RESEARCH PAPER

Prevalence of Greater Trochanteric Pain in Triathlon and Duathlon Athletes

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Received: 25th Aug, 2026 | Revised: 1st Sep, 2026 | Accepted: 5th Sep, 2026 | Available Online: 11th Sep, 2026

ABSTRACT

Background

Greater Trochanteric Pain Syndrome (GTPS) is a common musculoskeletal condition involving the lateral aspect of the hip, often associated with gluteal tendinopathy, trochanteric bursitis, and iliotibial band pathology. Endurance athletes, particularly those participating in triathlon and duathlon events, are at increased risk due to repetitive loading, prolonged training durations, and high biomechanical demands. Despite its clinical significance, limited data exist regarding the prevalence of GTPS in this specific athletic population. Therefore, this study aimed to determine the prevalence of Greater Trochanteric Pain among triathlon and duathlon athletes.

Methodology

An observational cross-sectional study was conducted among 104 triathlon and duathlon athletes aged 18–40 years in Kolhapur using simple random sampling. Assessment of GTPS was carried out using the Numeric Pain Rating Scale (NPRS) and clinical diagnostic tests including the FABER test, Ober's test, and Single Leg Stance test. The study duration was six months.

Result

The findings revealed that 40.4% of participants demonstrated positive clinical findings suggestive of GTPS, indicating a substantial prevalence within this population. Test-specific results showed 47.1% positivity in the FABER test, 50% in Ober's test, and 45.2% in the Single Leg Stance test. The mean age of participants was 30.62 ± 6.12 years, and the mean duration of training was 3.56 ± 1.05 hours. The results suggest that GTPS is not limited to older individuals but is also prevalent among younger athletes due to repetitive mechanical stress, prolonged activity, iliotibial band tightness, and hip abductor dysfunction.

Conclusion

The study concludes that there is a moderate to high prevalence of Greater Trochanteric Pain among triathlon and duathlon athletes. The findings highlight that training load, biomechanical stress, and muscular imbalances are key contributing factors rather than age or gender alone. The null hypothesis was rejected, confirming a significant prevalence of GTPS in this population. Early screening, targeted strengthening of hip abductors, flexibility training, and appropriate load management strategies are essential to prevent and manage GTPS effectively.

Keywords

Greater Trochanteric Pain Syndrome, Triathlon Athletes, Duathlon Athletes, Lateral Hip Pain, Iliotibial Band Tightness, Hip Abductor Weakness, Overuse Injury, Endurance Sports

How to cite this article: Prathamesh B. Pawar1 Dr. Aditi Jadhav2* Dr. Samruddhi S. Shete3. Prevalence of Greater Trochanteric Pain in Triathlon and Duathlon Athletes. Int J Drug Deliv Technol. 2026;16(82s):1081-1091. DOI: 10.25258/ijddt.16.82s.118.

INTRODUCTION

Greater Trochanteric Pain Syndrome (GTPS) is widely recognized as a significant cause of lateral hip pain, characterized by localized tenderness over the greater trochanter of the femur and pain that may radiate along the lateral thigh [1,2]. Historically, this condition was primarily attributed to trochanteric bursitis; however, contemporary research has redefined GTPS as a multifactorial clinical entity involving gluteus medius and minimus tendinopathy, partial or full-thickness tendon tears, iliotibial band friction, and associated soft tissue inflammation [2,3]. This shift in understanding emphasizes that GTPS is not merely an isolated inflammatory condition but rather a complex syndrome involving both mechanical and degenerative processes.

Clinically, individuals with GTPS often report pain during functional and weight-bearing activities such as walking, running, stair climbing, prolonged standing, and particularly when lying on the affected side in many cases, patients describe difficulty performing routine daily activities such as sitting cross-legged, rising from a chair, or maintaining a single-leg stance, all of which require adequate hip abductor strength and pelvic stability. Over time, persistent symptoms may lead to compensatory movement patterns, reduced activity levels, and a decline in overall quality of life [(7,8).]

In athletic populations, hip pain constitutes a considerable proportion of overuse injuries, largely due to repetitive loading, biomechanical stress, and insufficient recovery periods [(11).] Endurance athletes are especially vulnerable because of the cumulative nature of their training, where high mileage, prolonged sessions, and repetitive movement cycles subject musculoskeletal structures to microtrauma over time. Unlike acute injuries, these overuse conditions often develop insidiously, making early detection and management more challenging.

From a functional perspective, the lateral hip region plays a critical role in maintaining pelvic stability, facilitating shock absorption, and ensuring efficient force transmission during locomotion (16,20). The gluteus medius and minimus muscles are particularly important in controlling hip adduction and internal rotation during dynamic activities such as running and cycling. When these muscles are weak, fatigued, or overloaded, abnormal biomechanics may occur, increasing stress on surrounding structures and predisposing athletes to GTPS [(16,20).]

