Cross Sectional Study of the patterns of knee joint abnormalities detected by knee MRI in patients evaluated at Tikur Anbessa Specialized Hospital, Addis Ababa University, Addis Ababa, Ethiopia from April–September 2017.

Investigator: **Dr. Elias Gizaw (MD, Radiology Resident)**

A thesis Submitted to The Radiology Department, College of Health Science, Addis Ababa University in Preparation for Partial Fulfillment of the Requirements for the Post Graduate Study Completion in Radiology.

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ABSTRACT

Introduction: The knee joint, the largest joint in the body, has several functions which are essential for human beings to walk, run and jump. Primarily, it enables flexion-extension of the lower limb in the sagittal plane. Joint stability during movement is attained by the shape of the articular surfaces, the collateral and cruciate ligaments, the menisci and tendons and muscles crossing the knee joint. (1) The vulnerability of the knee, the largest joint in the body, to direct trauma makes knee injuries very common throughout life. (2)

MRI visualizes most components of the knee joint, including articular cartilage, menisci, intra-articular ligaments, synovium, bone marrow, subchondral cysts, and other periarticular and intra-articular lesions that are not detectable by radiography. (4).

The patterns of abnormalities of these different joint components as detected by MRI has been studied in different centers. Such types of studies, to date, have not been done in our country to our knowledge. The aim of this paper is to study frequency and the patterns of these abnormalities in the knee joint detected by knee MRI.

Objective: To assess the patterns of abnormalities in the knee joint detected by knee MRI.

Methods: Hospital based prospective cross sectional study was conducted on 49 patients who had knee MRI at Tikur Anbessa Specialized Hospital for a period of 7 months from January 1 to August 2016. Patients included here are those who had knee MRI and no history of knee surgery.

Results: A total of 49 patients were included in the study out of which 26(53.1%) were male and 23 (46.9%) were female, with a mean age of 43 years (range 17 to 68 years). The three most common pathologies were joint effusion seen in 32(65.3%), bone marrow edema in 22(45.8%) and osteophytes in 22(44.9%). ACL tear was the commonest ligament abnormality occurring in 5 (10.4%) patients. Ten (20.8%) patients had meniscal tear, all involving the medial meniscus with the posterior horn being involved in 8(80%) of these patients.

Conclusion: The mean age of our study population was higher than most referenced papers suggestive of possible delay in health seeking. The commonest knee pathologies were similar to other studies. Features of osteoarthritis were seen in higher frequency in our study population. Even though the higher mean age could be the possible cause, further study is recommended to look into the causes. Bone fracture, tendon abnormality and ligament abnormality showed statistically significant association with trauma. These abnormalities which were seen with higher frequency in those with a history of trauma were also observed in higher frequency in the male population.

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ABBREVIATIONS

CHS= College of Health Science
TASH= Tikur Anbessa Specialized Hospital
ACL=Anteiro Cruciate Ligament
PCL=Posterior Cruciate Ligament
MCL=Medial Collateral Ligement
LCL=Lateral Collateral Ligement
T1W MRI = T1 Weighted Magnetic Resonance Imaging
T2WMRI= T2 Weighed Magnetic Resonance Imaging
MRI= Magnetic Resonance Image
TSE=Turbo Spin Echo
T= Tesla
FOV=Field of View
FSE=Fast Spin Echo
GRE= Gradient Echo
LFC=Lateral femoral condyle
MFC=Medial Femoral Condyle
LTC=Lateral Tibial Condyle
MTC=Medial Tibial Condyle
MM=Medial Mensicus
LM=Lateral Meniscus

CHAPTER ONE

1. INTRODUCTION

BACKGROUND

The knee joint, the largest joint in the body, is located between the two other joints of the lower limb; the hip and the ankle. The proximal end of the tibia and the distal end of the femur form the medial and lateral tibiofemoral compartments. The patella and the anterior part of the distal femur form the patellofemoral joint. Together, these joints form the knee joint. High demands are imposed on the knee joint and it has several functions which are essential for human beings to walk, run and jump. Primarily, it enables flexion-extension of the lower limb in the sagittal plane. Joint stability during movement is attained by the shape of the articular surfaces, the collateral and cruciate ligaments, the menisci and tendons and muscles crossing the knee joint. (1)

The vulnerability of the knee, the largest joint in the body, to direct trauma makes knee injuries very common throughout life. Most acute injuries to the knee are sustained during adolescence and adulthood, with motor vehicle accidents and athletic activities being the major causative factors.(2)

Magnetic resonance (MR) imaging is an excellent means of evaluating the musculoskeletal system for the presence of soft-tissue and bone abnormalities after trauma (3).

