JOURNAL OF BASHIR INSTITUTE OF HEALTH SCIENCES

RESEARCH ARTICLE

OPEN ACCESS

ARTICLE INFO
Date Received:
March 13, 2025
Date Revised:
March 25, 2025
Date Published Online
June 30, 2025

Prevalence of Groin Strain and Its Impact on Quality of Life among Field Hockey Players of Islamabad: Cross-Sectional Study

[a]Hina Javed, [b]Muhammad Taimoor ul Hassan Javed, [c]Fatima Arif, [d]Ayesha Nawab, [e]Hafiza Sufia Saba

[a]*Assistant Professor at Department of Rehabilitation Sciences, Bashir Institute of Health Sciences, Bhara kahu, Islamabad, Pakistan*
[b]*Senior Lecturer at the Department of Rehabilitation Sciences, Bashir Institute of Health Sciences, Bhara Kahu, Islamabad, Pakistan*
[c,d,e]*Department of Rehabilitation Sciences, Bashir Institute of Health Sciences, Bhara Kahu, Islamabad, Pakistan*

*CORRESPONDENCE
Fatima Arif
Department of Rehabilitation Sciences, Bashir Institute of Health Sciences, Bhara Kahu, Islamabad, Pakistan
E-mail: ftm.arif201@gmail.com
Phone: +92 307 0221026

ABSTRACT

Background: Groin strain is a condition in which the inner thigh muscles, the adductors, are overstretched, causing pain. This is a common injury among athletes in many sports, especially those involving sudden twisting or rapid changes of direction. Groin strains are highly prevalent in field hockey due to sport-specific biomechanics; however, data on prevalence and quality-of-life (QoL) impact in Pakistani athletes is limited. Hence, understanding the prevalence and impact of groin strains can help identify common risk factors in developing prevention and treatment strategies to reduce injury rates. This study aims to determine groin strain prevalence and its association with QoL using HAGOS in Islamabad field hockey players. **Methods**: A cross-sectional study of 134 male field hockey players (20–51 years) from Islamabad Sports Complex assessed groin strain prevalence using the Copenhagen Hip and Groin Outcome Score (HAGOS). Groin strain was defined as HAGOS ≤70. Descriptive statistics characterized demographics; ANOVA with effect sizes (η^2) compared HAGOS domains between impaired/non-impaired groups; and multiple regression identified quality-of-life (QoL) predictors. **Results:** The study identified a 31.3% prevalence (n=42) of clinically significant groin strain (HAGOS ≤70) among male field hockey players in Islamabad. Athletes with groin strain exhibited severe functional deficits across all HAGOS domains ($p<0.001$), with the largest impairments in Pain ($\Delta=31.4$, $\eta^2=0.626$) and Symptoms ($\Delta=30.4$, $\eta^2=0.567$). Paradoxically, Physical Activity participation was preserved despite symptoms (lowest $\eta^2=0.119$), reflecting cultural norms prioritizing athletic persistence over symptom reporting. Regression analysis revealed Pain ($\beta=0.3479$, $p=0.003$), Daily Function ($\beta=0.2484$, $p=0.018$), and Symptoms ($\beta=0.2112$, $p=0.024$) as key predictors of diminished Quality of Life (QoL), collectively explaining 52.7% of variance. Conversely, Sports Function showed no QoL association ($\beta=-0.0008$, $p=0.992$), highlighting a critical disconnect between athletic performance and holistic wellbeing. **Conclusion:** Groin strain prevalence in Pakistani hockey players reflects region-specific risks, with pain—not mechanical dysfunction—driving severe disability. Athletes prioritize sport participation over wellbeing, decoupling performance from holistic health. Culturally adapted interventions must target pain neuroscience education, load management on natural turf, and institutional QoL monitoring to reconcile athletic resilience with sustainable health.