Triathlon and duathlon are multisport endurance disciplines that impose unique and combined biomechanical demands on the hip joint. Triathlon involves sequential swimming, cycling, and running phases, whereas duathlon includes running and cycling components. These sports require sustained muscular endurance, efficient neuromuscular coordination, and optimal biomechanical alignment [(15,19).] During running, repetitive ground reaction forces demand eccentric control from the hip abductors, while cycling involves prolonged hip flexion and repetitive concentric contractions, which may lead to muscle fatigue and altered load distribution [(10,16,20).]

For example, during long-distance running, an athlete with inadequate hip abductor strength may exhibit excessive hip drop (Trendelenburg pattern), thereby increasing compressive forces on the lateral hip structures. Similarly, in cycling, improper bike fit—such as incorrect saddle height or handlebar position—can alter hip kinematics, contributing to increased strain on the gluteal tendons [(10,11).] Even swimming, although non-weight bearing, may contribute indirectly through cumulative fatigue and muscular imbalance, particularly in athletes who do not incorporate adequate strength training into their training programs.

With the increasing popularity of triathlon and duathlon at both recreational and competitive levels, there has been a corresponding rise in musculoskeletal injuries among participants. Commonly reported injury sites include the knee, lower leg, and lumbar spine; however, hip-related pain is frequently under-reported or overlooked. This under-recognition may be due to symptom overlap with other conditions such as lumbar radiculopathy, hip osteoarthritis, or iliotibial band syndrome, leading to misdiagnosis and delayed treatment [(11,19).]

In practical scenarios, athletes often ignore early signs of lateral hip discomfort, attributing them to general soreness or fatigue. For instance, a triathlete may continue training despite experiencing mild lateral hip pain during long runs, only seeking medical attention when the pain becomes severe enough to limit performance or interfere with sleep. Such delays can result in chronicity, increased tissue damage, and prolonged rehabilitation periods.

Several intrinsic and extrinsic factors contribute to the development of GTPS. Intrinsic factors include muscle weakness, particularly of the hip abductors, reduced flexibility, leg length discrepancies, and poor neuromuscular control [(16).] Extrinsic factors include training errors such as sudden increases in training intensity or volume, inadequate warm-up, improper footwear, and unsuitable training surfaces. Biomechanical abnormalities such as excessive hip adduction and internal rotation further increase the risk of lateral hip overload.

In cycling-specific contexts, prolonged hip flexion combined with repetitive pedaling cycles may lead to gluteal muscle fatigue and reduced force generation capacity [(10,11).] This fatigue can compromise pelvic stability during subsequent running phases, especially in triathlon events, thereby increasing the risk of GTPS.

Despite the growing body of literature on GTPS in the general population and among runners, there remains limited research specifically addressing its prevalence in triathlon and duathlon athletes [(11,12).] This gap in knowledge restricts the ability of clinicians and physiotherapists to design targeted prevention and rehabilitation strategies for these populations.

Understanding the prevalence of GTPS is essential for early identification, effective management, and prevention of chronic symptoms. Physiotherapists play a vital role in the assessment, treatment, and prevention of GTPS through structured exercise programs, biomechanical correction, and education on load management [16].

The gluteus medius is the primary hip abductor and acts to prevent contralateral pelvic drop during locomotion, thereby ensuring efficient energy transfer and minimizing compensatory movement patterns.The gluteus minimus assists in hip abduction and contributes significantly to internal rotation and dynamic stabilization of the femoral head within the acetabulum [16]. Dysfunction, overload, or degeneration of these tendons—collectively referred to as gluteal tendinopathy—is now recognized as a central pathological component of greater trochanteric pain syndrome (GTPS), rather than isolated bursitis as previously believed [16].

Surrounding the greater trochanter are multiple bursae that function to reduce friction between osseous and soft tissue structures. The most clinically relevant include the trochanteric bursa, subgluteus medius bursa, and subgluteus minimus bursa. These bursae facilitate smooth movement of the gluteal tendons over the greater trochanter during repetitive hip motion. However, excessive mechanical loading, repetitive friction, or compressive forces—common in endurance sports—may lead to inflammation or irritation of these bursae, contributing to lateral hip pain [18].

The iliotibial band (ITB), a dense longitudinal fascial structure extending from the iliac crest

to the lateral tibial condyle, passes over the greater trochanter and plays a significant role in lateral hip biomechanics [19]. During repetitive activities such as running and cycling, the ITB moves anteriorly and posteriorly relative to the greater trochanter, generating compressive forces on the underlying gluteal tendons and bursae. Increased ITB tension or reduced flexibility can exacerbate this compression, thereby contributing to the development and persistence of GTPS [16].

