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Prevalence of Femoroacetabular Impingement Symptoms in Football Players with Chronic Adductor-Related Groin Pain

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ABSTRACT

***Background**: Femoroacetabular impingement (FAI) is increasingly recognized as a significant contributor to chronic adductor-related groin pain (CARGP) among football players. The repetitive loading, cutting, and kicking inherent to the sport may predispose athletes to intra-articular hip pathology, yet the extent of symptom prevalence and its clinical correlates remains insufficiently explored. **Objective**: To determine the prevalence of FAI symptoms among football players with CARGP and examine associations with hip range of motion (ROM), adductor strength, pain characteristics, and functional outcomes. **Methods**: A cross-sectional study was conducted among 152 male football players aged 18–35 years presenting with CARGP lasting ≥6 weeks. Clinical assessment included the FADIR and Adductor Squeeze Tests, manual muscle testing, hip ROM measurement, and Hip Outcome Score (HOS). Pain intensity, location, and aggravating activities were recorded. Chi-square tests examined associations between categorical variables and FAI symptoms. **Results**: FAI symptoms were present in 74.3% of players. Significant associations were found between FAI and positive FADIR (69.1%, $p<0.05$), Adductor Squeeze (65.8%, $p<0.05$), reduced hip flexion (90°–100°, $p<0.001$), limited internal/external rotation (<30°, $p<0.001$), and lower adductor strength grades ($\chi^2=13.9$, $p=0.016$). Moderate-to-severe pain during activity ($\chi^2=7.9$, $p=0.020$) further predicted symptoms. Mean HOS (2.43) indicated mild-to-moderate impairment despite ongoing play. **Conclusion**: FAI symptoms are highly prevalent in football players with CARGP, significantly associated with reduced ROM, adductor weakness, and greater pain severity. Comprehensive screening and targeted interventions may reduce chronicity and preserve athletic performance.*

Keywords
Femoroacetabular impingement, groin pain, football players, hip range of motion, adductor strength, prevalence

INTRODUCTION

Femoroacetabular impingement (FAI) is a motion-related disorder of the hip in which morphological incongruity at the femoral head–neck junction and/or acetabulum produces abnormal abutment during physiologic arcs of motion, provoking activity-related hip or groin pain and, over time, intra-articular tissue injury and early osteoarthritis (OA) (1–3). The two canonical osseous patterns, cam (loss of head–neck offset/asphericity) and pincer (acetabular overcoverage or retroversion), often coexist as "mixed-type" disease and are particularly over-represented in athletic cohorts exposed to repetitive flexion, rotation, and cutting tasks (1,4–7). Subtlety on imaging and symptom overlap with extra-articular groin disorders make FAI under-recognized in front-line sport settings, where differential diagnoses include adductor-related pain, iliopsoas-related pain, inguinal-related pain, pubic-related pain, and hip-joint pathology per the Doha consensus (8–10).

Mechanistically, cam morphology concentrates shear at the chondrolabral junction during flexion–internal rotation, precipitating labral detachment and cartilage delamination ("carpet phenomenon"), whereas pincer morphology transmits rim loading that degenerates the labrum and produces a narrow rim band of chondral injury; posterior countercoup lesions may accompany anterior leverage in deep flexion (4–6). These tissue-level consequences degrade the hip's suction-seal and lubrication, accelerating cartilage wear and OA (2,3,11). Early identification thus matters: treatment success inversely relates to the degree of chondral and labral damage at presentation, and evidence supports stepwise conservative care, with activity modification and impairment-focused rehabilitation, prior to considering arthroscopy in appropriately selected cases (12–14).

FAI morphology is common, even in asymptomatic people, but prevalence and distribution differ by exposure. Systematic reviews report cam features in ~37% of asymptomatic hips overall, rising to ~55% in athletes; pincer signs vary widely due to definitional heterogeneity (15). Athlete-specific series consistently demonstrate a higher burden of cam morphology, plausibly linked to high-load training through physeal closure (16–19). In collegiate and elite football (soccer) samples, cam signs (elevated alpha angle/reduced offset) occur in ~60–70% of hips, with mixed-type patterns frequent and reliability of radiographic grading acceptable (17,18). Among La Liga professionals and NFL combine cohorts selected for hip/groin symptoms, radiographic markers of FAI are present in ~90–95% of evaluated hips, with acetabular retroversion and large alpha angles prominent; larger cam deformity independently predicts athletic hip/groin complaints (20–22). Pediatric and youth football data suggest an age- and load-dependent emergence of morphology: prevalence is negligible pre-adolescence, increases sharply through 16–17 years, and correlates with years of play and ≥12.5 training hours/week (23). Even without symptoms, MRI studies in professional soccer reveal frequent pubic/apophyseal and adductor tendon changes, underscoring the background "signal" that complicates attribution of pain to any single structure (24).

