Prevalence and Severity of Knee Pathologies in Sportsmen and Individuals with Sedentary Lifestyles

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ORIGINAL ARTICLE

ABSTRACT

Background: Magnetic Resonance Imaging (MRI) is a reliable and noninvasive modality for evaluating knee pain, offering high diagnostic accuracy for meniscal and anterior cruciate ligament (ACL) tears. With a sensitivity exceeding 90% for detecting medial meniscal tears, MRI effectively reduces the need for unnecessary arthroscopies.

Objectives: To assess the prevalence and severity of knee pathologies in sportsmen and individuals with sedentary lifestyles.

Methods: A cross-sectional analytical study was conducted using MRI. Patients from both Sportsmen's (Group I N=35) as well as patients with a sedentary lifestyle (Group II, N=32) complaining about knee pain, were recruited after taking informed consent. Patients' age and gender were noted. The MRI was done using standard operating procedures of the Radiology Department and findings were noted. Demographic and clinical data were analyzed and compared between the two groups.

Results: MRI findings revealed that meniscus damage was prevailing. Out of group II, 3 patients (9.4%) had medial collateral ligament, and 3 (9.4%) had lateral collateral ligament damage. Out of group I, 12 patients (34.3%) had damage to anterior cruciate ligament and 3 patients (8.6%) had posterior cruciate ligament damage while 20 of group II patients (62.5%) had damaged anterior cruciate ligament and 2 patients (6.25%) had posterior cruciate ligament damage. Joint effusion was present among both groups. Among group I patients, the number of chondromalacia patellae, baker's cysts, bone bruises/marrow edema, osteoarthritis and tumor patients were 3(8.6%), 4 (11.4%), 7(20%), 1(2.9%), and 2 (5.7%) respectively. Among the group II patients, the cases of chondromalacia patellae, bone bruises/marrow edema and osteoarthritis were 2(6.5%), 10 (31.3%) and 2 (6.3%) in number, respectively. One patient in group II was found to be normal (3.1%) through an MRI.

Conclusion: The prevalence and severity of knee pathologies in sportsmen group was better due to strenuous exercise as compared to individuals with sedentary lifestyles.

Introduction

Magnetic resonance imaging (MRI) is regarded as the most reliable, advanced, and noninvasive diagnostic technique for the assessment of knee pain and associated joint pathologies [1] It provides excellent soft tissue contrast and multiplanar imaging capabilities, allowing for detailed visualization of intra-articular structures such as the menisci, cruciate ligaments, cartilage, and surrounding soft tissues [2]. Because of its superior imaging resolution, MRI has a very high negative

predictive value, which makes it a valuable tool for ruling out serious internal derangements and thus preventing unnecessary invasive diagnostic procedures like knee arthroscopy [3]. It is widely accepted as the gold standard imaging modality for confirming the presence of meniscal tears, ligamentous injuries, and other internal derangements of the knee joint [4].

Numerous studies have reported that the diagnostic accuracy of MRI exceeds 89% for detecting both meniscal and anterior cruciate ligament (ACL) tears, making it a dependable choice for clinicians to establish precise diagnoses and formulate effective treatment plans. Moreover, MRI demonstrates a sensitivity greater than 90% in detecting medial meniscal tears, which are among the most common knee injuries encountered in both athletes and the general population [5]. Owing to these advantages, MRI plays a pivotal role in early diagnosis, treatment planning, and follow-up evaluation of knee pathologies, enabling better patient outcomes and faster recovery.

The current research study was conducted to determine the prevalence and frequency of various knee pathologies among patients presenting with knee pain. The study further aimed to compare the severity and extent of knee damage between individuals engaged in regular sports activities and those leading a sedentary lifestyle. The recruitment process for sportsmen (Group I) included the selection of above-average healthy subjects to ensure accurate comparison with sedentary individuals (Group II). Additionally, the study analyzed the relationship between age and the occurrence of knee pathologies across both groups. The outcomes of this research may contribute to the development of evidence-based guidelines or standard operating procedures (SOPs) to promote knee joint health, minimize injury risk during strenuous activities, and support a higher quality of life.