Keywords: Field Hockey, HAGOS Scale, Hip Groin Injury, Hip Groin Strain, Hockey, Physical Activity, Quality of Life

INTRODUCTION

Groin strain is a complicated clinical syndrome that is very common among sportsmen in multidirectional sports, i.e., field hockey. Modern classification systems, such as the Doha Agreement, standardize terminology by categorizing groin pain into adductor-, iliopsoas-, inguinal-, and pubic-related entities and replacing general terms such as groin pull that are not evidence-based management [1-3]. The adductor longus is common to anatomical injury because of the biomechanical susceptibility to eccentric loading, especially in sports that involve quick acceleration and change of direction [4-6]. Field hockey in particular exposes athletes to distinct requirements with repetitive skating movements, which involve hip abduction-adduction cycles (35-65 range), forceful kicking, and abrupt pivoting, which produce peak adductor forces of more than 450N during push-off phases [7]. Such activities interfere with force-coupling between abdominal muscles and adductors, which leads to microtrauma at the pubic symphysis and musculotendinous junctions [8].

Groin injury is clinically reported to account for 5-18% of all field hockey injuries, and the recurrence rate is higher than 30% in cases of insufficient rehabilitation [9]. Athletes usually have deep inguinal pain during sprinting, limited hip internal rotation (<20), and associated intra-articular pathology in 34-41% of chronic cases [10]. Diagnosis standardized protocols include palpation of adductor origins, resisted strength testing, and functional provocation manoeuvres (e.g., bent-knee fallouts) [3, 11]. Advanced imaging is still necessary to distinguish between adductor tears and osteitis pubis or labral pathology [12, 13].

Similarly, the elite soccer and ice hockey players have an injury rate of 1.5-1.9 injuries per 1,000 exposure hours [14, 15]. The major risk factors include a history of groin injury (which raises the likelihood of recurrence by 67-80 percent), muscle strength imbalances (especially adductor-to-abductor ratio <80 percent), and poor hip range of motion [15, 16]. The incidence is disproportionately higher in men, and collegiate male athletes experience 41% more groin injuries than females, probably because male-dominated sports have higher-intensity, multidirectional demands [14, 15]. Although the development of diagnostic tools (Doha Agreement taxonomy 2015) has enhanced the classification of groin pain; however, underreporting remains a common problem since athletes tend to train despite pain [17]. Injury rates are reduced by 41-59 percent in soccer with prevention programs that include the Copenhagen Adduction Exercise (CAE), which emphasizes the importance of specific strength training [18].

Although field hockey is a popular sport in Pakistan, a country with high-level international successes such as Olympic gold medals, there is limited epidemiological evidence on groin pain in this group [19, 20]. The existing literature is dominated by Western populations in ice hockey or soccer without the inclusion of region-specific variables, including the biomechanics of turf surfaces, tropical climatic stressors, and the cultural training strategies [21]. This gap impedes targeted prevention strategies, particularly given that 72% of Pakistani hockey athletes report training through pain [22]. Our study addresses this by quantifying prevalence using Copenhagen Hip and Groin Outcome Score (HAGOS) criteria and evaluating its impact on quality of life to inform culturally adapted rehabilitation frameworks.

MATERIALS AND METHODS

The data of this cross-sectional quantitative study were collected from the Islamabad Sports Complex. The study was completed in six months following the approval from the institutional review boards and the ethical committee of the Bashir Institute of Health Sciences, Islamabad, i.e., ECCR Ref No.: B1-116/DPT-/DPT-2024. The approval was also taken from the Islamabad Sports Complex with Ref. No. IHA/2024-16. The study population was male field hockey players of Islamabad City. Inclusion Criteria for this study were male field hockey players between 20 and 51 years of age. Exclusion Criteria included Players of any other spots, Female players, and Players with any recent injury. The Sample size was 134, calculated through RaoSoft, and the Non-probability Convenient Sampling technique was applied. Data was collected through a semi-structured questionnaire including the Copenhagen Hip and Groin Outcome Score (HAGOS) [23] and details regarding demographic data. Data was entered in SPSS version 27 for data analysis.