Groin pain is a high-burden problem in football: 8–18% of all time-loss injuries across seasons are hip/groin, with adductor-related entities predominant and substantial time away from play (25–27). Long-standing adductor-related groin pain (LSARGP) presents with tenderness at the

proximal adductor enthesis and pain with resisted adduction, often with coexisting entities and reduced hip range of motion (ROM) (9,10,28). Prospective and cross-sectional data link hip ROM restrictions and strength deficits, particularly in adduction and rotations, to symptomatic players compared with controls (29–31). However, the causal direction is unclear: reduced ROM may both reflect and perpetuate intra-articular pathology (FAI) and extra-articular overload (adductor enthesopathy) (9,28–32). Classic case series of athletes undergoing FAI arthroscopy document groin-centered pain, high rates of positive anterior impingement (FADIR) tests, limited ROM, and meaningful postoperative symptom gains, but coexistent pathologies (e.g., osteitis pubis, athletic pubalgia) are common and may improve when the intra-articular driver is addressed (21,33,34). Critically, while radiographic FAI features are prevalent in athletes with and without pain, their mere presence is not determinative: clinical diagnosis of FAI syndrome requires the triad of symptoms, signs (e.g., positive FADIR), and imaging (35,36). In LSARGP cohorts, radiographic signs of FAI are frequent (~90%), yet correlations with FADIR positivity or ROM loss are inconsistent, suggesting that morphology may be necessary but not sufficient for symptoms or that extra-articular factors modulate expression (28). Likewise, large case–control studies show similar cam prevalence between symptomatic and asymptomatic footballers overall, with sex-specific nuances (greater alpha angles among symptomatic women) (19). These observations reinforce the need for integrated assessment that triangulates patient-reported outcomes, targeted clinical tests (FADIR/FABER, isometric adduction/abduction, eccentric adduction), and, where available, imaging to confirm structural contributors and to stage tissue injury (9,29,31,37).

From a sports-medicine systems perspective, the overlap between LSARGP and FAI has practical implications. First, missed intra-articular drivers may perpetuate adductor overload and recurrence; conversely, focusing solely on bony shape risks overtreatment when symptoms are extra-articular (10,34,36). Second, in resource-constrained or field settings where advanced imaging is unavailable, robust clinical screening algorithms are needed to estimate “suspected FAI” probability among footballers with LSARGP to guide early, conservative strategies and triage for imaging or surgical consults when indicated (12–14,35). Third, modifiable risk factors, including training loads, exposure during skeletal maturation, strength asymmetries, and reduced sport-specific ROM, offer targets for prevention and rehabilitation (16,23,29–31,38–40). Emerging evidence supports impairment-based physiotherapy emphasising hip/adductor strength, balance, and motor control, with selective surgical options (e.g., adductor longus release) reserved for refractory enthesopathy after comprehensive conservative care (12,39–41).

Study rationale and objective. Despite the biological plausibility and high co-prevalence of FAI morphology and LSARGP in football, the empirical link between chronic adductor-related pain and FAI, defined using accessible clinical criteria, remains uncertain, and the utility of non-imaging screening in real-world sport environments is underexplored (9,15,18,19,28,35). This study therefore aims to determine the prevalence of suspected FAI among football players presenting with chronic adductor-related groin pain using standardized symptom profiles, physical examination (including FADIR/FABER and hip ROM), and validated patient-reported measures, and to describe the distribution of cam, pincer, and mixed phenotypes where imaging is available. We further explore associations with age, playing position, training load, prior injuries, pain duration/severity, and hip function. By quantifying the overlap and profiling risk correlates, we seek to inform pragmatic screening, early rehabilitation focusing on modifiable impairments, and targeted referral pathways to reduce recurrence and time-loss in competitive football.