MRI visualizes most components of the knee joint, including articular cartilage, menisci, intra-articular ligaments, synovium, bone marrow, subchondral cysts, and other periarticular and intra-articular lesions that are not detectable by radiography. (4).

The frequency and patterns of abnormalities of these different joint components as detected by MRI has been studied in different centers.

Such types of studies, to date, have not been done in our country to our knowledge. The aim of this paper is to study prevalence of these abnormalities in the knee joint detected by knee MRI

CHAPTER TWO

2.1 LITERATURE REVIEW

The knee is a major weight bearing joint that provides mobility and stability during physical activity as well as balance while standing.(5) To provide this range of function, the joint relies on multiple soft-tissue structures to maintain bony alignment during weight bearing and movement. If the knee is exposed to forces beyond its physiologic range, bone or soft-tissue structures are at risk of injury. (6,7)

Magnetic resonance imaging scanning is widely used to evaluate knee symptoms, and clinical decision making is influenced by the results of these scans. (8)

MRI is a valuable tool in the evaluation and management of patients of knee pain and it has been established as an effective, noninvasive test for identifying different knee pathologies.(9)It also significantly influences clinicians' diagnoses and management plans.(10)

There are different researches done to assess the patterns of these knee joint abnormalities on MRI.

A research conducted by *Mehta R et al* in India, published in the International Journal of Research in Medical Sciences, studied the prevalence of abnormalities detected on MRI in patients with knee pain. It examined knee MR images of fifty patients taken with 1.5T MR machine. Out of the fifty patients, 72% were males and 28% females with male to female ratio of 2.6:1. Their ages ranging from 11-80 years with mean age of 42 years. The patients were classified into age groups and out of these groups 12 (24%) were found to be in age group between 31-40 years.

In this study, joint effusion was the most frequently found knee pathology constituting 74%, followed marrow edema (62%). Meniscal lesion (44%) and features of osteoarthritis (40%) were the other common pathologies. The study showed that meniscal lesions (44%) were more common as compared to ligament lesions (14%). Out of the study population, 4% were suffering from intra-articular tumors.(11)

Another study conducted by Mustafa Z. Mahmoud et al and published in International Journal of Science and Research (IJSR), studied the incidence of knee pathologies on MRI in patients presenting with knee pain. This was a retrospective study of 58 patients for whom MRI of the knees was done using four channel knee coil and a 1.5 Tesla superconducting magnet.

Their ages ranged between 5 to 53 years, with a mean age of 30±11.4 years. Males represented 10(17.2%) of the study population, while 48 (82.8%) were females, with a female to male ratio of 4.8:1. The peak age range was 20-29 years which accounted 22 cases (37.9%).

The study found painful swollen knee joint to be the commonest presenting clinical complaint in 38 (65.4%) patients, while joint pain without swelling was the second commonest symptom accounting 20 (34.6%) among study samples.

Out of the 58 patients evaluated, ligament lesions were demonstrated in 21(36.2%) of the knees, meniscal lesions detected in 22(37.9%) and joint effusion developed in 37(63.8%). Subchondral edema and tumour were found equally in 1(1.7%). Bone marrow edema and bursitis represented 3(5.2%) of conditions and bony contusion present in 9(15.5%). Findings of osteoarthritis such as bone erosion, osteophyte changes were seen in 7(12.1%) and Baker cyst was diagnosed in 6(10.4%). Knee joint effusion found to be the commonest pathology that developed in both sexes. Ligament lesions and bursitis were the least pathologies to develop in males; while in females subchondral edema and tumor were the least in development.(12)

A paper published in the Indian Journal of Radiology and Imaging by DH Shetty et al titled, ‘Magnetic resonance imaging in pathologic conditions of knee’, studied MR appearances of various conditions affecting the knee and identified the common lesions. One hundred and fifteen patients with knee complaints and suspected to have meniscal, ligamentous or other pathology were studied using Sigma contour 0.5 T (GE) MR machine. In this study, the common age group was in the range of 21-30 years and men predominated over women.

