International Journal of Orthopaedics Sciences

E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2025; 11(2): 118-120

www.orthopaper.com
Received: 13-02-2025
Accepted: 12-03-2025

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Prevalence of groin pain in recreational breast stroke swimmers: An observational study

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DOI: https://www.doi.org/10.22271/ortho.2025.v11.i2b.3755

Abstract
Background: Groin pain is commonly associated with sports involving intense lower limb activity. While much of the existing literature focuses on elite athletes and high-impact sports, limited attention has been given to recreational swimmers, particularly those performing the breaststroke. This swimming style involves a powerful whip-like kick that places considerable stress on the hip adductor muscles, potentially predisposing individuals to overuse injuries.
Objective: The objective of this study was to assess the prevalence of groin pain in recreational breaststroke swimmers.
Methods: This observational study was conducted in Mumbai, India, over a period of six months. A total of 130 recreational breaststroke swimmers between the ages of 18 and 30 participated. Participants with a prior history of groin injury, other lower limb injuries, or pregnancy were excluded. Standardized clinical tests, namely the Adductor Squeeze Test and Patrick's Test, were performed to identify signs of groin-related discomfort. Informed consent was obtained from all participants.
Results: The participant pool consisted of 68% males and 32% females, with a mean age of 24 years. The prevalence of groin pain was found to be 27.69% using the Adductor Squeeze Test and 32.30% using Patrick's Test, indicating an overall prevalence of approximately 30% among the study group.
Conclusion: The findings highlight a notable prevalence of groin pain in recreational breaststroke swimmers, a population often overlooked in existing sports injury research. This suggests a need for increased awareness, early assessment, and preventive strategies targeting musculoskeletal imbalances and technique errors. Educating recreational swimmers about proper training practices and early symptom management may play a significant role in reducing the burden of groin-related injuries in this group.

Keywords: Groin pain, breaststroke swimming, recreational athletes, prevalence study, adductor strain, sports injury prevention

Introduction
Groin pain in athletes refers to discomfort in the anterior lower abdomen, inguinal areas, adductors, upper hip, and anterior thigh. Various anatomical structures, including bones, joints, bursae, muscles, tendons, fascial structures, and nerves, can contribute to groin pain. The condition arises from a spectrum of disorders, ranging from musculoskeletal issues to urological and general surgical concerns. While the onset is generally gradual, it can also present acutely. Acute groin pain is more prevalent in sports requiring rapid cutting movements, such as football, which involves frequent kicking and running. In contrast, chronic groin pain presents a more complex diagnostic challenge, often arising from non-musculoskeletal causes. Athletes with chronic groin pain may experience persistent symptoms for months or even years [1-2].
Internal sources of groin pain include inguinal hernias, prostatitis, urethritis, epididymitis, and primary or secondary tumours. Accurate diagnosis relies on structural palpation and careful radiological evaluation, as the absence of point tenderness may necessitate further laboratory testing for internal conditions. Early diagnosis is crucial to prevent groin pain from becoming chronic [4]. Functional movements such as transitioning from sitting to standing, stair climbing, prolonged ambulation, or athletic participation can aggravate groin pain. Mechanical symptoms like clicking, popping, and catching during hip movement may also be present [5].
Swimming is a widely practiced competitive sport that involves repetitive lower limb movements, which, if performed without proper training, can lead to musculoskeletal injuries.

Breaststroke swimming, commonly referred to as the "frog kick" due to its resemblance to a frog's movement, places significant stress on the hip adductor muscles [6, 2]. The high stress occurs during the powerful finishing phase of the frog kick, when forceful hip adduction is performed with the knees flexed, the hips in a valgus position, and the ankles and feet externally rotated [3]. This repetitive movement predisposes swimmers to overuse injuries, particularly affecting the adductor longus, brevis, magnus, pectineus and gracilis muscles. During breaststroke swimming, there is a substantial intra-cyclic velocity variation of the body's center of mass. The frog kick begins with excessive hip abduction, followed by a powerful contraction of the hip adductors against the resistance of the water. This repetitive motion results in overuse of the adductor muscles, eventually leading to muscle strains [8].

Several studies have investigated the prevalence and impact of groin pain in athletes, particularly in sports involving high-intensity lower limb movements [2, 3, 5, 6, 9]. Research suggests that overuse injuries are common in swimmers due to repetitive hip adduction, especially in breaststroke swimming, where the frog kick mechanism places significant strain on the adductor muscles. Studies highlight that adductor strains and osteitis pubis are primary causes of chronic groin pain in athletes, often resulting in prolonged rehabilitation. Additionally, previous research emphasizes the biomechanical factors contributing to groin injuries, indicating that inadequate strength, flexibility imbalances, and improper training techniques are key risk factors [2, 3]. While groin pain has been extensively studied in high-impact sports such as football and hockey, there is limited literature on its prevalence among recreational breaststroke swimmers. Most existing studies focus on elite athletes, leaving a gap in understanding how groin pain affects non-professional swimmers [6, 9]. The aim of this study was to assess the prevalence of groin pain in recreational breaststroke swimmers.

Materials and Methods

This observational study was conducted in city of Mumbai, Maharashtra, India, from September 2023 to February 2024. The population included male and female recreational breaststroke swimmers, between ages 18-30. Swimmers having history of groin injury, other lower limb injuries and pregnant females were excluded from the study. Convenient sampling was used to recruit a total of 130 participants for the study (calculated from the formula for a finite population and 95% confidence interval). An informed consent was taken from participants in a language best understood by them, and the purpose of study was explained to them. Adductor squeeze test and Patrick's tests were performed for all the subjects [12].