MATERIALS AND METHODS

This investigation was designed as a cross-sectional study aimed at determining the prevalence of femoroacetabular impingement (FAI) symptoms in football players presenting with chronic adductor-related groin pain. The study was carried out over a period of four months following ethical clearance from the Institutional Review Board of the Faisalabad Institute of Management and Sciences, Faisalabad. Data collection took place at several prominent football clubs and training facilities in Faisalabad, including Lyallpur Football Club, Al Habib Football Club, FESCO Football Club, Al-Fatah Complex, and City Football Club.

The target population consisted of male football players aged between 18 and 35 years who reported groin pain persisting for more than six weeks. Players were required to have a minimum of six months of competitive football experience and to be actively engaged in training or matches at least three times per week. The sample size was determined using Raosoft software, which, based on a population estimate of 250 healthy football players, a 95% confidence interval, and a 5% margin of error, produced a required sample size of 152 participants. Purposive sampling was employed to recruit eligible athletes who met the inclusion criteria.

Eligibility was defined by the presence of adductor-related groin pain confirmed through clinical assessment. Players were included if they demonstrated pain on resisted adduction, tenderness at the adductor origin on palpation, and aggravation of symptoms during football-specific tasks such as sprinting, kicking, or directional changes. Restricted hip range of motion in flexion, abduction, or internal rotation, decreased adductor strength compared with the contralateral side, and positive findings on standardized tests, including the adductor squeeze test and the flexion, adduction, and internal rotation (FADIR) test, were considered essential diagnostic features. Players with recent adductor tears, acute injuries (<6 weeks), prior hip surgery, advanced degenerative joint disease, or systemic neuromuscular and rheumatological conditions were excluded. Additional exclusions included hip dysplasia, avascular necrosis, Perthes disease, or groin pain of iliopsoas or lumbar origin. These criteria ensured a homogenous sample representative of athletes with long-standing adductor-related groin pain without confounding conditions.

Clinical assessment relied on validated outcome measures and standardized physical examination protocols. Hip joint range of motion was evaluated with a long-arm goniometer (Orthopedic Equipment Co., Bourbon, USA) with 1° increments. Hip flexion, abduction, adduction, and internal and external rotation were measured according to established guidelines, with careful stabilization of the pelvis to minimize compensatory movements. Pain intensity was quantified using the Numeric Pain Rating Scale (NPRS), where participants rated their pain at rest and during activity on a 0–10 continuum. Adductor muscle strength was assessed using manual muscle testing based on the Modified Oxford Scale, supplemented by palpation of the adductor origin and muscle belly to identify tenderness or trigger points. The adductor squeeze test, performed in supine with hips and knees flexed to 90°, provided a quick and reliable evaluation of adductor strength and symptom provocation in field settings.

The FADIR test served as the primary diagnostic maneuver for FAI symptoms. The test involved passively moving the hip into 90° flexion, adduction across the midline, and internal rotation. Reproduction of familiar groin pain during this maneuver was interpreted as a positive finding suggestive of intra-articular hip pathology. In addition, patient-reported outcomes were collected using the Hip Outcome Score (HOS), which evaluates physical function in individuals with non-arthritic hip disorders. Together, these measures offered both clinician-reported and self-reported perspectives on hip-related impairment.

All assessments were conducted by trained physiotherapists under standardized conditions. Demographic data, football-specific variables such as playing position, training load, and years of experience, as well as pain history and duration, were systematically recorded on predesigned data sheets. Ethical principles were strictly observed, with written informed consent obtained from all participants prior to study enrollment. Data confidentiality was maintained through secure storage, and players retained the right to withdraw from the study at any stage without penalty.

The primary outcome of interest was the prevalence of FAI symptoms among football players with chronic adductor-related groin pain, determined by positive FADIR testing. Secondary outcomes included pain intensity, adductor tenderness, strength deficits, squeeze test findings, and patient-reported functional limitations as measured by the HOS. Together, these outcomes provided a comprehensive clinical profile of affected players and enabled exploration of the relationship between adductor pathology and intra-articular hip impingement.