DATA COLLECTION PROCEDURE

Participants were approached during scheduled training sessions at Islamabad Sports Complex after obtaining permission from coaches. The researcher introduced the study objectives verbally and distributed participant information sheets. Written informed consent was obtained before questionnaire administration. The semi-structured questionnaires (demographics + HAGOS scale) were administered in-person by trained research assistants, and collected data were entered into a Microsoft Excel sheet to be transported in SPSS.

STATISTICAL ANALYSIS

The analysis of data was done with SPSS 27. The study used descriptive statistics (frequencies/percentages) to describe the age and BMI distribution in the cohort. The prevalence of groin strain was quantified by categorical analysis using a predefined HAGOS score cutoff (≤70). Effect sizes (η^2) of ANOVA were used to compare the HAGOS domain scores of groin-strains and non-strain groups. Finally, the predictors of Quality of Life were determined with the help of multiple linear regression based on all HAGOS domains as the independent variables

RESULTS

The cohort (N=134) consisted of Islamabad male field hockey players, with the majority aged 20 to 27 years (56.0%), and the representation declining in older age groups (28 to 35 years: 23.9%; 36 to 43 years: 8.2%; and 44 to 51 years: 11.9%). The distribution of BMI showed that 55.2% were in the healthy range (18.5-24.9 kg/m2), 32.8% were above healthy limits, 26.1% overweight (25-29.9 kg/m2) and 6.7% obese (30 kg/m2).

Table 1: Groin Strain Prevalence and Quality of Life in Islamabad Field Hockey Players: Demographic Variables [N=134]

Variables	Sub-Categories	Frequency	Percentages
Age	20-27 Years	75	56
	28-35 Years	32	23.9
	36-43 Years	11	8.2
	44-51 Years	16	11.9
Weight/BMI	<18.5 (underweight)	16	11.9
	18.5-24.9 (healthy)	74	55.2
	25-29.9 (overweight)	35	26.1
	30-39.9 (obesity)	7	5.2
	>40 (Severe obesity)	2	1.5

Groin strain athletes (Group A, HAGOS ≤ 70, n=42) had a marked functional limitation in all HAGOS domains compared to unimpaired peers (Group B, HAGOS ≥ 71, n=92) in statistically significant deficits ($p<0.001$). The greatest differences were observed in Pain (Group A: 56.7 ± 12.2 vs. Group B: 88.1 ± 10.9; Δ=31.4) and Symptoms & Stiffness (58.8 ± 15.4 vs. 89.2 ± 10.8; Δ=30.4), with the largest effect sizes (η^2= 0.626 and η^2= 0.567, respectively), showing that disability is dominated by pain perception, rather than mechanical limitation. This was the case with daily living activities (Δ=31.1; η^2=0.538), which again indicated that groin pathology interferes with the basic functioning. Physical Activity had the lowest effect size (eta-squared=0.119) even though the deficit was 18.8 points, indicating that athletes preferred to participate in sports using compensatory mechanisms regardless of debilitating symptoms, which is consistent with the Pakistani culture of training through pain. The quality of Life decreased by 24.4 points in Group A (η^2 = 0.350), revealing the athletic endurance: athletes are willing to forgo their overall wellbeing to stay on the field, and this trend continues, as the cultural idealization of perseverance conceals the decline in health.

Table 1: Comparative Analysis of HAGOS Subscale Scores Between Groin Strain (n=42) and Non-Strain (n=92)

Symptoms	Groin Strain	N=134	Mean ± SD	F	df1, df2	Eta-squared	P
Symptoms & Stiffness	A	42	58.8 ± 15.4	133.5	1, 60	0.567	<.001
	B	92	89.2 ± 10.8				
Pain	A	42	56.7 ± 12.2	204.1	1, 72.3	0.626	<.001
	B	92	88.1± 10.9				
ADL	A	42	57.1± 15.1	134.7	1, 68.4	0.538	<.001
	B	92	88.2 ± 12.6				
Sports	A	42	54 ± 15	91.7	1, 90.4	0.385	<.001
	B	92	82 ± 17.2				
Physical Activities	A	42	59.5 ± 22.4	19	1,86.2	0.119	<.001
	B	92	78.3 ± 24.4				
QoL	A	42	59.9 ± 16.6	66	1, 72.8	0.350	<.001
	B	92	84.3 ± 15				