Neuromuscular control of the lateral hip is primarily mediated by the superior gluteal nerve, which innervates the gluteus medius and minimus muscles. Impairments in neuromuscular coordination or delayed muscle activation can result in altered movement patterns, increased hip adduction, and excessive pelvic drop during functional activities. These biomechanical alterations increase stress on the greater trochanteric region and are commonly observed in athletes with GTPS.

Additionally, the interplay between the hip abductors, trunk musculature, and lower limb kinetic chain is essential for maintaining optimal biomechanics. Weakness or fatigue of the hip abductors can lead to compensatory strategies such as increased trunk lean or altered stride mechanics, further increasing compressive loads on the lateral hip structures. This is particularly relevant in endurance athletes, where repetitive loading cycles and inadequate recovery can result in cumulative microtrauma, tendon degeneration, and persistent pain [15,20].

Recent evidence suggests that GTPS should be considered a spectrum of disorders involving gluteal tendinopathy, bursitis, and ITB-related friction rather than a single pathological entity. Understanding the detailed anatomy and biomechanical interactions of the greater trochanteric region is therefore critical for accurate diagnosis, targeted physiotherapeutic assessment, and the development of effective load management and rehabilitation strategies.

BIOMECHANICS OF GREATER TROCHANTERIC REGION

The biomechanics of the greater trochanteric region are fundamentally linked to the role of the hip joint in load transmission, shock absorption, and movement efficiency during dynamic activities. In endurance sports such as triathlon and duathlon, the hip is subjected to repetitive cyclical loading, particularly during running and cycling phases, placing significant mechanical demands on the lateral hip structures [15,20].

During normal gait and running, the hip joint undergoes coordinated movements across multiple planes, including flexion-extension, abduction-adduction, and internal-external rotation. The stance phase, especially single-leg support, is biomechanically critical, as the body's center of mass shifts over the supporting limb. At this point, the hip abductors—primarily the gluteus medius and minimus—generate force to stabilize the pelvis and prevent contralateral pelvic drop [16,23]. This stabilizing action reduces excessive hip adduction and maintains proper alignment of the lower limb.

Increased hip adduction and internal rotation during dynamic tasks have been identified as key biomechanical contributors to greater trochanteric pain syndrome (GTPS). These movements elevate compressive forces between the greater trochanter and the overlying ITB, as well as tensile loading on the gluteal tendons. Repetitive exposure to such forces, particularly in endurance athletes, can result in cumulative microtrauma and eventual tendon degeneration [20].

The concept of compressive versus tensile loading is central to understanding GTPS biomechanics. While tendons are well adapted to tolerate tensile loads, excessive compressive forces—such as those occurring when the hip is in adduction—can impair tendon structure and function. In positions of increased hip adduction, the gluteus medius and minimus tendons are compressed against the greater trochanter by the ITB, creating a mechanically disadvantageous environment that promotes tendinopathy [26].

Running mechanics further amplify these stresses. Factors such as increased stride length, excessive crossover gait (narrow step width), and reduced cadence can increase hip adduction angles and pelvic instability. Similarly, fatigue of the hip abductors during prolonged activity reduces their ability to control frontal plane motion, leading to compensatory strategies that increase lateral hip loading. These maladaptive patterns are particularly relevant in long-distance triathlon and duathlon events, where repetitive loading occurs over extended durations.

Cycling, although considered a lower-impact activity, also contributes to GTPS through sustained hip flexion and repetitive motion. Prolonged time in a flexed hip position can alter muscle activation patterns and increase tension in the ITB, thereby contributing to compressive forces over the greater trochanter [25]. Improper bike fit, such as excessive saddle height or poor alignment, may further exacerbate these biomechanical stresses.

The interaction between the trunk, pelvis, and lower limb—often referred to as the kinetic chain—is another critical component of lateral hip biomechanics. Weakness or poor neuromuscular control of proximal stabilizers, including the core and hip abductors, can lead to increased trunk lean and pelvic drop during movement. This shifts the line of force laterally, increasing the load on the greater trochanteric region. Additionally, delayed activation or reduced endurance of the gluteal muscles has been associated with altered movement patterns and increased injury risk [21].

Ground reaction forces (GRFs) also play a significant role in the development of GTPS. During running, these forces are transmitted from the foot through the lower limb to the hip. Inefficient shock absorption, due to factors such as poor muscle control or inadequate joint mobility, can result in higher loads being transferred to the lateral hip structures. Over time, this repeated loading may exceed the tissue's capacity for repair, contributing to pain and dysfunction.

