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Prevalence of Adductor Muscles Strength and Hip Joint Mobility on Groin Pain in Male Sports Runners

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ABSTRACT

Background: Groin pain is a frequent, clinically complex complaint in runners and may be associated with impaired hip adductor function and activity limitation despite continued participation. Objective: To determine the prevalence profile of adductor muscle strength impairment, adductor-related pain provocation, and hip/groin-related functional restriction in male recreational runners with groin pain. Methods: A cross-sectional study recruited 150 male recreational runners in Lahore using convenience sampling. Demographics and weekly running exposure were recorded. Pain during activity and running participation effects were assessed using standardized symptom and participation instruments alongside numeric pain grading. Clinical profiling included manual muscle testing-based adductor strength grading, adductor squeeze test pain provocation, and side-to-side examination comparison. Descriptive statistics were reported as means ± SD and frequencies with prevalence estimates. Results: Mean age was 24.55 ± 3.32 years and weekly running distance was 13.49 ± 1.95 km. Pain during running was reported by 94.0% of participants. Pain intensity during activity was mild in 42.7%, moderate in 54.7%, and severe in 2.7%. Adductor strength was predominantly grade 3 (76.7%), with grade 5 observed in 2.0%. Adductor squeeze test provoked pain in 94.7% (mild 77.3%; moderate 16.0%; severe 1.3%). Performance was affected in 96.0% and training was affected in 96.0% (mostly mild-to-moderate). Conclusion: Male recreational runners demonstrated a high prevalence of groin pain with frequent adductor-related pain provocation, predominantly submaximal adductor strength grading, marked side-to-side asymmetry, and meaningful participation restriction.

Keywords

Adductor muscles; groin pain syndrome; runners; adductor squeeze test; hip function; HAGOS; OSTRC.

INTRODUCTION

Running is a widely practiced sport and recreational physical activity, yet it carries a meaningful burden of overuse injury due to repetitive loading of the lumbopelvic–hip complex and lower extremity. Groin pain in athletes is clinically challenging because symptoms may arise from multiple structures across the hip, pelvis, pubic symphysis, and proximal thigh, and presentations often overlap across musculoskeletal and non-musculoskeletal sources, complicating diagnosis and management (1,2). In field and multidirectional sports, hip–groin conditions are frequently reported and can persist despite continued participation, suggesting that time-loss definitions may underestimate the real population burden and functional restriction experienced by athletes (3). This concern has contributed to international efforts to standardize terminology and classification for groin pain in athletes and reduce inconsistency in non-anatomical labeling across the literature (4,5).

Among proposed modifiable risk factors, hip adductor function has received sustained attention because adductors contribute to pelvic stability, force transmission, and control of hip motion under load. Reduced hip adductor strength has repeatedly been associated with hip/groin pain and has been reported as protective when strength is higher at baseline, particularly in male football cohorts (6,7). Systematic syntheses also support the preventive value of targeted adductor strengthening, although relationships with abductor strength and adduction-to-abduction ratios remain complex and context dependent across sports and testing methods (8). Alongside strength, hip range of motion (ROM) has been examined as a potential risk factor and clinical correlate, but evidence is mixed; while some studies suggest restricted hip ROM may precede or accompany chronic groin problems, other investigations report inconsistent or null associations depending on population, ROM plane, and measurement approach (9,10). Mechanistically, limited hip motion may alter load distribution across the pubic symphysis and adductor-related structures, increasing compensatory stress during athletic tasks and contributing to persistent symptoms (11). Most high-quality evidence on strength, ROM, and groin pain has focused on sports characterized by cutting, kicking, and high-velocity directional change (e.g., football codes, ice hockey), whereas the running population—particularly male recreational runners—has been comparatively understudied despite high training volumes and repetitive hip–pelvic loading. This represents a clinically relevant knowledge gap because linear running imposes distinct cumulative demands that may produce different patterns of adductor-related symptoms, asymmetry, and participation restriction. Therefore, in male recreational runners with groin pain, this study aimed to quantify the prevalence profile of adductor muscle strength impairment, adductor-related pain provocation, and hip/groin-related functional limitation. The research question was: Among male recreational runners with groin pain, what is the prevalence of reduced adductor strength and groin/hip functional restriction as measured by standardized athlete-reported outcome tools and clinical provocation assessment? (12,13)