Anterior cruciate ligament (ACL) tears accounted for (36.5 percent) followed by medial meniscal tears (MM)(36.5%) and lateral meniscal tear (17.3 percent).Meniscal tears seen commonly were grade III in the medial meniscus and Grade 1in the lateral meniscus.

Discoid menisci were seen in 6(5.2cm) cases. The study also found 5(4.3%) patients with intraarticular tumors where MR demonstrated internal hemorrhage with intraarticular, marrow and soft tissue extension. (13)

ACL tear was the commonest condition accounting for 42 patients (36.5%). Mid substance tear in the form of hyperintensity was noted in 30 (71.4%). Hyperintensity in the ligament was seen in 28 patients (61.9%) and discontinuity in 10(23.8%). 6(14.3%) with ACL tear showed non-visualization of ACL. Associated meniscal tear was seen in 32(76.2%) patients.

PCL tear accounted for only a small percentage of patients (4.34%) and the signs were hyperintensity in 3 patients and discontinuity in 2. (13)

An article published in the Kerala Journal of Orthopaedics, India, assessed the Correlation between MRI and arthroscopic findings in injuries of knee joint. They evaluated the MRI findings of 80 patients with knee injuries and correlation was done for the forty patients with subsequent arthroscopy. Age ranged between 15-61 years with a mean age of 30 years and the maximum number of patients affected belonged to the age group of 21-40 years. Males comprised 52(65.31%) of the cases and females 28(34.68%). Out of the 80 patients included in the study, 35(43.75%) showed ACL injury, 23(28.75%) showed medial meniscus tear, 11(13.75%) showed lateral meniscus tear, 4 (5%) showed PCL injury, 4(5%) showed MCL injury and 3(3.75%) showed LCL tear on MRI. 23 (28.75%) showed medial meniscal tear and 11(13.75%) showed lateral meniscal tear. (14)

Another article published in the Turkish Journal of Trauma and Emergency Surgery evaluated MRI findings in traumatic knees. 49 patients with knee injury who were admitted to orthopedic surgery service were included in the study population. The study found that bone contusions were the most common finding in the injuries, n:33 (67%). The other findings were, anterior cruciate ligament injuries in 17 patients (34.69%), meniscal tears in 12 (24.48%), osteochondral fractures in 9 (18.3%), collateral ligament injuries in 7(14.28%) and bone fractures in 5 (10.2%) respectively. (15)

A paper done by Lluı´s Puig et al, factors affecting meniscal extrusion, studied the MRI images of 100 knees prospectively to ascertain the prevalence of meniscal extrusion in non-arthritic patients. The study results showed 68.5% of the medial menisci to have some degree of extrusion, averaging at 28% of the meniscal size. While the lateral menisci extruded in 18.8% of cases at an average of 15% of the meniscal size. (19)

A separate study conducted by Michel D. Crema et al, published by RSNA, studied the factors associated with meniscal extrusion in knees with or at risk for osteoarthritis. A total of 1527 subjects (2131 knees; 2116 medial and 2106 lateral menisci) were included in the study which reported a 44.2% medial meniscal extrusion and 9.4% for the lateral meniscus. (20)

CHAPTER THREE

OBJECTIVES

3.1 General objective

- To assess the patterns of abnormalities in the knee joint detected by knee MRI.

3.2 Specific objectives

- To assess the socio demographic distribution of patients with knee MRIs done during the study period
- To assess the patterns of bone abnormalities detected on knee MRI.
- To assess the types of ligament abnormalities detected on MRI.
- To assess the frequency and pattern of menisci abnormalities detected on MRI.
- To identify the common types of abnormalities on MRI
- To assess the distribution of abnormalities among the sexes
-To assess the distribution of abnormalities in patients with and without a history of trauma

CHAPTER FOUR

METHODS AND MATERIALS

4.1 Study area and period

The study was conducted at TASH, College of health science, Addis Ababa University, Addis Ababa Ethiopia. TASH, located in the nation's capital Addis Ababa, which is the largest referral as well as the main teaching hospital. The hospital provides a tertiary level referral treatment with over 900 beds and providing emergency service on a round-the-clock basis.