Furthermore, biomechanical asymmetries between limbs, leg length discrepancies, and altered movement strategies following fatigue or prior injury can increase susceptibility to GTPS [9,15]. These factors can disrupt normal load distribution and place disproportionate stress on the gluteal tendons and associated structures. Recent literature emphasizes that GTPS is not solely an inflammatory condition but a load-management disorder involving the failure of tissues to adapt to mechanical stress. Therefore, understanding the biomechanical factors that influence load distribution at the greater trochanter is essential for both prevention and rehabilitation. Effective management strategies often focus on optimizing movement patterns, improving hip abductor strength and endurance, and reducing excessive compressive forces through targeted exercise and load modification.

PREVALENCE

Greater trochanteric pain syndrome (GTPS) is a relatively common cause of lateral hip pain, particularly in physically active populations. In the general population, its prevalence is estimated to range between 10–25%, with higher rates observed among individuals involved in repetitive lower limb activities. Although specific prevalence data for triathlon and duathlon athletes are limited, evidence from studies on runners and active adults suggests that endurance athletes are at increased risk.

Triathlon and duathlon athletes are exposed to repetitive and combined loading from both cycling and running. Sustained hip flexion during cycling, followed by impact loading during running, may increase stress on the gluteal tendons and surrounding structures, contributing to the development of GTPS. This cumulative loading, particularly when combined with inadequate recovery, can lead to microtrauma and tendon degeneration [20].

Several risk factors influencing prevalence include hip abductor weakness, altered lower limb biomechanics, and increased training volume. These factors can increase compressive forces at the greater trochanter, predisposing athletes to lateral hip pain. Additionally, GTPS can negatively affect function and athletic performance, as symptoms are often aggravated during weight-bearing activities such as running.

Despite limited sport-specific data, the biomechanical demands and training characteristics of triathlon and duathlon strongly indicate a notable risk of GTPS in this population. The condition may also be underreported due to misdiagnosis or overlap with other sources of hip pain [19].

Assessment and Outcome Measures

Accurate assessment of GTPS requires a combination of subjective evaluation and objective clinical testing to identify pain, functional limitations, and underlying biomechanical impairments. In endurance athletes such as triathletes and duathletes, assessment is particularly important due to the repetitive loading patterns and high functional demands placed on the hip joint.

Pain Assessment

Pain intensity is commonly measured using the Numeric Pain Rating Scale (NPRS), a valid and reliable tool for quantifying subjective pain levels. It is an 11-point scale ranging from 0 (no pain) to 10 (worst imaginable pain). The NPRS is widely used in musculoskeletal conditions, including GTPS, to monitor symptom severity and response to intervention [27].

Clinical Tests

Clinical tests that reproduce lateral hip pain are essential for confirming the diagnosis of GTPS and differentiating it from other hip pathologies [29].

FABER Test (Flexion, Abduction, External Rotation): This test places the hip in a figure-four position to assess joint and periarticular structures. Pain elicited over the lateral hip region during this test may indicate involvement of the greater trochanteric structures, including the gluteal tendons or bursae [29].

Ober Test:

The Ober test is used to assess tightness of the iliotibial band (ITB). A positive test, indicated by limited adduction of the hip, suggests increased ITB tension, which may contribute to compressive forces over the greater trochanter and exacerbate GTPS symptoms.

Functional Assessment

Single Leg Stance Test:

This test evaluates hip abductor strength and pelvic stability during weight-bearing. The patient is asked to stand on one leg while maintaining pelvic alignment. In individuals with GTPS, a positive test may present as pelvic drop on the contralateral side or reproduction of lateral hip pain, indicating dysfunction of the gluteus medius and minimus muscles [16,20].

Clinical Relevance

These outcome measures collectively provide insight into pain severity, soft tissue involvement, and functional impairments associated with GTPS. Combining subjective and objective assessments enhances diagnostic accuracy and helps guide physiotherapeutic management, particularly in athletes where early identification of deficits is crucial to prevent progression and optimize performance [20].

MATERIALS AND METHODOLOGY

Materials-Data Collection Sheet, Consent Form, Mat/ Plinth

Methodology

An Observational Cross-Sectional Study conducted on Triathlon and Duathlon Athletes aged between 18-40 years at Kolhapur using Simple Random Sampling. Sample Size: 104. The Study Duration was 6 months. Study subjects were selected fulfilling exclusion and inclusion criteria.

Inclusion criteria Athletes aged between 18-40 years, All genders, Ability to perform functional tests, Active Triathlon /or Duathlon Athletes participating in training or competition for 3 or more than 3times a week for past 6 months, Willingness to provide informed consent.