Methods

This cross-sectional study was conducted from June to December 2022 at the Department of Radiology, Combined Military Hospital (CMH) Rawalpindi, and Tehsil Headquarter (THQ) Hospital Kharian. Participants were recruited using a convenience sampling technique and included patients from both Group I (sportsmen) and Group II (sedentary individuals) who presented with complaints of knee pain. Prior to inclusion, all participants were briefed in detail about the study objectives, methodology, and MRI procedure, including its benefits, potential risks, and

limitations. Only those who voluntarily consented to participate were enrolled in the study. Each participant was assigned a unique identification number to ensure confidentiality, and all collected data from initial examination to final analysis were managed anonymously under this ID code. Demographic details such as age and gender were documented for every participant.

MRI examinations were performed according to the standardized operating procedures of the Radiology Department at CMH Rawalpindi. The imaging protocols ensured optimal visualization of the menisci, ligaments, and associated soft tissue structures. All MRI findings were systematically recorded and categorized based on the observed pathologies. Patients with known comorbidities or prior knee surgeries were excluded to avoid confounding factors that could affect diagnostic accuracy or pathology distribution.

Statistical analysis was carried out using SPSS version 29. Descriptive statistics were employed to summarize demographic and clinical data, with frequencies and percentages used to describe categorical variables. Comparative analyses were performed to evaluate differences in knee pathologies, severity, and demographic characteristics between the two groups.

The research protocol was reviewed and approved by the Ethical Committee of CMH Kharian Medical College. The study was conducted in accordance with the principles outlined in the Declaration of Helsinki (WMA, 2000) and Good Clinical Practice guidelines (FDA, 1996), ensuring that all participants' rights, safety, and confidentiality were maintained throughout the research process.

Results

In this study, group I i.e., sportsmen background included 35 patients while group II i.e., patients with sedentary lifestyles included 32 patients complaining knee pain. The age of the participants in group I ranged from 17 to 65 years with an average age of 37.8± 10.4 years. The age of patients in group II ranged from 13 to 62 years with an average age of 33.1±12.1 years. All the 35 participants in group I were males (100%). In group II, there were 24 males (75%) and 8 females (25%) (as mentioned in Table 1).

MRI findings have shown that a significant percentage of patients from both group I and group II had knee pain due to meniscus damage. Among the group I patients, 25 (71.4%) had medial meniscus damage (posterior horn) and 5 patients (14.3%) had lateral meniscus damage

(posterior horn). Among the patients with group II patients, 19 (59.4%) had medial meniscus damage (including main body, posterior and anterior horn) and 9 patients (28.1%) had lateral meniscus damage (including posterior and anterior horn). None of the group I personals had any kind of collateral ligament damage while 3 patients (9.4%) of group II had medial collateral ligament damage, and 3 patients (9.4%) had lateral collateral ligament damage. Twelve group I patients (34.3%) had damage to cruciate ligament (anterior) and 3 patients (8.6%) had posterior cruciate ligament damage while twenty patients (62.5%) of group II patients had damaged anterior cruciate ligament and 2 patients (6.25%) had posterior cruciate ligament damage. Joint effusion was present among patients of both groups.

Table 1: Age and gender distribution of the participants

GROUPS	Total Patients	AGE (years)			GENDER			
		Min	Max	Mean±SD	Male		Female	
					n	%	n	%
Sportsmen (Group I)	35	17	65	37.829± 10.411	35	100	0	0
Patients with sedentary lifestyle (Group II)	32	13	62	33.094±12.092	24	75	8	25

Table 2: Responses of adoptability questions (n = 102)