The study was conducted from April-September 2017 G.C

4.2 Study design and Methods

A hospital-based prospective cross-sectional study was conducted for all patients who had knee MRI during the study period and had no history of surgery.

Procedure

MRI acquisition of the knee was conducted by using Philips Achieva MR machine with a superconducting magnet and field strength of 1.5T. The Patient was placed in supine position with the knee in a closely coupled extremity coil. Pulse sequences used were T1W-TSE, T2-TSE, PDW-SPAIR, T2W-SPIR and STIR in three standard imaging planes namely coronal, sagittal and axial. Slice thickness of 4mm.

4.3 Population

4.3.1 Study population

The study populations were all patients with knee MRIs evaluated at the orthopedics clinic of TASH during the study period.

4.3.2 Inclusion and exclusion criteria

4.3.2.1 Inclusion criteria

All patients evaluated with knee MRI during the study period.

4.3.2.2 Exclusion criteria

Patients with surgery to the knee were excluded from the study.

4.4 Sampling technique and sample size

A non-probability, consecutive sampling was used to select the study samples.

All patients with knee MRI taken during the study period with no history of surgery were included in the study.

4.5 Data collection Method

Then data was collected using a structured questionnaire. The knee MRI images and reports were reviewed by the principal investigator and findings recorded in the questionnaires. Patients' charts were reviewed for history of trauma.

4.6 Data quality control

In order to evaluate the clarity of the questionnaire and to assure the data quality, proper designing and pre-testing of the questionnaires was done on 5% of participants.

4.7 Data analysis and interpretation

The data collected was entered and analyzed using SPSS version 20 software package. Data cleaning was performed to check for accuracy, missed values and variables. Any error identified during data entry was corrected by revising the original questionnaire. Statistical analysis was done on the cleaned data.

4.8 Ethical considerations

Written ethical clearance letters were obtained from the IRB. Data collection was done after the formal letter was forwarded and permission obtained from the medical director of the Hospital.

Any piece of information regarding the study subjects was kept confidential by keeping anonymity of the study subjects using code numbers on the questionnaires during the data collection process.

4.9Limitations of the study

The number of patients who underwent knee MRI examination during the study period was small making the sample size small.

Chapter 5

Results

1. Socio-demographic data

A total of 49 patients were included with in a study period of six months. Of these 49 patients, 26(53.1%) were male and 23 (46.9%) female, with a male to female ratio of 1.1:1. The mean age of the patients was 43 years with a range of 17 to 68 years. They were classified into five age groups and out of these, the 46-60 years age group was the commonest age group consisting of 16 (32.7%) patients. (Tables 1 and 2)

Table 1: Frequency and percentage of gender of the study population TASH, April-September 2017 G.C

Sex	Frequency	Percentage
Female	23	46.9
Male	26	53.1
Total	49	100

Table 2: Distribution of the study population in to age groups, TASH, April-September 2017 G.C

Age Groups	Frequency	percentage
15-30	13	26.5
31-45	13	26.5
46-60	16	32.7
>61	6	12.2

2. Results for the whole population

Out of the 49 patients included in the study, joint effusion was seen in 32(65.3%), bone marrow edema in 22(44.9%) and osteophytes in 22(44.9%) patients accounting for the three commonest pathologies. These were followed by meniscal extrusion 15(30.6%), ligament abnormality 13(27.1%), subchondral cyst 12(24.5%) and meniscal tear 10(20.8%).

An intra-articular mass was seen in 3(6.1%) of the patients. Bone fracture was seen in 8(16.7%) and tendon abnormality in 6(12.2%) patients. (Table 3)

Table 3: Distribution of most common knee pathologies detected by MRI TASH, April-September 2017 G.C

No	Knee pathologies	Male		Female		Total	
		No.	%	No.	%	No.	%
1	Joint effusion	17	65.4	15	65.2	32	65.3
2	Osteophytes	9	34.6	13	56.5	22	44.9
3	Bone Marrow edema	11	44	11	47.8	22	44.9
4	Meniscal extrusion	6	23.1	9	39.1	15	30.6
5	Subchondral cysts	4	15.4	8	34.8	12	24.5
6	Meniscal Tear	5	20	5	21.7	10	20.8
7	Ligament abnormality	8	32	5	21.7	13	27.1
8	Bone fracture	5	20	3	13	8	16.7
9	Tendon Abnormality	5	19.2	1	4.3	6	12.2
10	Intra-articular mass	1	3.8	2	8.7	3	6.1