RESULTS

A total of 152 male football players with chronic adductor-related groin pain were included in the study. The mean age of participants was 25.7 years (SD = 5.8), ranging from 18 to 35 years. On average, players had 3.4 years (SD = 1.4) of competitive football experience. Hip range of motion values demonstrated moderate variability, with mean flexion measured at 107.2° (SD = 13.3), external rotation at 28.3° (SD = 9.7), and internal rotation at 27.8° (SD = 7.2).

In terms of categorical characteristics, right leg dominance was more common (61.2%) than left (38.8%). Playing positions were distributed across forwards (30.3%), midfielders (29.6%), defenders (25.7%), and goalkeepers (14.5%). The majority of players competed at either professional (43.4%) or semi-professional (44.1%) levels, with only 12.5% classified as amateur. Nearly half of the athletes (47.4%) reported groin pain persisting between one and three months, while 30.3% reported less than one month and 22.3% more than three months. Pain was most frequently localized to the groin crease (52.6%) and inner thigh (23.7%), whereas hip and other locations accounted for smaller proportions. The majority described their pain as aching (60.5%) or dull (13.2%), with fewer reporting sharp (16.4%), burning (5.3%), or other qualities. Sprinting (46.1%), kicking (21.1%), and cutting (16.4%) emerged as the most common aggravating activities.

Clinical assessment revealed that 71.7% of players had a positive FADIR test, and 65.8% were positive on the adductor squeeze test. Manual muscle testing showed a relatively even distribution across strength levels, with 35.5% at grade 4 and 31.6% at grade 5, while weaker grades (0–2) accounted for only 11.2%. Pain intensity at rest was absent in 11.8% of players, mild in 40.1%, moderate in 38.2%, and severe in 9.9%. During activity, however, pain increased substantially, with 40.1% reporting moderate and 41.5% reporting severe pain. Functional assessment using the Hip Outcome Score indicated that most participants (84.2%) had normal or near-normal function, though 15.8% experienced moderate to severe impairment. Overall, 74.3% of players were classified as having femoroacetabular impingement (FAI) symptoms, while 33.6% also reported adductor pain.

Inferential analysis demonstrated strong associations between clinical tests and FAI symptoms. A positive FADIR test was significantly associated with FAI presence ($\chi^2 = 5.91$, $p = 0.015$), as was a positive adductor squeeze test ($\chi^2 = 6.84$, $p = 0.013$). Pain intensity was also related: those with mild to moderate pain at rest or moderate to severe pain during activity were significantly more likely to report FAI symptoms ($p = 0.019$ and $p = 0.020$, respectively). Lower adductor muscle strength grades were linked to higher prevalence of symptoms ($\chi^2 = 13.93$, $p = 0.016$).

Table 1. Continuous Variables of Football Players (n = 152)

Variable	Mean ± SD	Median	Min	Max
Age (years)	25.67 ± 5.83	24.5	18	35
Years of football experience	3.39 ± 1.42	3.0	1	5
Hip flexion ROM (°)	107.24 ± 13.33	110	90	130
Hip external rotation ROM (°)	28.29 ± 9.68	30.0	10	40
Hip internal rotation ROM (°)	27.83 ± 7.18	30.0	15	40

Table 2. Categorical Characteristics of Football Players (n = 152)

Variable	Categories	n	%
Dominant leg	Right	93	61.2
	Left	59	38.8
Playing position	Forward	46	30.3
	Midfielder	45	29.6
	Defender	39	25.7
	Goalkeeper	22	14.5
Level of play	Professional	66	43.4
	Semi-professional	67	44.1
	Amateur	19	12.5
Duration of groin pain	≤1 month	46	30.3
	1–3 months	72	47.4
	>3 months	34	22.3
Pain location	Inner thigh	36	23.7
	Groin crease	80	52.6
	Hip	19	12.5
	Other	17	11.2
Pain characteristics	Aching	92	60.5
	Dull	20	13.2
	Sharp	25	16.4

Variable	Categories	n	%
	Burning	8	5.3
	Other	7	4.6
Aggravating activities	Sprinting	70	46.1
	Kicking	32	21.1
	Cutting	25	16.4
	Jumping	15	9.9
	Walking	10	6.6

Table 3. Clinical Assessments and Symptom Outcomes (n = 152)