A: Groin Strain [HAGOS HIP Score ≤70], B: No Groin Strain [HAGOS HIP Score ≥71], ADL: Daily Life Activities, QoL: Quality of Life, Sports: Function Sports and Recreation Activities, HAGOS Score 0: Severe Hip/Groin Problem, HAGOS Score 110: No Hip or Groin Problem

Figure 1 reveals that 31.3% (n=42) of Islamabad's male field hockey players exhibit clinically significant groin strain (HAGOS score ≤70), while 68.7% (n=92) maintain functional hip-groin capacity (HAGOS score ≥71). This translates to nearly 1 in 3 athletes experiencing moderate-to-severe impairment affecting sports performance and quality of life.

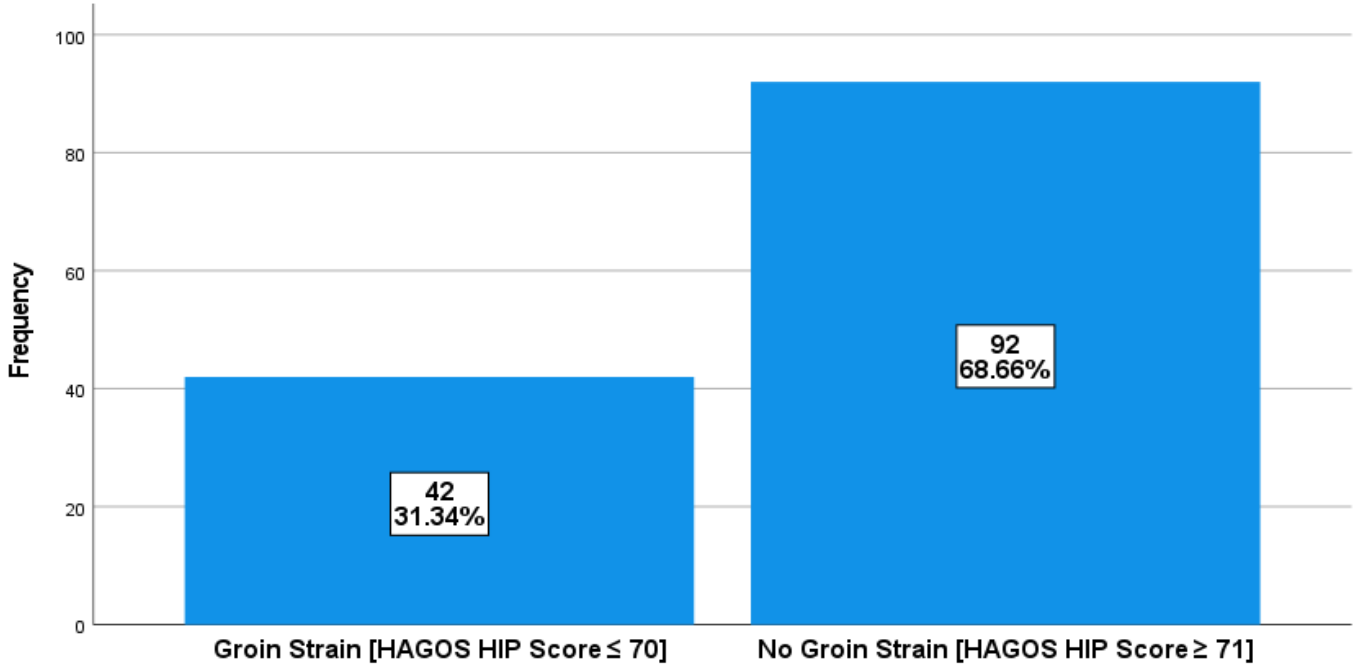

Figure 1: Prevalence of Groin Strain among Field Hockey Players in Islamabad

Regression analysis (Table 3) indicates that Pain (beta=0.3479, p=0.003), Daily Life Activities (beta=0.2484, p=0.018), and Symptoms & Stiffness (beta=0.2112, p=0.024) are significant predictors of Quality of Life (QoL) in Pakistani hockey players, which explains 52.7 percent of the variance in QoL (R 2 =0.527). The most powerful factor was Pain, with every 1-point increment in Pain score correlating with a 0.35-point increment in QoL, which also underscores the importance of pain management in wellbeing. In contrast, Sports Function (beta=-0.0008, p=0.992) and Physical Activities (beta=0.0242, p=0.646) were not significant, which means that athletes disengage sport involvement with life satisfaction even with a groin strain. This paradox