From the 22 patients with bone marrow edema, the majority was seen in the femur occurring in 18 of the patients while tibial and patellar bone marrow changes occurred in 8 & 7 patients respectively. (Table 4)

Table 4: Distribution of bone marrow edema in different anatomic regions of the evaluated Knee MRIs, TASH, April-September 2017 G.C

Involved Bone	Frequency	Percentage
Femur	18	37.5
Tibia	8	16.7
Patella	7	14.6

Out of the 10(20.8%) patients with meniscal tear, all involved the medial meniscus while 1 patient had both medial and lateral meniscal tear. The posterior horn of the medial meniscus was involved in 8(80%) of these patients while the remaining two had meniscal root tears. There was no isolated anterior horn tear. (Table 5)

Table 5: Distribution and Grade of Meniscal Tear in the evaluated MRI, TASH, April-September 2017 G.C

Involved Menisci	Grade of Meniscal Tear			Total
	Grade I	Grade II	Grade III	
Medial Meniscus	2	3	5	10
Lateral Meniscus	-	1	-	1

From the 15 patients with meniscal extrusion, 13 had medial meniscal extrusion, one patient had both medial and lateral extrusion while isolated lateral meniscal extrusion occurred in 1 patient). (Table 6)

Table 6: Distribution of Meniscal Extrusion among the sexes, TASH, April-September 2017 G.C

Involved Menisci	Sex				Total	
	Male		Female			
	No	%	No	%	No	%
Medial Meniscus	6	23.1	8	34.8	14	28.6
Lateral Meniscus	1	3.8	1	4.3	2	4.1

Out of the 13patients with ligament abnormality, ACL tear was the commonest occurring in 5 (10.4%) patients followed by LCL tear occurring in 4(8.3%) patients. Three of the ACL tears were full thickness tears while the other two were partial thickness tears. (Table 7)

Table 7: Distribution of ligament abnormalities in the evaluated Knee MRIs TASH, April-September 2017 G.C

Ligament abnormality	Frequency	Percentage
ACL Tear	**5**	**10.4**
PCL Tear	**3**	**6.2**
MCL Tear	**2**	**4.2**
LCL Tear	**4**	**8.3**
ACL Degeneration	**4**	**8.3**
PCL Degeneration	**-**	**-**

Six (12.2%) patients had tendon abnormality, with patellar and popliteus tendons being the commonly affected.

Bone fracture was seen in 8(16.7%) of patients. Out of these, the tibia was the most commonly affected accounting for 5(10.4%) while the rest occurred in the femur and patella accounting for 2(4.2%) each. (Table 8)

Table 8: Distribution of bone fracture in different anatomic regions of the evaluated Knee MRIs, TASH, April-September 2017 G.C

Involved Bone	Frequency	Percentage
Femur	**2**	**4.2**
Tibia	**5**	**10.4**
Patella	**2**	**4.2**

3. Patients with no history of trauma

Out of the 49 patients, 11 patients had a history of trauma associated with the current compliant while the rest 38 patients had no history of trauma.
In those patients with no history of trauma, joint effusion was seen in 25(65.5%), osteophytes in 20(52.6%) and bone marrow edema in 15(40.5%) patients accounting for the three commonest pathologies.
These were followed by meniscal extrusion 14(36.6%), subchondral cyst 12(31.6%), meniscal tear 8(21.6%) and ligament abnormality 7(18.9%).

An intra-articular mass was seen in 3 (7.9%) of the patients.

There was no tendon abnormality and bone fracture was seen in only 1 patient. From the 15 patients with bone marrow edema, the majority were seen in the femur occurring in 13 of the patients while tibial bone marrow changes occurred in 5 patients.

Out of the 7 patients with ligament abnormality, ACL degeneration was the commonest occurring in 4 (10.8%) patients followed by ACL tear 2 and LCL tear in 1 patient.

Out of the 8 patients with meniscal tear, all involved the medial meniscus while 1 patient had both medial and lateral meniscal tear. The posterior horn is involved in 6(75%) of these patients while the rest two had meniscal root tears. There was no isolated anterior root tear.