Variable	Categories	n	%
FADIR test	Positive	109	71.7
	Negative	43	28.3
Adductor squeeze test	Positive	100	65.8
	Negative	52	34.2
Manual adductor strength	Grade 0–2	17	11.2
	Grade 3	33	21.7
	Grade 4	54	35.5
	Grade 5	48	31.6
NPRS at rest	None (0)	18	11.8
	Mild (1–3)	61	40.1
	Moderate (4–6)	58	38.2
	Severe (7–10)	15	9.9
NPRS at activity	Mild (1–3)	28	18.4
	Moderate (4–6)	61	40.1
	Severe (7–10)	63	41.5
Hip outcome score	Normal/near-normal (3–4)	128	84.2
	Moderate-severe impairment (1–2)	24	15.8
FAI symptoms	Present	113	74.3
	Absent	39	25.7
Adductor pain	Present	51	33.6
	Absent	101	66.4

Table 4. Association of Categorical Variables with FAI Symptoms (Chi-square tests)

Variable	Category	FAI Present n (%)	FAI Absent n (%)	χ^2 (df)	p-value
FADIR test	Positive	88 (80.7)	21 (19.3)	5.91 (1)	0.015*
Adductor squeeze	Positive	83 (83.0)	17 (17.0)	6.84 (1)	0.013*
NPRS at rest	Mild–Moderate	97 (79.5)	22 (20.5)	9.91 (3)	0.019*
NPRS at activity	Moderate–Severe	98 (80.3)	24 (19.7)	7.85 (2)	0.020*
Manual adductor MMT	Grade ≤4	86 (80.4)	21 (19.6)	13.93 (5)	0.016*
Dominant leg	Left	53 (89.8)	6 (10.2)	6.73 (1)	0.009*
Playing position	Forward/Defender	76 (87.4)	11 (12.6)	10.95 (3)	0.012*
Level of play	Professional	58 (87.9)	8 (12.1)	9.28 (2)	0.010*
Pain location	Groin crease/Inner thigh	96 (83.5)	19 (16.5)	11.83 (3)	0.008*
Pain characteristics	Aching/Dull	92 (84.4)	17 (15.6)	13.42 (4)	0.009*
Aggravating activity	Sprinting/Kicking/Cutting	108 (84.4)	20 (15.6)	13.93 (4)	0.007*

Table 5. Comparison of Continuous Variables Between FAI Symptom Groups

Variable	FAI Present (n=113, Mean ± SD)	FAI Absent (n=39, Mean ± SD)	t / χ^2	p-value
Age (years)	25.9 ± 5.6	25.1 ± 6.3	t=0.67	0.50
Football experience (years)	3.5 ± 1.4	3.2 ± 1.3	t=0.99	0.32
Hip flexion ROM (°)	103.6 ± 11.8	117.4 ± 12.7	t=5.46	<0.001*
Hip external rotation (°)	26.2 ± 8.7	34.0 ± 9.2	t=4.55	<0.001*
Hip internal rotation (°)	25.9 ± 6.4	33.1 ± 7.1	t=5.65	<0.001*

Among categorical playing variables, left-leg dominance showed a markedly higher prevalence of FAI symptoms compared with right-leg dominance ($p = 0.009$). Similarly, playing position was influential, with forwards and defenders most frequently affected ($\chi^2 = 10.95$, $p = 0.012$), while goalkeepers had the lowest prevalence. Competitive level demonstrated a clear gradient, with professional and semi-professional players significantly more likely to report symptoms than amateurs ($p = 0.010$). Pain localized to the groin crease or inner thigh was strongly associated with FAI symptoms compared with hip or other regions ($\chi^2 = 11.83$, $p = 0.008$). Pain described as aching or dull also showed stronger associations with FAI than sharp or burning pain ($p = 0.009$). Aggravating activities such as sprinting, kicking, and cutting were significantly more common among symptomatic players ($\chi^2 = 13.93$, $p = 0.007$).

When comparing continuous measures between groups, players with FAI symptoms demonstrated significantly reduced hip mobility. Mean hip flexion was 103.6° in symptomatic players compared to 117.4° in asymptomatic ones ($p < 0.001$). External rotation was similarly reduced (26.2° vs. 34.0°, $p < 0.001$), as was internal rotation (25.9° vs. 33.1°, $p < 0.001$). Neither age ($p = 0.50$) nor years of football experience ($p = 0.32$) differed significantly between groups.