Results:

The results of the study are discussed under the following headings:

- **Demographic data:** Demographic characteristics of the participants are presented in Table 1.
- **Prevalence of groin pain:** The Adductor squeeze test and Patrick's test was performed on all the participants. Number of participants who exhibited a positive sign are represented in Figure 1.

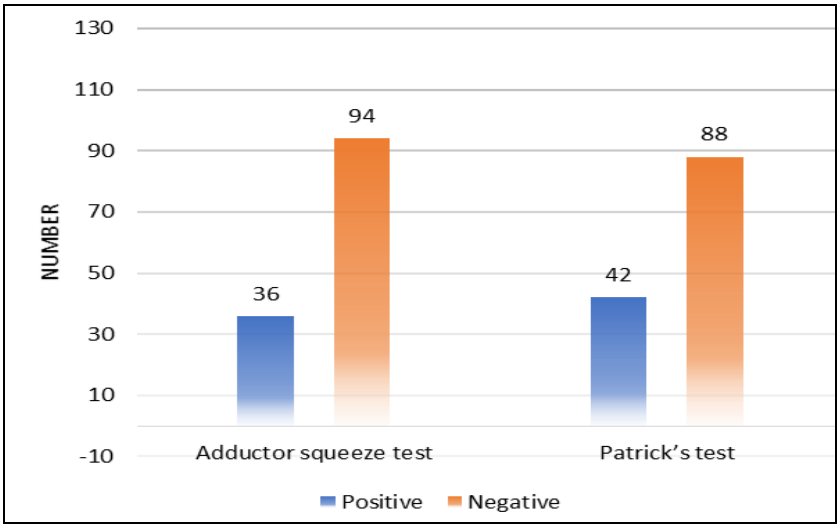

Fig 1: Results of adductor squeeze test and Patrick's test

Table 1: Demographic data of the participants

Demographic characteristic	Value	Number of subjects	Percentage	Mean
1. Age	18-22 years	54	42	
	23-26 years	44	34	24
	27-30 years	32	24	
2. Gender	Male	88	68	
	Female	42	32	

Prevalence of groin pain from adductor squeeze test was 27.69% and that from Patrick's test was 32.30%, thus giving an overall prevalence of 29.9% (approximately 30%).

Discussion

Groin pain is a prevalent condition among recreational breaststroke swimmers, primarily attributed to the biomechanical demands of the breaststroke kick. This swimming style requires simultaneous and forceful hip adduction, abduction, and rotation during the whip kick phase, putting significant stress on the adductor muscles, hip joint, and surrounding soft tissues. As a result, swimmers are

at risk of overuse injuries, muscle imbalances, and discomfort in groin region [1]. Understanding the prevalence of this condition and its implications on quality of life is essential for promoting health, performance, and overall well-being among recreational athletes [2].

The prevalence of groin pain among recreational swimmers is underscored by the results of clinical diagnostic tests such as the Adductor Squeeze Test and Patrick's Test. Results indicate that 36 swimmers tested positive on the Adductor Squeeze Test and 42 on Patrick's Test, highlighting a combined prevalence of approximately 30% for groin-related discomfort [3]. This significant proportion suggests that groin pain is a common condition within this population, necessitating targeted intervention [4].

Recreational swimmers often lack the rigorous training and conditioning routines seen in competitive athletes, making them more vulnerable to overuse injuries. Furthermore, insufficient recovery periods and poor technique may exacerbate the risk of developing groin pain. The prevalence observed in this group may also reflect a lack of awareness about proper training practices, injury prevention strategies, and the importance of addressing early signs of discomfort [5].

The impact of groin pain on the quality of life for recreational swimmers extends beyond physical discomfort. It interferes with routine activities such as walking, sitting, or climbing stairs [6]. For individuals who swim as a means of maintaining physical activity, this limitation can be particularly frustrating, as it affects their ability to stay active and mobile. Recreational swimmers participate in swimming as a form of socialization. Refraining from swimming due to groin pain can lead to social isolation and loneliness [7].

Addressing groin pain in recreational breaststroke swimmers requires a multifaceted approach focused on prevention, early intervention, and rehabilitation. Prevention can be done by paying attention to strengthening abductors and core muscles to enhance stability [8]. Overall flexibility of the body, with special emphasis on lower limb muscles and ligaments, will also help in injury prevention [9]. Recreational swimmers can be made aware of the importance of warm-up routines, proper technique, and recovery strategies and their role in injury prevention [10]. Swimmers should seek guidance from qualified coaches or instructors to refine their breaststroke technique. It includes proper alignment of the hips and knees during the kick, which can minimize stress on the groin muscles [11].

Swimmers experiencing groin pain should seek physiotherapy to address muscle imbalances, improve mobility, and develop individualized recovery plans [13]. Rehabilitation should also focus on gradually reintroducing swimming to prevent reinjury [14]. In addition to the above, incorporating adequate rest periods between training sessions is crucial to allow for tissue repair and prevent cumulative fatigue [15]. Swimmers should also be encouraged to listen to their bodies and take breaks when experiencing discomfort [16].

Conclusion

This observational study highlights that groin pain is a common issue among recreational breaststroke swimmers, with a prevalence of 30%. The unique biomechanical demands of the breaststroke stroke likely contribute to this occurrence. Early recognition of symptoms, along with awareness regarding technique, training practices, and recovery strategies, can help reduce the risk and impact of groin pain in this population. These findings emphasize the need for preventive and rehabilitative measures tailored to recreational swimmers to maintain their participation and overall well-being.

Conflict of Interest: Not available

Financial Support: Not available

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How to Cite This Article
Vedpathak R, Borkar V, Kumar A. Prevalence of groin pain in recreational breast stroke swimmers: An observational study. International Journal of Orthopaedics Sciences. 2025;11(2):118-120.