MATERIALS AND METHODS

A cross-sectional observational study was conducted in Lahore, Pakistan, recruiting male recreational runners from community and institutional running settings, including university and stadium-based runner groups. Participants were enrolled using convenience sampling based on eligibility

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screening and willingness to participate. Male runners aged 18–34 years who had been participating in regular running for at least six months and reported groin-region pain for at least two weeks (and less than 12 months) were considered eligible. Participants were required to be able to undergo adductor strength assessment and clinical provocation testing. Individuals were excluded if they reported recent acute groin injury within the preceding three months, neurological conditions affecting the lower limb, recent hip or groin surgery, known intra-articular hip pathology (including confirmed femoroacetabular impingement, osteoarthritis, or labral tear), acute fracture or muscle rupture, systemic inflammatory disease, recent corticosteroid injection to the hip/groin region, or ongoing physiotherapy care for the current groin complaint within the preceding four weeks (1,4).

After eligibility confirmation, each participant provided written informed consent prior to data collection. Demographic and training exposure variables were recorded, including age, height, and weekly running distance. Symptom severity and functional consequences were captured using a numeric pain rating approach for pain intensity and standardized athlete-reported outcome instruments designed to quantify hip/groin-related symptoms, function, participation, and quality of life, with an emphasis on capturing both performance impact and continued participation with symptoms (12,13). Overuse-related burden and participation restriction were additionally documented by quantifying missed training sessions over the preceding month, consistent with broader recommendations to describe athlete health problems beyond time-loss alone (3). Clinical assessment included grading of adductor muscle strength using an ordinal manual muscle testing approach and a pain-provocation adductor squeeze test to characterize adductor-related symptom provocation during resisted adduction (14,15). A side-to-side clinical comparison was recorded to identify asymmetry on examination, given the clinical relevance of asymmetry in hip/groin presentations (6,14).

The target sample size was set at 150 participants to provide stable prevalence estimates for key outcomes in this runner cohort and to allow precise estimation of proportions with narrow confidence intervals in descriptive epidemiology contexts (16). Data were analyzed using SPSS (version 25). Continuous variables were summarized as mean, standard deviation, and range, while categorical variables were summarized as frequencies and percentages. In the revised reporting below, prevalence proportions are additionally presented with 95% confidence intervals (CIs) using binomial proportion methods to enhance interpretability and reporting rigor. Analyses were conducted on complete observations for each variable, and results are presented descriptively to reflect the cross-sectional design and the study objective focused on prevalence profiling (3,9).

The study procedures were conducted in accordance with institutional research ethics requirements, with participant confidentiality maintained through anonymized data handling and voluntary participation, including the right to withdraw at any time without consequence (4).

RESULTS

The cohort comprised predominantly young adult male runners, with a mean age of 24.55 ± 3.32 years (range 18–34). Mean height was 5.71 ± 0.19 feet (range 5.3–6.2). Weekly running exposure averaged 13.49 ± 1.95 km, spanning 11 to 22 km, indicating a recreational training load profile in this sample.

Table 1. Participant characteristics and weekly running exposure (N = 150)

Variable	Mean ± SD	Range
Age (years)	24.55 ± 3.32	18–34
Height (feet)	5.71 ± 0.19	5.3–6.2
Weekly running distance (km)	13.49 ± 1.95	11–22

Table 2. Adductor muscle strength grading (manual muscle testing; N = 150)

Adductor strength grade (MMT)	n	%
Grade 2	9	6.0
Grade 3	115	76.7
Grade 4	23	15.3
Grade 5	3	2.0

Adductor strength was most frequently classified as Grade 3 (115/150; 76.7%), while only 3 participants (2.0%) demonstrated Grade 5 strength. Grades 2 and 4 were observed in 6.0% and 15.3% of runners, respectively, indicating that the majority clustered in a “fair” strength category rather than near-normal maximal grading.

Table 3. Groin pain prevalence and symptom provocation profile (N = 150)

Clinical indicator	n	Prevalence (95% CI)
Pain during running (Yes)	141	94.0% (89.0–96.8)
Pain during running (No)	9	6.0% (3.2–11.0)
Pain intensity during activity – Mild	64	42.7% (35.0–50.7)
Pain intensity during activity – Moderate	82	54.7% (46.7–62.4)
Pain intensity during activity – Severe	4	2.7% (1.0–6.7)
Adductor squeeze test pain – None	8	5.3% (2.7–10.2)
Adductor squeeze test pain – Mild	116	77.3% (70.0–83.3)
Adductor squeeze test pain – Moderate	24	16.0% (11.0–22.8)
Adductor squeeze test pain – Severe	2	1.3% (0.4–4.7)