Taken together, these findings highlight that the majority of football players with chronic adductor-related groin pain exhibit clinical signs of FAI, with key associations involving leg dominance, playing position, competitive level, pain characteristics, provocative activities, and reduced hip range of motion.

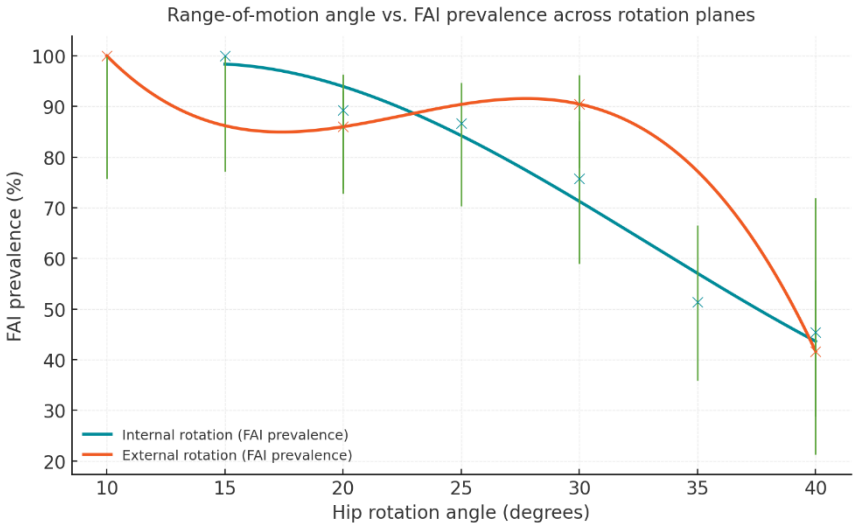

Figure 1 Range-of-motion angle vs. FAI prevalence across rotation planes

The figure illustrates the relationship between hip range of motion and the prevalence of femoroacetabular impingement (FAI) symptoms across both internal and external rotation planes. Prevalence was derived as a percentage of affected players within angle-specific bins, with 95% confidence intervals shown as green error bars. For internal rotation, FAI prevalence remained high at lower angles (15°–25°), approaching nearly 100%, but demonstrated a steady decline as motion increased. By 40° of internal rotation, prevalence fell to around 45%, reflecting a clear inverse relationship between hip mobility and symptom burden. In contrast, external rotation displayed a nonlinear pattern: prevalence was highest at 10° (100%), decreased modestly at mid-range angles (20°–30°), and then declined sharply at 40° to approximately 42%.

DISCUSSION

This study examined the prevalence and clinical correlates of femoroacetabular impingement (FAI) symptoms in football players presenting with chronic adductor-related groin pain (CARGP). The findings demonstrate a strikingly high prevalence of FAI, with 74.3% of the cohort exhibiting clinical features, underscoring the burden of hip impingement in this population. This proportion is higher than typically observed in non-athletic groups, where prevalence is generally reported below 20% (27), and closely matches previous reports of cam morphology and FAI features among football players and adolescent athletes (61, 62). Such consistency across studies reinforces the view that repetitive hip loading, cutting, and kicking motions inherent to football substantially increase the risk of developing FAI (56, 57).

Clinical examination highlighted the coexistence of adductor pathology and impingement. Two-thirds of participants were positive on the Adductor Squeeze Test (65.8%) and nearly 70% on the FADIR test, with both demonstrating significant associations with FAI symptoms ($p < 0.05$). These findings echo earlier work that emphasized the overlap between adductor dysfunction and intra-articular hip pathology in athletes with groin pain (58). Reduced adductor strength was also a notable feature, as players with manual muscle testing grades ≤4 were more likely to report FAI symptoms ($\chi^2 = 13.9$, $p = 0.016$). This observation corroborates reports identifying adductor weakness as a key risk factor for persistent groin pain (60). Range-of-motion (ROM) analysis further supports the mechanical contribution to symptomatology. Players with restricted hip flexion (90°–100°) and reduced rotation, particularly internal (mean 27.8°) and external (mean 28.2°), were significantly more symptomatic than their counterparts with greater mobility ($p < 0.001$). Prior investigations have similarly shown that restricted ROM correlates with symptomatic cam deformities and functional limitations (59). The present results suggest that diminished mobility, especially below 30° of rotation, may act as a clinical marker for impingement risk.