Exclusion criteria Athletes having history of Hip or Pelvic surgery (Eg: THR, Trochanteric Surgery), Acute Hip, knee or lower limb injury within past 3 months that limits participation, Athletes having any neurological disorders affecting lower limb function, Athletes with Congenital Dislocation of Hip.

PROCEDURE

Ethical Approval:

Ethical clearance was obtained from the institutional review board prior to data collection.

Participant Recruitment:

Athletes who fit the inclusion criteria were approached post Triathlon or Duathlon and brief them about the study.

Consent and Pre-Screening:

Informed consent was obtained. Participants then underwent screening to rule out systemic or neurological conditions.

Questionnaire Administration:

Each participant was asked to fill out the demoPie Chartic data sheet and all pain/disability scales under researcher supervision.

Physical Assessment:

A Physiotherapist conducted assessment tests like FABER, Ober's and Single leg stance to rule out GTPS.

Data Recording:

All data was entered manually into datasheets and later cross-verified before statistical analysis.

Data Analysis:

Data was entered and analysed using descriptive statistics. Frequency, mean, and percentage was calculated to assess prevalence and clinical findings.

Confidentiality:

Participants' identities and responses will be kept confidential and used solely for academic purposes.

RESULTS

INTERPRETATION

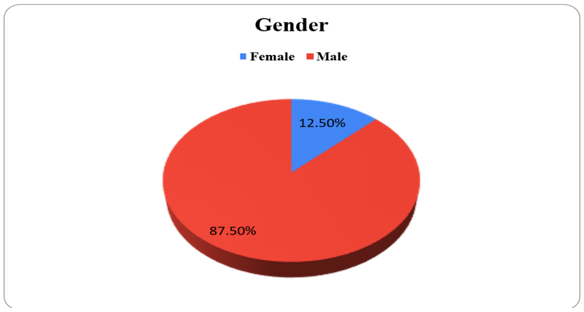
Gender distribution:

The table shows that the study population consisted of both male and female participants, with a total of 104 individuals included in the analysis. Of these, 91 participants (87.50%) were males and 13 participants (12.50%) were females. This indicates that the sample primarily comprised male participants, while female participants represented a smaller proportion of the study population. Overall, the gender distribution reflects the characteristics of the recruited sample, with a clear predominance of males within the study group.

Table 1: Gender Distribution

Gender	Frequency	Percent
Female	13	12.50%
Male	91	87.50%
Total	**104**	**100%**

Pie Chart 1**:** Gender-wise distribution of participants



Age and Duration of Practice:
The table presents the descriptive statistics for age and duration of practice among the study participants. The age of the participants ranged from a minimum of 19 years to a maximum of 40 years, with a mean age of 30.62 years. The standard deviation of 6.12 indicates a moderate variation in the age distribution, suggesting that participants were relatively spread across the young adult to early middle-aged group.
In terms of duration of practice (in hours), the values ranged from 2 hours to 5 hours, with a mean duration of 3.56 hours. The standard deviation of 1.05 indicates relatively low variability, showing that most participants had a fairly consistent range of practice duration. Overall, the data reflects a sample of young to middle-aged individuals with a moderately uniform level of practice exposure.

Table 2: Distribution of Age and Duration of Practice

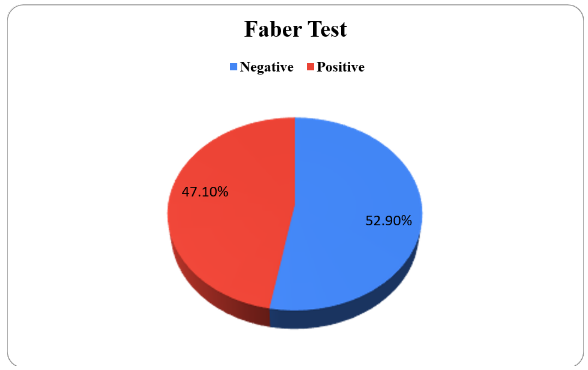
Variables	Minimum	Maximum	Mean	Std. Deviation
Age	19	40	30.62	6.12
Duration of Practice(Hours)	2	5	3.56	1.05

A. **Faber Test Findings:**
The table presents the distribution of Faber test results among the study participants. Out of a total of 104 individuals, 55 participants (52.90%) tested negative, while 49 participants (47.10%) tested positive. This indicates that a slightly higher proportion of participants demonstrated a negative Faber test compared to those with a positive result. Overall, the findings show a relatively balanced distribution of Faber test outcomes within the study population.