Pain while running was highly prevalent, reported by 94.0% of participants (141/150; 95% CI 89.0–96.8). During activity, pain intensity was most commonly moderate (82/150; 54.7%, 95% CI 46.7–62.4), followed by mild (64/150; 42.7%, 95% CI 35.0–50.7), while severe pain was uncommon (4/150; 2.7%, 95% CI 1.0–6.7). On the adductor squeeze test, pain provocation was frequent: 77.3% reported mild pain (116/150; 95% CI 70.0–83.3) and 16.0% reported moderate pain (24/150; 95% CI 11.0–22.8), with only 5.3% reporting no pain (8/150; 95% CI 2.7–10.2).

Table 4. Participation restriction, performance impact, quality of life, and ADL limitation (N = 150)

Participation/functional impact	n	Prevalence (95% CI)
Performance impact – Not at all	2	1.3% (0.4–4.7)
Performance impact – Mild	66	44.0% (36.2–52.0)
Performance impact – Moderate	78	52.0% (44.1–59.8)
Performance impact – Severe	4	2.7% (1.0–6.7)
Training impact – Not at all	6	4.0% (1.9–8.4)
Training impact – Mild	80	53.3% (45.4–61.1)
Training impact – Moderate	62	41.3% (33.7–49.5)
Training impact – Severe	1	0.7% (0.1–3.7)
Training impact – Cannot participate	1	0.7% (0.1–3.7)
Quality of life impact – Mild	123	82.0% (75.0–87.5)
Quality of life impact – Moderate	25	16.7% (11.6–23.3)
Quality of life impact – Severe	2	1.3% (0.4–4.7)
ADL restriction – None	27	18.0% (12.5–25.0)
ADL restriction – Slight	111	74.0% (66.4–80.4)
ADL restriction – Moderate	12	8.0% (4.6–13.6)

Groin pain meaningfully affected sport function: moderate performance impact was reported by 52.0% (78/150; 95% CI 44.1–59.8), while 44.0% (66/150; 95% CI 36.2–52.0) described mild performance effects; only 1.3% reported no performance impact. Training was also affected, most commonly at mild (53.3%) or moderate (41.3%) levels. Quality of life impact was predominantly mild (82.0%), whereas ADL restriction was most commonly slight (74.0%), suggesting broad but generally non-catastrophic functional consequences in daily life.

Table 5. Missed training sessions in the last month due to pain (N = 150)

Missed training sessions (last month)	n	Prevalence (95% CI)
0 sessions	26	17.3% (12.1–24.4)
1 session	107	71.3% (63.6–77.9)
2 sessions	17	11.3% (7.1–17.7)

Training disruption was common: 71.3% (107/150; 95% CI 63.6–77.9) reported missing one session in the prior month due to pain, while 17.3% missed none and 11.3% missed two sessions.

Table 6. Functional running tolerance and examination asymmetry (N = 150)

Functional capacity and asymmetry	n	Prevalence (95% CI)
Can complete >5 km easily without pain	15	10.0% (6.1–16.0)
Can complete >5 km but with pain	132	88.0% (82.0–92.3)
Cannot run long distances	3	2.0% (0.7–5.7)
Side-to-side difference on examination (Yes)	142	94.7% (90.0–97.4)
Side-to-side difference on examination (No)	8	5.3% (2.7–10.2)

Only 10.0% of runners could complete distances greater than 5 km without pain, whereas 88.0% could do so with pain, indicating that symptoms frequently persisted despite maintained participation. Side-to-side asymmetry on clinical examination was reported in 94.7% of participants, aligning with the broader pattern of strength grading clustered below maximal and high prevalence of adductor-related provocation findings.