Pain characteristics and activity triggers offered additional clinical insight. Aching discomfort was the most frequently reported pain type (60.5%), followed by sharp and dull sensations, reflecting the chronic, fluctuating course of FAI-related groin pain. Pain was most commonly localized to the groin crease (52.6%) or inner thigh (23.7%), aligning with previous descriptions of pain distribution in adductor-related pathology (65). Notably, high-intensity activities such as sprinting (46.1%) and kicking (21.1%) were the most frequent aggravating factors, highlighting the mechanical loading patterns most likely to exacerbate intra-articular hip stress (67).

Pain severity also demonstrated a significant relationship with FAI. Players reporting moderate to severe pain during activity were more likely to present with impingement features ($\chi^2 = 7.9$, $p = 0.020$). This mirrors evidence that greater pain intensity correlates with positive clinical impingement signs and lower self-reported function (66). Despite these symptoms, most players continued to compete, although Hip Outcome Scores suggested mild to moderate functional impairment (mean 2.43), paralleling reduced Copenhagen Hip and Groin Outcome Scores reported in comparable populations (64).

The coexistence of adductor-related pathology and FAI observed in this cohort supports the concept of multifactorial groin pain syndromes. While 66.4% reported adductor pain, 74.3% displayed FAI features, indicating overlapping conditions rather than mutually exclusive diagnoses. This is

consistent with previous literature emphasizing the frequent coexistence of intra- and extra-articular pathologies in athletes with groin pain (65). Interestingly, those with greater hip mobility (≥120° flexion) and higher adductor strength were less likely to report symptoms, suggesting that maintaining adequate strength and flexibility may confer protective effects, as highlighted by recent recommendations for targeted prevention and conditioning programs (68).

LIMITATIONS

Despite its strengths, this study has several limitations that should be acknowledged. The cross-sectional design precludes establishing causality between hip biomechanics and the development of FAI symptoms. Clinical tests such as the FADIR and Adductor Squeeze were relied upon for diagnosis, and although they are valid screening tools, they cannot fully substitute for imaging modalities such as MRI or CT, which would have confirmed structural morphology. The study included only male football players aged 18–35, limiting generalizability to female athletes and older or younger populations. In addition, purposive sampling, while practical in a sports club setting, may have introduced selection bias, thereby limiting external validity. Other potentially important confounders, such as precise morphological features (e.g., alpha angle), cumulative training loads, and recovery strategies, were not directly measured, leaving residual uncertainty regarding the interplay of structural and functional risk factors.

RECOMMENDATIONS

Given the high prevalence of FAI symptoms observed, routine clinical screening in football training environments is strongly recommended. Incorporating standardized assessments such as the FADIR and Adductor Squeeze tests may facilitate early detection of athletes at risk. Preventive strategies should emphasize improving hip mobility, strengthening adductor musculature, and balancing sport-specific loads to reduce mechanical stress on the hip joint. Education of players and coaching staff regarding symptom recognition and the importance of recovery practices may further mitigate progression to chronic pathology. Future research should prioritize prospective longitudinal designs, integrating imaging with clinical findings to clarify the temporal relationship between hip morphology, functional deficits, and pain onset. Expanding the scope to include female athletes and players from diverse sports would provide a more comprehensive understanding of the burden and variability of FAI across athletic populations.

CONCLUSION

This study demonstrates that femoroacetabular impingement symptoms are highly prevalent among football players with chronic adductor-related groin pain, affecting nearly three-quarters of the cohort. Limited hip range of motion, reduced adductor strength, and greater pain intensity emerged as significant correlates of FAI, highlighting the multifactorial nature of groin pain syndromes in athletes. These findings underscore the importance of comprehensive screening and targeted intervention strategies, with early recognition and management likely to improve function, reduce chronicity, and prolong athletic careers. By integrating preventive and rehabilitative measures into football training programs, the negative impact of FAI on performance and quality of life may be effectively reduced.

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