Categories			(Group I)		(Group II)	
			N	%	N	%
Meniscus damage	Medial meniscus	Medial meniscus damage total	25	71.42857	19	59.375
		Medial meniscus body	0	0	4	12.5
		Anterior horn of medial meniscus	0	0	2	6.25
		Posterior horn of medial meniscus	25	71.42857	15	46.875
	Lateral meniscus	Lateral meniscus damage (total)	5	14.28571	9	28.125
		Lateral meniscus body	0	0	0	0
		Anterior horn of lateral meniscus	0	0	4	12.5
		Posterior horn of lateral meniscus	5	14.28571	5	15.625
Collateral ligament damage		Lateral collateral ligament	0	0	3	9.375
		Medial collateral ligament	0	0	3	9.375
Cruciate ligament		Anterior cruciate ligament	12	34.28571	20	62.5
		Posterior cruciate ligament	3	8.571429	2	6.25
Joint effusion		Minimal	6	17.14286	6	18.75
		Mild	18	51.42857	9	28.125
		Moderate	2	5.714286	5	15.625
		Total	26	74.28571	20	62.5
Chondromalacia patellae			3	8.571429	2	6.25
Bakers' cyst			4	11.42857	0	0
Bone bruise/marrow edema			7	20	10	31.25
Osteoarthritis			1	2.857143	2	6.25
Tumor			2	5.714286	0	0
Others			7	20	12	37.5
Normal			0	0	1	3.125

Cases of minimal, mild, and moderate joint effusion among group I patients were 6 (17.1%), 18 (51.4%) and 2 (5.7%) respectively. Among patients of group II, the cases of minimal, mild, and moderate joint effusion were 6 (18.75%), 9 (28.1%) and 5 (15.6%) respectively. Among group I patients, the number of chondromalacia patellae, baker's cysts, bone bruises/marrow edema, osteoarthritis and tumor patients were 3(8.6%), 4 (11.4%), 7(20%), 1(2.9%), and 2 (5.7%) respectively. Among group II, the cases of chondromalacia patellae, bone bruises/marrow edema and osteoarthritis were 2(6.5%), 10 (31.3%) and 2 (6.3%) respectively. There were no cases of Bakers cyst and tumor among group II patients. One patient of group II was normal (3.1%) through MRI (table 2).

Discussion

Magnetic Resonance Imaging (MRI) is one of the most frequently used techniques for evaluating both acute injuries and chronic knee pain [6]. With its remarkable diagnostic accuracy, MRI has become the gold standard for assessing knee joint pathologies [7]. Its ability to provide high soft-tissue contrast, excellent spatial resolution, and multiplanar imaging allows for a clear and detailed visualization of the knee's anatomy [8], including both intra-articular and extra-articular structures. These qualities make MRI an invaluable diagnostic tool that has significantly improved patient care and management, particularly in guiding appropriate treatment plans and reducing unnecessary invasive procedures [9].

Several studies have compared individuals with active lifestyles to those with sedentary habits to understand differences in musculoskeletal health outcomes. Three such studies have reported a higher incidence of arthritis among veterans compared to non-veterans [10][11][12], while another study observed that male veterans experienced knee pain more frequently than their non-veteran counterparts [13]. Additional research has also indicated an increased prevalence of pain-related conditions, such as joint discomfort and stiffness, among veterans [14][15]. However, MRI-based comparisons of knee pathology between sportsmen and sedentary individuals remain largely unexplored in our country.

In one study, the prevalence of severe knee pain was compared between physically active individuals and those leading sedentary lives of similar age and gender. The findings revealed that actively exercising participants reported joint pain more often (43.6%) than non-exercising individuals (31.5%), though there was no significant difference in the frequency of severe pain between the two groups [16]. In the present research, the age-related data indicated that sportsmen tend to develop knee-related problems at a considerably later age compared to sedentary individuals, likely due to their adherence to structured fitness routines and regular medical checkups [17]. Moreover, the observed difference in the male-to-female ratio between Group I (sportsmen) and Group II (sedentary individuals) could be attributed to the relatively lower participation of females in athletic activities, influencing the overall demographic distribution between groups.

Conclusion

In general, sportsmen demonstrate a higher quality of life compared to individuals with sedentary lifestyles. Those with limited physical activity are more prone to developing knee problems at an earlier age. Maintaining an active lifestyle-supported by proper fitness regimens, balanced nutrition, and routine medical evaluations-can play a key role in preventing knee pathologies and ensuring long-term musculoskeletal health and overall well-being.

Availability of data and materials
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The Ethics Review Committee of Combined Military Hospital (CMH) Rawalpindi approved the study. Informed consent was taken from all volunteer participants.

Consent for publication

Informed consent obtained from all volunteer participants.

Competing interests

The authors declare no competing interests.