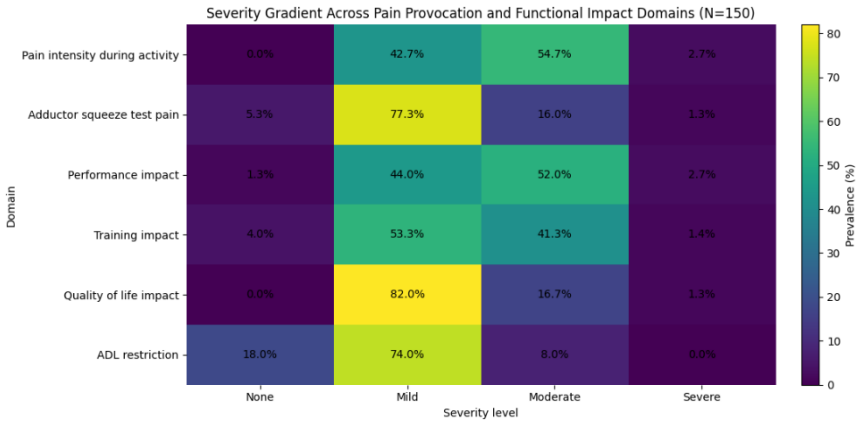

Figure 1 Severity distribution across six clinically relevant domains and shows a consistent

The figure synthesizes the severity distribution across six clinically relevant domains and shows a consistent "mild-to-moderate dominance" pattern rather than severe limitation. Pain intensity during activity clustered primarily in the moderate range (54.7%) with a substantial mild component (42.7%) and minimal severe pain (2.7%). A similar gradient was observed for performance impact (52.0% moderate; 44.0% mild) and training impact (41.3% moderate; 53.3% mild), indicating that most runners continued participation but at reduced tolerance. In contrast, adductor squeeze test provocation concentrated heavily in the mild category (77.3%), suggesting frequent adductor-related symptom reproduction even when severe provocation was rare (1.3%). Quality of life was predominantly mildly affected (82.0%), while ADL restriction showed the largest "no impairment"

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fraction (18.0%) but remained mainly slight (74.0%). Collectively, the severity gradient indicates a high prevalence of ongoing symptoms with functional compromise that is substantial enough to affect sport participation and performance but typically not severe enough to eliminate activity altogether.

DISCUSSION

This cross-sectional profile of male recreational runners from Lahore demonstrates a very high symptom burden consistent with persistent hip/groin complaints in active populations, with 94.0% reporting pain during running and most classifying pain during activity as mild-to-moderate. While the prevalence observed here is higher than many time-loss estimates reported in field sports, it aligns with contemporary epidemiological interpretations that broader "all complaint" definitions capture a substantially larger symptomatic group who continue participation despite pain and performance compromise (12,17). This matters clinically because runners frequently maintain training volume, thereby sustaining repetitive exposure and potentially perpetuating symptoms without triggering time-loss thresholds captured in traditional surveillance frameworks (3,12).

The study's strength profile suggests a notable predominance of submaximal adductor strength grades, with 76.7% graded as MMT grade 3 and only 2.0% graded as grade 5, alongside a strikingly high prevalence of side-to-side difference on examination (94.7%). These findings are directionally consistent with the broader literature identifying reduced hip adductor strength as a key modifiable characteristic associated with hip/groin pain, and with evidence that stronger adduction capacity may be protective in athletic cohorts (6,7,8). Although manual muscle testing cannot quantify torque deficits precisely, the clustering at grade 3 and the asymmetry signal are clinically relevant because inter-limb strength imbalance and reduced adduction capacity have been linked to increased groin injury risk and symptom persistence in athletes (20). The adductor squeeze test findings further reinforce probable adductor-related involvement: 94.7% reported pain provocation (mild-to-severe), which is consistent with evidence supporting squeeze-based testing as a practical clinical discriminator in athletes with longstanding groin pain, particularly when integrated with symptom history and functional limitation (21,14).

Functional consequences in this cohort were prominent despite continued participation. Most runners reported that groin pain impaired performance (96.0% mild-to-severe), affected training (96.0% mild-to-severe), and produced at least slight restriction in activities of daily living (82.0% slight-to-moderate). The pattern of "participation with pain" also appears in the running tolerance data, where 88.0% could complete distances >5 km but only with pain. This presentation resembles the persistent, non-time-loss phenotype described in athletic groin pain, where athletes maintain exposure but report reduced performance quality, altered mechanics, and progressive restriction rather than abrupt cessation (18,23). From a biomechanical perspective, reduced hip–pelvic control and altered intersegmental coordination can amplify load transfer demands on the adductor–pubic complex during repetitive tasks, which may explain why even modest strength deficits and asymmetry coincide with meaningful participation limitations (22,25).