Table 3: Distribution of FABER test findings

Faber Test	Frequency	Percent
Negative	55	52.90%
Positive	49	47.10%
Total	**104**	**100%**

Pie Chart 2: Distribution of participants according to FABER Test Results



B. **Ober's Test Findings:**

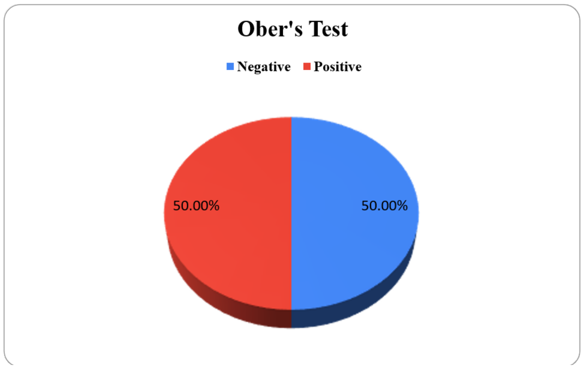
C. The table presents the distribution of Ober's test results among the study participants. Out of a total of 104 individuals, 52 participants (50.00%) tested negative and 52 participants (50.00%) tested positive. This indicates an equal distribution of positive and negative findings within the study population. Overall, the results show a balanced pattern of Ober's test outcomes, with no variation in proportion between the two groups.

Table 4: Distribution of Ober's Test Findings

Ober's Test	Frequency	Percent
Negative	52	50.00%
Positive	52	50.00%
Total	**104**	**100%**

Pie Chart 3: Distribution of participants according to OBER Test Results

Faber Test	Result		Total	p-value
	Negative	Positive		
Negative	55	0	**55**	<0.001*
	88.70%	0.00%	**52.90%**	
Positive	7	42	**49**	
	11.30%	100.00%	**47.10%**	
Total	**62**	**42**	**104**	
	100.00%	**100.00%**	**100.00%**	



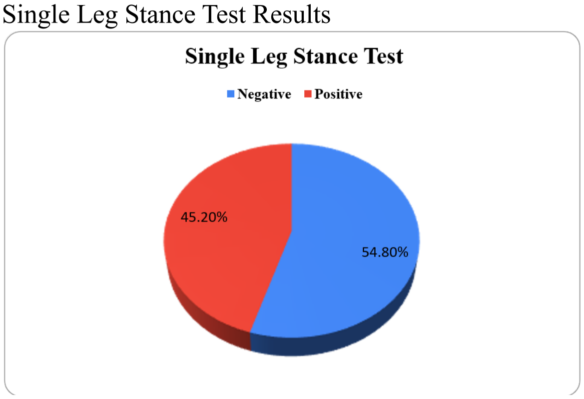
D. **Single Leg Stance Test Findings:**

The table presents the distribution of Single Leg Stance Test results among the study participants. Out of a total of 104 individuals, 57 participants (54.80%) tested negative, while 47 participants (45.20%) tested positive. This indicates a slightly higher proportion of negative results compared to positive results within the study population. Overall, the findings reflect a relatively balanced distribution of outcomes, with a marginal predominance of negative test results.

Table 5: Distribution of Single Leg Stance Test Findings

Single Leg Stance Test	**Frequency**	**Percent**
Negative	57	54.80%
Positive	47	45.20%
Total	**104**	**100%**

Pie Chart 4: Distribution of participants according to Single Leg Stance Test Results



The table shows the association between FABER test findings and study results among 104 participants. Out of the total participants, 62 (52.90%) were reported as negative and 42 (47.10%) were positive in the final results. Among the negative FABER test group, 55 participants (88.70%) remained negative, while none were positive. Among the positive FABER test group, 42 participants (100.00%) were positive and 7 (11.30%) were negative. The statistical analysis revealed a highly significant association between FABER test findings and study results ($p < 0.001$), indicating that the FABER test had a strong relationship with the obtained results.

Table 6: Result Distribution of FABER Test

The table shows the association between Ober's test findings and study results among 104 participants. Out of the total participants, 52 (50.00%) were reported as negative and 52 (50.00%) were positive in the Ober's test. Among the negative Ober's test group, 52 participants (83.90%) showed negative results, while none were positive. In contrast, among the positive Ober's test group, 42 participants (100.00%) were positive and 10 participants (16.10%) were negative. The statistical analysis revealed a highly significant association between Ober's test findings and study results ($p < 0.001$), indicating that the Ober's test had a strong relationship with the obtained outcomes.