References

[1]. Kotian P, Nayak UKR, Annappa R, Joe CV, Sujir PR, Tripathi A, et al. Correlation between clinical examination, magnetic resonance imaging, and arthroscopy in meniscal injuries of the knee: a prospective cohort study. J Arthros Joint Surg. 2024;11(1):12-7.

[2]. Cheng Q, Lin H, Zhao J, Lu X, Wang Q. Application of machine learning-based multi-sequence MRI radiomics in diagnosing anterior cruciate ligament tears. J Orth Surg Res. 2024;19(1):99.

[3]. Santomartino SM, Kung J, Yi PH. Systematic review of artificial intelligence development and evaluation for MRI diagnosis of knee ligament or meniscus tears. Skeletal Radiol. 2024;53(3):445-54.

[4]. Cristiani R, van de Bunt F, Kvist J, Stålman A. High Prevalence of superficial and deep medial collateral ligament injuries on magnetic resonance imaging in patients with anterior cruciate ligament tears. J Arthros Related Surg. 2024;40(1):103-10.

[5]. Farivar D, Pascual TA, Hevesi M, Chahla J. Measuring technique for meniscal extrusion using ultrasound in the setting of posterior medial meniscal root tears. Arthros Tech. 2024:102916.

[6]. Ichinose H, Natsume T, Yano M, Awaga Y, Hanada M, Takamatsu H, et al. Evaluation of brain activation related to resting pain using functional magnetic resonance imaging in cynomolgus macaques undergoing knee surgery. J Orthop. 2024;52:12-16.

[7]. Wen D, Zhou X, Hou B, Zhang Q, Raithel E, Wang Y, et al. 3D-DESS MRI with CAIPIRINHA two-and fourfold acceleration for quantitatively assessing knee cartilage morphology. Skeletal Radiol. 2024:1-14.

[8]. Ilyas M, Amin S, Maida AS, Baig T, Khan MA, Imran S. Advances in biomedical imaging techniques: a comprehensive review. Sig Bioeng Biosci. 2023:6(2):000634.

[9]. Simpfendorfer CJ, P. MRI of the Knee: What Do We Miss? Current Radiology Reports. 2014;2(43).

[10]. Barrett DH, Boehmer TK, Boothe VL, Flanders WD, Barrett DH. Health-related quality of life of U.S. military personnel: a population-based study. Military Med. 2003;168(11):941-7.

[11]. Dominick KL, Golightly YM, Jackson GL. Arthritis prevalence and symptoms among US non-veterans, veterans, and veterans receiving Department of Veterans Affairs Healthcare. The Journal of rheumatology. 2006;33(2):348-54.

[12]. Hoerster KD, Lehavot K, Simpson T, McFall M, Reiber G, Nelson KM. Health and health behavior differences: U.S. Military, veteran, and patients with sedentary life style men. Am J Prevent Med. 2012;43(5):483-9.

[13]. Murphy LB, Helmick CG, Allen KD, Theis KA, Baker NA, Murray GR, et al. Arthritis among veterans - United States, 2011-2013. MMWR Morbidity and mortality Weekly Report. 2014;63(44):999-1003.

[14]. Haskell SG, Ning Y, Krebs E, Goulet J, Mattocks K, Kerns R, et al. Prevalence of painful musculoskeletal conditions in female and male veterans in 7 years after return from deployment in Operation Enduring Freedom/Operation Iraqi Freedom. Clin J Pain. 2012;28(2):163-7.

[15]. Kazis LE, Miller DR, Clark J, Skinner K, Lee A, Rogers W, et al. Health-related quality of life in patients served by the Department of Veterans Affairs: results from the Veterans Health Study. Arch Intern Med. 1998;158(6):626-32.

[16]. Nahin RL. Severe Pain in Veterans: The Effect of Age and Sex, and Comparisons With the General Population. J Pain. 2017;18(3):247-54.

[17]. Mori Y, Matsushita K, Inoue K, Fukuma S. Patterns and predictors of adherence to follow-up health guidance invitations in a general health check-up program in Japan: A cohort study with an employer-sponsored insurer database. Plos One. 2023;18(5):e0286317.