implies that the players separate athletic performance (in which they are maintained through coping strategies) and the holistic health, in which pain and daily functioning are the predominant aspects of the well-being perceptions.

Table 2: Impact of Groin Strain (HAGOS Domains) on Quality of Life of Field Hockey Players in Islamabad, Pakistan

Predictor	Estimate	SE	t	p
Intercept	11.4104	5.8396	1.95395	0.053
Symptoms & Stiffness	0.2112	0.0924	2.28594	0.024
Pain	0.3479	0.1142	3.04649	0.003
Daily Life Activities	0.2484	0.1033	2.4047	0.018
Functional Sports and Recreational Activities	-8.20e−4	0.0859	-0.00955	0.992
Physical Activities	0.0242	0.0524	0.46075	0.646

N:134, R:0.726, R2:0.527

DISCUSSION

The prevalence of clinically significant groin strain (HAGOS ≤ 70) in Pakistani field hockey players (31.3%) is a high disease burden, placing it between global standards of ice hockey (53.2%) [24] and field hockey (17-22%) [9, 25]. This medium prevalence implies regional and sport-specific susceptibility. The age distribution of the athletes (56% aged 20-27 years) is consistent with the fact that adolescence and early adulthood are important times when groin pathologies in athletes may develop because of skeletal immaturity and excessive training loads [26]. The prevalence of BMI (32.8% overweight/obese) is high in comparison to European cohorts, in which athletes tend to have lower BMI [9, 24]. This difference indicates the presence of nutritional and conditioning differences in South Asian athletes, which may increase mechanical loads on the adductor complex during skating actions. The lack of female players in this cohort continues to create a major research gap, with recent research showing that female athletes have different patterns of hip/groin pathology (e.g., increased incidences of iliopsoas-related pain) [9, 24, 25].

The catastrophic functional impairments in groin-strain athletes, especially in pain (Δ31.4, eta-squared=0.626) and symptoms (Δ30.4, eta-squared=0.567), are worse than those observed in ice hockey cohorts [24]. This implies that there are cultural or diagnostic factors that affect the perception of pain. The superiority of pain-related disability over mechanical limitation is inconsistent with traditional biomechanical models but is supported by chronic athletic groin pain studies, in which central sensitization can increase symptoms [26, 27]. More importantly, the maintenance of physical activity involvement (lowest η2 = 0.119) even with severe pain resembles the performance-wellbeing dissociation in Swedish ice hockey, where 83 percent of hip/groin issues were non-time-loss injuries [24, 28]. This is an indication of a global sport ethic valorizing resilience, but Pakistani athletes exhibit an extreme form of it-85% of them played on even though their deficit of strength was greater than the injury risk thresholds [29]. The regression model indicates a clinically concerning dynamic in that pain (beta=0.3479) and daily function (beta=0.2484) are associated with QoL impairment, whereas sports participation is not (beta=-0.0008, p=0.992). This dissociation of athletic performance and life satisfaction is an indication of a pathological compartmentalization in which athletes trade overall well-being in the name of field presence. Evidence is supported by ice hockey research, which found that the players with >6 weeks of symptoms had significantly lower HAGOS scores in all domains [24]. The 24.4-point QoL deficit in affected Pakistani athletes is greater than the declines in collegiate athletes (15-18 points) [25] and is driven by cultural enhancers such as poor access to sports medicine (74% unmet need in Pakistan) and financial incentives to play with pain [29]. This is in line with the finding by Ali et al. that 72 percent of Pakistani athlete's train with disabling symptoms- a figure that is higher than the Western standards [29].