Table 7: Result Distribution of OBER Test

Ober's Test	**Result**		**Total**	**p-value**
	Negative	**Positive**		
Negative	52	0	**52**	<0.001*
	83.90%	0.00%	**50.00%**	
Positive	10	42	**52**	
	16.10%	100.00%	**50.00%**	
Total	**62**	**42**	**104**	
	100.00%	**100.00%**	**100.00%**	

The table shows the association between Single Leg Stance Test findings and study results among 104 participants. Out of the total participants, 57 (54.80%) were reported as negative and 47 (45.20%) were positive in the Single Leg Stance Test. Among the negative Single Leg Stance Test group, 57 participants

(91.90%) showed negative results, while none were positive. In contrast, among the positive Single Leg Stance Test group, 42 participants (100.00%) were positive and 5 participants (8.10%) were negative. The statistical analysis revealed a highly significant association between Single Leg Stance Test findings and study results ($p < 0.001$), indicating that the Single Leg Stance Test had a strong relationship with the obtained outcomes.

Single Leg Stance Test	**Result**		**Total**	**p-value**
	Negative	**Positive**		
Negative	57	0	**57**	<0.001*
	91.90%	0.00%	**54.80%**	
Positive	5	42	**47**	
	8.10%	100.00%	**45.20%**	
	62	**42**	**104**	

Table 8: Result

Result	**Frequency**	**Percent**
Negative	62	59.60%
Positive	42	40.40%
Total	**104**	**100%**

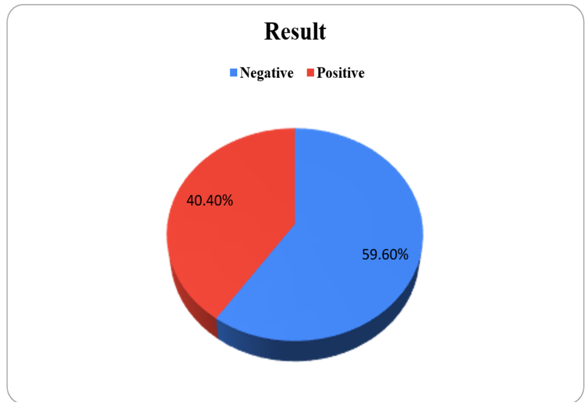
Distribution of Single Leg Stance Test

Distribution of participants according to the Test Results:

The table presents the distribution of participants according to test results among a total of 104 participants. Out of the total sample, 62 participants (59.60%) showed negative results, while 42 participants (40.40%) showed positive results. The findings indicate that the majority of participants were in the negative result category.

Table 9: Result Distribution

Pie Chart 5 : Result Distribution



DISCUSSION

The present study was conducted among 104 triathlon and duathlon athletes aged 18–40 years to determine the prevalence of Greater Trochanteric Pain Syndrome (GTPS) using clinical assessment tools. The findings revealed that 40.4% of participants demonstrated positive findings suggestive of GTPS, indicating a substantial burden of lateral hip pain within this athletic population. This prevalence is consistent with previous literature suggesting that GTPS is common among physically active individuals due to repetitive loading and overuse mechanisms[15].

GTPS is recognized as a spectrum of conditions involving gluteal tendinopathy, trochanteric bursitis, and iliotibial band (ITB) pathology[11]. The relatively high prevalence observed in the present study supports the understanding that endurance athletes are particularly vulnerable due to sustained mechanical stress and inadequate recovery periods[20]. Furthermore, the presence of multiple positive clinical tests strengthens the diagnostic likelihood, as combining physical examination findings improves clinical accuracy.[16]

Relation with Age

The mean age of participants in this study was 30.62 ± 6.12 years, representing a young to middle-aged athletic population. Although GTPS is traditionally reported to be more prevalent in middle-aged and older adults[18], the findings of this study suggest that younger athletic individuals are also at considerable risk, particularly when exposed to repetitive high-load activities.

This may be attributed to cumulative microtrauma resulting from prolonged training durations rather than age-related degenerative changes. Previous studies indicate that repetitive tensile and compressive forces acting on the gluteal tendons can lead to tendinopathy even in younger populations engaged in high-intensity sports.[16] Therefore, in this study, age appears to be a secondary factor, with training load and biomechanical stress playing a more dominant role in the development of symptoms.

Relation with Gender

The study population consisted predominantly of male athletes (87.5%). Despite this, the prevalence of GTPS observed cannot be conclusively attributed to gender differences. Traditionally, GTPS has been reported to be more common in females due to anatomical and biomechanical factors such as wider pelvis and altered hip mechanics[15].

However, in the present study, the higher representation of males likely reflects sampling distribution rather than true gender predisposition. The findings suggest that sport-specific mechanical demands, including repetitive loading, muscle fatigue, and training intensity, may override gender-based risk factors. This aligns with literature indicating that in athletic populations, biomechanical stress and activity patterns are stronger predictors of GTPS than demoPie Chartic variables[10].

Relation with Duration of Practice

The mean duration of practice was 3.56 ± 1.05 hours, indicating prolonged and consistent training exposure. Such extended durations of physical activity are known to contribute to overuse injuries, particularly in endurance sports.