Hip range-of-motion impairment could not be directly quantified in this study because goniometric or instrumented ROM values were not reported; therefore, conclusions about hip mobility should be interpreted as functional inferences rather than objective joint-measurement findings. Nevertheless, the literature remains mixed regarding hip ROM as a risk factor: some evidence suggests restrictions in hip motion—particularly rotation—may precede chronic groin injury, while systematic syntheses highlight inconsistency across populations and testing approaches (10,9). In the context of runners, persistent pain during distance running and high provocation rates on resisted adduction may reflect a combination of tissue overload, compensatory strategies, and pelvic–hip load redistribution rather than ROM restriction alone (11,25). Future studies should incorporate standardized ROM measurement to clarify whether mobility limitation is a contributor, a consequence, or an unrelated correlate in runner-specific groin pain.

Interpretation of prevalence estimates should consider design limitations. The cross-sectional design precludes causal inference and cannot determine whether reduced adductor strength or asymmetry preceded groin pain. Convenience sampling from a limited geographic region may inflate prevalence if recruitment preferentially captured symptomatic runners. Measurement limitations include reliance on ordinal MMT grading, which is less sensitive than dynamometry and may compress variance near mid-scale grades, potentially masking clinically important strength differences (24). Despite these constraints, the results provide a clinically actionable profile that supports routine screening of symptomatic runners using standardized symptom/participation instruments aligned with contemporary injury surveillance principles, alongside objective strength and hip ROM assessment in future work (12,26). Where persistent symptoms exist, referral for imaging is not routinely indicated for all athletes, but MRI can be valuable when differential diagnosis is unclear or when intra-articular, pubic symphyseal, or musculotendinous pathology is suspected and conservative progression is stalled (30,28).

CONCLUSION

In male recreational runners, groin pain was highly prevalent and commonly persisted during running, with most participants reporting mild-to-moderate pain intensity alongside meaningful performance and training limitations. The cohort demonstrated a predominance of submaximal adductor strength grades, frequent pain provocation on adductor squeeze testing, and a very high prevalence of side-to-side asymmetry, collectively supporting the clinical relevance of adductor-related impairment in symptomatic runners. While hip mobility restriction could not be objectively quantified, the high functional burden during distance running and activity restriction underscores the need for structured screening and rehabilitation emphasizing quantified adductor strengthening, asymmetry correction, and objective hip mobility assessment within runner-specific management pathways.

REFERENCES

1. LeBlanc KE, LeBlanc KA. Groin pain in athletes. Hernia. 2003;7(2):68–71.
2. Macintyre J, Johson C, Schroeder EL. Groin pain in athletes. Curr Sports Med Rep. 2006;5(6):293–9.
3. Carolan D, Richter C, Thorborg K, Franklyn-Miller A, O'Donovan J, McDonald C, et al. Hip and groin pain prevalence and prediction in Elite Gaelic Games: 2703 male athletes across two seasons. Scand J Med Sci Sports. 2022;32(5):924–32.
4. Weir A, Brukner P, Delahunt E, Ekstrand J, Griffin D, Khan KM, et al. Doha agreement meeting on terminology and definitions in groin pain in athletes. Br J Sports Med. 2015;49(12):768–74.
5. Mitrousias V, Chytas D, Banios K, Fyllos A, Raoulis V, Chalatsis G, et al. Anatomy and terminology of groin pain: Current concepts. J ISAKOS. 2023;8(5):381–6.