Adductor strain is likely to be worsened by the turf biomechanics in Pakistani hockey since natural grass surfaces produce 27 percent more rotational stiffness than synthetic turf [29]. The hip is subjected to repetitive abduction-adduction movements (35-65 range) during skating that produce peak adductor forces of greater than 450N 4 [26]. These forces focus the stress on the adductor longus enthesis- the weakest link in the kinetic chain. Although deficits in adductor strength are traditional predictors of injury, our results (and those of Beddows et al. 1) indicate that there is no association between strength and symptoms, which is inconsistent with prevention paradigms [26]. Rather, early sport specialization (<12 years) is perhaps the main risk factor

because exposure to shear stresses of hockey during adolescence induces cam morphology in 70 percent of elite players [26]. This shape limits internal rotation, which adds to pubic symphysis stress in rotational movements, which is a major injury mechanism.

The Doha Agreement taxonomy offers diagnostic clarity that is not currently available in this study and standardizes the classification of groin pathologies into discrete clinical entities (adductor-related, iliopsoas-related, inguinal-related, and pubic-related groin pain) by reproducible clinical examination criteria instead of vague terminology or over-reliance on imaging findings that are common in asymptomatic athletes [1, 30, 31]. When applied to the Pakistani scenario, this framework would imply that the pathology profile is likely to be dominated by adductor-related groin pain (58.8% global prevalence) and iliopsoas-related pain (17.6%, higher in female athletes), but this would need imaging to rule out co-existent intra-articular hip pathologies such as femoroacetabular impingement, which co-exists in 34-41% of chronic cases [30]. The key to prevention is breaking down the most significant cultural and structural obstacles: the introduction of Pain Neuroscience Education (PNE) to reframe pain as a neurobiological alarm system, instead of a sign of weakness, to minimize the damaging training-through-pain patterns compounded by the pressure to prove oneself as an athlete [32]; use of mobile apps in Urdu to manage loads, providing turf-specific adaptations, such as eccentric slide-board training on natural grass, to address biomechanical stressors 10; and the promotion of policy solutions that require Although the Copenhagen Adduction Exercise (CAE) decreases injury by 41% in soccer, its success in Pakistan depends on context-specific adaptations such as the use of sandbags as an alternative to loading the adductors, to avoid the lack of equipment in resource-limited environments [18].

LIMITATIONS AND RECOMMENDATIONS

The use of the cross-sectional design with focus on Islamabad field hockey players restricts its generalizability to other areas or sports with hip-groin strain that affects the performance and quality of life in the same way, and the small sample size (N=134) reduces the statistical power and generalizability. The clinical validity of the impairment testing is also restricted by the fact that the subjective evaluation of HAGOS is used, without the supplementary objective diagnostics (e.g., MRI, ultrasound, or biomechanical analysis). Future research is required to add geographic and sport diversity (e.g., cricket, football) and add imaging to differentiate pathologies (e.g., adductor vs. iliopsoas-related pain). It is desirable to conduct empirical proofs of the efficiency of rehabilitation strategies in Pakistani conditions, such as strength training and load management programs adapted to the realities of limited resources (e.g., sandbag exercises). Importantly, prevention must be systemic: players must learn to identify early signs to be treated in time; coaches must incorporate injury-prevention regimens (e.g., Copenhagen Adduction Exercise variations) into daily practice; and sports organizations must have monitoring systems to avoid overuse injuries that are characteristic of the biomechanical requirements of hockey.

CONCLUSION

This study identifies a significant burden of groin strain among male field hockey players in Islamabad, characterized by severe functional limitations dominated by pain and stiffness rather than mechanical impairment alone. Athletes demonstrate a paradoxical persistence in sports participation despite debilitating symptoms, reflecting Pakistan's entrenched "train-through-pain" culture. This behavioural adaptation comes at a substantial cost to quality of life, where pain emerges as the primary driver of diminished wellbeing, while athletic performance shows no protective relationship with holistic health. The findings expose a critical disconnect between athletic identity and overall wellness, demanding culturally adapted interventions that prioritize pain management and redefine resilience beyond mere endurance.