Triathlon and duathlon training involve repetitive cycles of running and cycling, both of which impose sustained stress on the hip abductors and lateral hip structures. Prolonged loading without adequate recovery may lead to cumulative microtrauma, tendon overload, and eventual pain development[20]. This is supported by evidence suggesting that improper load management is a key contributor to gluteal tendinopathy and GTPS[16].

Thus, the findings of this study reinforce the concept that training duration and intensity are critical determinants in the development of lateral hip pain, rather than isolated acute injuries.

FABER Test Findings

In the present study, 47.1% of athletes demonstrated a positive FABER test, indicating possible involvement of the hip joint or surrounding soft tissues. The FABER test is widely used to assess hip and sacroiliac joint pathology, and when interpreted alongside other tests, it can aid in identifying GTPS[1,25].

The relatively high positivity rate suggests the presence of periarticular stress and altered hip biomechanics among the athletes. Repetitive movements involved in endurance sports may contribute to abnormal loading patterns across the hip joint, leading to irritation of surrounding structures.

Previous research highlights that no single clinical test is sufficient for diagnosis; however, clusters of positive findings improve diagnostic confidence[1,16]. Therefore, the FABER test findings in this study, when combined with Ober's and Single Leg Stance tests, strongly support the presence of lateral hip dysfunction.

Ober's Test Findings

The study found that 50% of participants had a positive Ober's test, indicating a high prevalence of iliotibial band tightness. Tightness of the ITB is known to increase compressive forces over the greater trochanter, thereby contributing to GTPS development[11].

In endurance athletes, repetitive hip flexion-extension cycles, especially during running and cycling, can lead to adaptive shortening of the ITB, further increasing friction and compression over lateral hip structures. This mechanical overload is a recognized contributing factor in the pathophysiology of GTPS[2].

The high positivity rate observed in this study emphasizes the importance of flexibility and soft tissue management in preventing lateral hip pain. It also aligns with previous findings that ITB dysfunction plays a significant role in lateral hip pathology[16].

Single Leg Stance Test Findings

The Single Leg Stance test was positive in 45.2% of participants, indicating reduced hip abductor endurance or pain during unilateral weight-bearing. This finding is particularly relevant in the context of triathlon and duathlon, where single-leg loading is a fundamental component of running mechanics.

The hip abductors, especially the gluteus medius, play a critical role in stabilizing the pelvis during single-leg stance. Weakness or fatigue in these muscles can lead to increased stress on the lateral hip structures, contributing to GTPS[16].

Previous studies have demonstrated that impaired hip abductor function is strongly associated with lower limb biomechanical abnormalities and overuse injuries[27–30]. Therefore, the findings of this study suggest that reduced muscular endurance and control may be key contributors to the development of lateral hip pain in endurance athletes.

Clinical Implications

The consistent positivity across FABER, Ober's, and Single Leg Stance tests highlights the multifactorial nature of GTPS, involving muscular, tendinous, and biomechanical components. The findings emphasize the need for:

Early screening of athletes using combined clinical tests

Strengthening of hip abductors

Flexibility training targeting the iliotibial band

Proper load management strategies

Intervention approaches focusing on education and exercise have been shown to be effective in managing GTPS[6,20], further supporting the preventive strategies suggested by this study.

In summary, the present study demonstrates a notable prevalence of Greater Trochanteric Pain among triathlon and duathlon athletes, with nearly half of the participants showing positive clinical findings. The results suggest that repetitive mechanical loading, prolonged training duration, ITB tightness, and hip abductor dysfunction are key contributing factors.

These findings align with existing literature and reinforce the importance of comprehensive assessment and preventive rehabilitation strategies to reduce the

CONCLUSION

The findings of the study revealed that a considerable proportion of athletes demonstrated positive clinical signs suggestive of Greater Trochanteric involvement, with 47.1% testing positive on FABER test, 50% on Ober's test, and 45.2% on Single Leg Stance test. These results indicate that nearly half of the studied population exhibited features associated with lateral hip dysfunction.

Based on the observed frequency of positive clinical findings, it can be concluded that Greater Trochanteric Pain has a moderate to high prevalence among Triathlon and Duathlon athletes within the selected age group. The repetitive loading patterns, prolonged training duration, and endurance-based mechanical demands of these sports may contribute significantly to the development of lateral hip pain.

Therefore, the null hypothesis is rejected, and the alternative hypothesis is accepted, confirming that there is a significant prevalence of Greater Trochanteric Pain among Triathlon and Duathlon athletes.

The study highlights the need for early screening, preventive physiotherapy interventions, targeted hip abductor strengthening, flexibility training, and appropriate load management strategies to reduce the risk and long-term impact of Greater Trochanteric Pain in this athletic population.

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