness and its relationship to anterior knee discomfort in healthcare providers.

The findings of the current study showed that, out of 210 healthcare workers, iliotibial tightness was found to be present in 110(52.38%). P Seema et al. found nearly the same results in bankers, concluding that the prevalence of ITB tightness was 43.72% (17). A Mane et al. carried out a study in 2020 to determine the occurrence of Iliotibial Band tightness in prolonged Sitting individuals. The study revealed that people who sat for more than 7 hours per day had a 47% occurrence of iliotibial band tightness (10). Similarly a study by I Arif et al. reported 45.69% prevalence of iliotibial band in office workers (11).

ITB syndrome severity is influenced more by the mechanics of the knee joint (18). The iliotibial band can be irritated and inflamed by continuous flexion of the knee and tibial medial rotation (19). The IT band might rub on the epicondyle of femur if the knee was frequently flexed and extended. The iliotibial band fibres contract and may be squeezed over the femur epicondyle at roughly 30° of knee flexion (20). Results of the recent were in line that IT band tightness may lead to knee pain. In current study 52.38% healthcare workers had tightness in iliotibial band. Out of total participants 47.61% reported mild to moderate pain and 14.28% reported severe to worst pain in the anterior knee.

In present study chi-square tests revealed a statistical significant association ($p < 0.05$) between iliotibial band tightness and anterior knee pain. Out of 110 total participants having iliotibial band tightness, 78 healthcare workers reported mild to moderate pain and 30 reported severe to worst pain in anterior

knee. Another research by R Sannasi et al. validated similar findings, demonstrating that patellofemoral pain syndrome (PFPS) had been associated with tightness of the iliotibial band and other lower limb muscles including the rectus femoris and calf muscle (7).

Although, the study had decent sample size of 210 participants, but it may not represent the entire population of healthcare workers, furthermore, it targeted the health providers of only one city, so the results may not be generalized at broad level. The study did not focused on other factors like physical activity and underlying health conditions that may cause knee pain and only a single self-reported pain scale was used for evaluation of anterior knee pain, which may cause inaccurate reporting or biasness from participants of the study.

4.0 CONCLUSION AND RECOMMENDATIONS

Conclusion

In conclusion, iliotibial tightness was found to be present in 52.38% of the health workers. Results of the study showed a p value below 0.05. A statistical significant association was found between iliotibial band tightness and anterior knee pain.

Recommendation

- Further research with larger sample size and more diverse population from different cities is recommended.
- Further studies are recommended with more developed assessment plan which objective outcome measures while considering the other factors like underlying health conditions and level of physical activity to accurately identifying the condition.
- Healthcare workers should focus on proper body biomechanics and incorporate regular muscle stretching in their routine to prevent the muscle tightness and associated problems.

Conflict of interest: None.

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