CONFLICT OF INTEREST

Authors declare no conflict of interest in publication and data privacy.

AUTHOR CONTRIBUTION

H.J.: Designed the study, managed the project, obtained funding, and critically revised/edited the manuscript with final approval. M.T.H.J.: Designed methodology, performed formal statistical analysis (SPSS), prepared/validated data, and wrote the original

manuscript. F.A. and A.N.: Conducted fieldwork (recruitment of participants and data collection), provided resources, and co-authored original manuscript sections. H.S.S.: Oversaw data collection, used software (SPSS/data entry), and assisted in manuscript review/editing. The final version was approved by all authors, and they all agreed to be responsible for all parts of the work.

ACKNOWLEDGEMENT

We extend our heartfelt gratitude to the Department of Rehabilitation Bashir Institute of Health Sciences Islamabad and Islamabad Sports Complex for providing competitive environment and facilities to complete this research study.

FINDING SOURCE

No funding was obtained for this study

REFERENCES

1. Dinis, J., et al., *Athletes With Adductor-Related Groin Pain: A Narrative Review.* Cureus, 2024. **16**(9): p. e68625.
2. Thorborg, K., *Current clinical concepts: Exercise and load management of adductor strains, Adductor ruptures, and long-standing adductor-related Groin Pain.* Journal of athletic training, 2023. **58**(7-8): p. 589-601.
3. Weir, A., et al., *Terminology and definitions on groin pain in athletes: building agreement using a short Delphi method.* Br J Sports Med, 2015. **49**(12): p. 825-7.
4. Jokela, A., et al., *Mechanisms of Severe Adductor Longus Injuries in Professional Soccer Players: A Systematic Visual Video Analysis.* Orthopaedic Journal of Sports Medicine, 2025. **13**(2): p. 23259671241309647.
5. Dupré, T. and W. Potthast, *Are sprint accelerations related to groin injuries? A biomechanical analysis of adolescent soccer players.* Sports biomechanics, 2024. **23**(12): p. 3564-3576.
6. Jokela, A., et al., *Mechanisms of Severe Adductor Longus Injuries in Professional Soccer Players: A Systematic Visual Video Analysis.* Orthop J Sports Med, 2025. **13**(2): p. 23259671241309647.
7. Cornelissen, M., et al., *A systematic review of injuries in recreational field hockey: From injury problem to prevention.* Journal of sports sciences, 2020. **38**(17): p. 1953-1974.
8. Arner, J.W., et al., *Evaluation and treatment of groin pain syndromes in athletes.* Annals of Joint, 2020. **5**.
9. Beddows, T.P.A., et al., *Hip and groin pain in male field hockey players: Prevalence, incidence and associations with patient reported outcome scores and hip muscle strength.* Physical Therapy in Sport, 2023. **61**: p. 66-72.
10. Mosler, A.B., et al., *Which factors differentiate athletes with hip/groin pain from those without? A systematic review with meta-analysis.* British journal of sports medicine, 2019. **49**(12): p. 810-810.
11. Santilli, O. and H. Santilli, *Narrative review of long-standing groin pain in athletes. Retrospective analysis of over 12 000 patients.* Hernia, 2025. **29**(1): p. 81.
12. Ooi, M.W.X., et al., *MRI findings in athletic groin pain: correlation of imaging with history and examination in symptomatic and asymptomatic athletes.* Skeletal Radiol, 2025. **54**(4): p. 841-850.
13. Hynes, J.P., et al., *Imaging of groin pain in athletes: patterns of injury at MRI and gender differences therein.* Ir J Med Sci, 2023. **192**(3): p. 1411-1418.
14. Kerbel, Y.E., et al., *Epidemiology of Hip and Groin Injuries in Collegiate Athletes in the United States.* Orthop J Sports Med, 2018. **6**(5): p. 2325967118771676.
15. Kekelekis, A., et al., *Hip Muscle Strength Ratios Predicting Groin Injury in Male Soccer Players Using Machine Learning and Multivariate Analysis—A Prospective Cohort Study.* Muscles, 2024. **3**(3): p. 297-309.
16. Eberbach, H., et al., *Long-standing pubic-related groin pain in professional academy soccer players: a prospective cohort study on possible risk factors, rehabilitation and return to play.* BMC Musculoskeletal Disorders, 2021. **22**(1): p. 958.
17. Jordan, S., et al., *The epidemiology of hip and groin pain and Femoroacetabular Impingement Syndrome (FAIS) in male and female Gaelic games players.* PLoS One, 2024. **19**(9): p. e0309027.