DOI: https://doi.org/10.61919/j15dmm58

6. Bourne MN, Williams M, Jackson J, Williams KL, Timmins RG, Pizzari T. Preseason hip/groin strength and HAGOS scores are associated with subsequent injury in professional male soccer players. J Orthop Sports Phys Ther. 2020;50(5):234–42.
7. Esteve E, Rathleff MS, Vicens-Bordas J, Clausen MB, Hölmich P, Sala L, et al. Preseason adductor squeeze strength in 303 Spanish male soccer athletes: a cross-sectional study. Orthop J Sports Med. 2018;6(1):2325967117747275.
8. Quintana-Cepedal M, Vicente-Rodríguez G, Crespo I, Olmedillas H. Is hip adductor or abductor strength in healthy athletes associated with future groin pain? A systematic review and meta-analysis. Br J Sports Med. 2025;59(7):501–9.
9. Tak I, Engelaar L, Gouttebarge V, Barendrecht M, Van den Heuvel S, Kerkhoffs G, et al. Is lower hip range of motion a risk factor for groin pain in athletes? A systematic review with clinical applications. Br J Sports Med. 2017;51(22):1611–21.
10. Verrall GM, Slavotinek JP, Barnes PG, Esterman A, Oakeshott RD, Spriggins AJ. Hip joint range of motion restriction precedes athletic chronic groin injury. J Sci Med Sport. 2007;10(6):463–6.
11. Rambani R, Hackney R. Loss of range of motion of the hip joint: a hypothesis for etiology of sports hernia. Muscles Ligaments Tendons J. 2015;5(1):29.
12. Jordan et al. (IOC) consensus statement on recording and reporting epidemiological data. 2024.
13. Dempster J, Dutheil F, Ugbolue UC. The prevalence of lower extremity injuries in running and associated risk factors: a systematic review. Phys Act Health. 2021;5(1).
14. Thorborg K, Branci S, Nielsen MP, Tang L, Nielsen MB, Hölmich P. Eccentric and isometric hip adduction strength in male soccer players with and without adductor-related groin pain: an assessor-blinded comparison. Orthop J Sports Med. 2014;2(2):2325967114521778.
15. Mosler AB, Weir A, Hölmich P, Crossley KM. Which factors differentiate athletes with hip/groin pain from those without? A systematic review with meta-analysis. Br J Sports Med. 2015;49(12):810.
16. Kerbel YE, Smith CM, Prodromo JP, Nzeogu MI, Mulcahey MK. Epidemiology of hip and groin injuries in collegiate athletes in the United States. Orthop J Sports Med. 2018;6(5):2325967118771676.
17. Whittaker JL, Small C, Maffey L, Emery CA. Risk factors for groin injury in sport: an updated systematic review. Br J Sports Med. 2015;49(12):803–9.
18. Hölmich P, Phillips M, Heaven S, Simunovic N, Philippon MJ, Ayeni OR. Athletic groin pain: a systematic review of surgical diagnoses, investigations and treatment. Br J Sports Med. 2016;50(19):1181–6.
19. Thorborg K, Rathleff MS, Petersen P, Branci S, Hölmich P. Prevalence and severity of hip and groin pain in sub-elite male football: a cross-sectional cohort study of 695 players. Scand J Med Sci Sports. 2017;27(1):107–14.
20. Markovic G, Šarabon N, Pausic J, Hadžić V. Adductor muscles strength and strength asymmetry as risk factors for groin injuries among professional soccer players: a prospective study. Int J Environ Res Public Health. 2020;17(14):4946.
21. Nevin F, Delahunt E. Adductor squeeze test values and hip joint range of motion in Gaelic football athletes with longstanding groin pain. J Sci Med Sport. 2014;17(2):155–9.
22. King E, Franklyn-Miller A, Richter C, O'Reilly E, Doolan M, Moran K, et al. Clinical and biomechanical outcomes of rehabilitation targeting intersegmental control in athletic groin pain: prospective cohort of 205 patients. Br J Sports Med. 2018;52(16):1054–62.
23. Thorborg K. Current clinical concepts: Exercise and load management of adductor strains, adductor ruptures, and long-standing adductor-related groin pain. J Athl Train. 2023;58(7-8):589–601.
24. Mosler AB, Crossley KM, Thorborg K, Whiteley RJ, Weir A, Serner A, et al. Hip strength and range of motion: Normal values from a professional football league. J Sci Med Sport. 2017;20(4):339–43.
25. King MG, Heerey JJ, Schache AG, Semciw AI, Middleton KJ, Sritharan P, et al. Lower limb biomechanics during low- and high-impact functional tasks differ between men and women with hip-related groin pain. Clin Biomech. 2019;68:96–103.
26. Dempster J, Dutheil F, Ugbolue UC. The prevalence of lower extremity injuries in running and associated risk factors: a systematic review. Phys Act Health. 2021;5(1).
27. Engebretsen AH, Myklebust G, Holme I, Engebretsen L, Bahr R. Intrinsic risk factors for groin injuries among male soccer players: a prospective cohort study. Am J Sports Med. 2010;38(10):2051–7.
28. Serner A, Weir A, Tol J, Thorborg K, Roemer F, Guermazi A, et al. Characteristics of acute groin injuries in the adductor muscles: a detailed MRI study in athletes. Scand J Med Sci Sports. 2018;28(2):667–76.
29. Becker I, Woodley SJ, Stringer MD. The adult human pubic symphysis: a systematic review. J Anat. 2010;217(5):475–87.
30. Bisciotti GN, Di Pietto F, Rusconi G, Bisciotti A, Auci A, Zappia M, et al. The role of MRI in groin pain syndrome in athletes. Diagnostics. 2024;14(8):814.