18. Fujisaki, K., et al., *Effects of a Groin Pain Prevention Program in Male High School Soccer Players: A Cluster-Randomized Controlled Trial.* Int J Sports Phys Ther, 2022. **17**(5): p. 841-850.
19. de Castro Fernandes, J.V., A. Pedrinelli, and J.Á. Rubio-Arias, *Comparative analysis of treatment strategies for groin injuries in athletes: Effects on successful recovery and recurrence of sports conditions – A systematic review.* Apunts Sports Medicine, 2025. **60**(227): p. 100481.
20. Tedeschi, R., et al., *Optimizing Conservative Management of Groin Pain in Athletes: Insights from a Narrative Review.* Life, 2025. **15**(3): p. 411.
21. Tariq, M., et al., *Athletic Runner's Quality of Life with Groin Strain-A Cross-Sectional Study.* Insights-Journal of Health and Rehabilitation, 2025. **3**(1 (Health & Allied)): p. 200-207.
22. Raza, A., Q. Idrees, and F. Tanveer, *Types And Regions of Musculoskeletal Injuries among Pakistani Field Hockey Players: An Association with Playing Position.* Asian Journal of Allied Health Sciences (AJAHS), 2022. **7**(4).
23. Harøy, J., L.K. Bache-Mathiesen, and T.E. Andersen, *Lower HAGOS subscale scores associated with a longer duration of groin problems in football players in the subsequent season.* BMJ Open Sport & Exercise Medicine, 2024. **10**(2).
24. Wörner, T., K. Thorborg, and F. Eek, *High prevalence of hip and groin problems in professional ice hockey players, regardless of playing position.* Knee Surgery, Sports Traumatology, Arthroscopy, 2020. **28**(7): p. 2302-2308.
25. Stadelmann, J.D., et al., *Hip and Groin Problems in Female Team-Sport Athletes: A Cross-Sectional Study.* Int J Sports Phys Ther, 2024. **19**(11): p. 1426-1438.
26. Kelly, M. and J. Secomb, *Associations Between Hip Pathology, Hip and Groin Pain, and Injuries in Hockey Athletes: A Clinical Commentary.* Int J Sports Phys Ther, 2024. **19**(5): p. 625-641.
27. Hölmich, P., et al., *Effectiveness of active physical training as treatment for long-standing adductor-related groin pain in athletes: randomised trial.* Lancet, 1999. **353**(9151): p. 439-43.
28. Wörner, T., et al., *Incidence, prevalence, and severity of and risk factors for hip and groin problems in Swedish male ice hockey players: a 1-season prospective cohort study.* Journal of athletic training, 2022. **57**(1): p. 72-78.
29. Quintana-Cepedal, M., et al., *The effect of match congestion on hip adductor squeeze strength in youth rink hockey players.* Apunts Sports Medicine, 2024. **59**(221).
30. Taylor, R., et al., *Multidisciplinary Assessment of 100 Athletes With Groin Pain Using the Doha Agreement: High Prevalence of Adductor-Related Groin Pain in Conjunction With Multiple Causes.* Clin J Sport Med, 2018. **28**(4): p. 364-369.
31. Mitrousias, V., et al., *Anatomy and terminology of groin pain: Current concepts.* Journal of ISAKOS, 2023. **8**(5): p. 381-386.
32. Louw, A., J. Nijs, and E.J. Puentedura, *A clinical perspective on a pain neuroscience education approach to manual therapy.* J Man Manip Ther, 2017. **25**(3): p. 160-168.