From the 14 patients with meniscal extrusion, 13 had medial meniscal extrusion while lateral meniscal extrusion occurred in 1patient**.**

There was no tendon abnormality and bone fracture was seen in 1 patient.

4. **Patients with a history of trauma**

Out of the 49 patients, 11 patients had a history of trauma associated with the current compliant while the remaining 38 patients had no history of trauma.

In those patients with a history of trauma, bone marrow edema, fracture and joint effusion were the most common pathologies occurring in 7(63.6%) patients each. These were followed by ligament abnormality 6(54.5%), tendon abnormality 6(54.5%), meniscal tears 2(18.2%) and osteophytes 2(18.2%).
There was no intra-articular mass seen.

From the 7 patients with bone marrow edema, the majority were seen in the femur occurring in 5(45.5%) patients followed by the tibia and the patella, each occurring in 3(27.3%) patients each.

The majority of bone fracture was seen in the tibia occurring in 4(36.4%) of the 7 patients with fracture.

Out of the 6 patients with ligament abnormality, ACL tear, PCL tear and LCL tear occurred with equal frequency in 3(27.3%) patients each followed by MCL tear which was seen in 2(18.2%) patients.

Both of the meniscal tears involved the posterior horn of the medial meniscus with no occurrence of lateral meniscal tear.

Out of the 6 patients with tendon abnormality, the commonest tendons involved were the patellar tendon and the popliteus tendon.

Chapter 6

Discussion

Magnetic resonance imaging scanning is widely used to evaluate knee symptoms, and clinical decision making is influenced by the results of these scans. (8)
MRI is a valuable tool in the evaluation and management of patients of knee pain and it has been established as an effective, noninvasive test for identifying different knee pathologies.(9)

In our series of 49 patients who underwent MR scan of the knee, the majority were male 26 (53.1%). A study by Mehta R et al (11) had shown that knee pain was found to be more common in males (72%) as compared to females. Similar results were also reported in other studies. (13, 14)
Contrary figures showing females with higher percentage of knee MRIs were reported by Ali Guermazi et al and Mustafa Z. Mahmoud, making it difficult to draw a conclusion. (12)

Our study group had a higher peak age group of 46-60yrs. Similar papers by DS Shetty et al and Mustafa Z. Mahmoud et al showed a lower peak age of 20-30yrs. (12, 13) Another paper published in the International Journal of Research in Medical Sciences also reported a peak age of 30-40yrs in their study. (11)
Delayed health seeking was considered as possible explanation for the higher peak age of our study population.

Joint effusion was the most frequent finding seen in 32 (65.3%) of our patients. Other studies have also shown joint effusion to be the most common finding in knee MRIs. Mehta et al reported joint effusion in 74% and Mustafa Z Mahmoud et al in 63.8%.(11,12) Synovial reactions to the different underlying pathologies were put as possible explanations. Joint effusion was seen with similar frequency in both the male and female populations.

Bone marrow edema and osteophytes were the next common findings seen in our study, equally occurring in 22 (44.9%) patients. The study by Mehtal R et al (11) also showed bone marrow edema to be the second commonest finding occurring in 62% while another study found it to be the most common finding occurring in 67% (12). The reviewed papers showed osteophytes to be less frequent, reported in 40% and 12.1% of the study population. (11,12) The younger peak age group of the studies as compared to ours could be the possible explanation for the less report of osteophytes.

Higher frequency of bone marrow edema was seen in those patients with a history of trauma. It occurred in 63.6% of patients with trauma and 40.5% of patients without trauma. This can be explained by studies that show trauma as a cause for bone marrow edema. (23)

Our study showed a higher frequency of osteophytes in females than in males. Even though this was not a statistically significant association, other studies have also shown higher frequency of osteophytes in females. The study by Mustafa Z et al reported similarly higher frequency of osteophytes in females 71.4%. (12) The finding that osteophytes are a feature of osteoarthritis and the overall frequency of osteoarthritis being more common in women than men can explain this result. (16)

Meniscal tears were seen in 10(20.8%) patients. All the meniscal tears involved the medial meniscus while 1 patient had both medial and lateral meniscal tear. A similar frequency of meniscal tear (24.48%) had been reported in a paper published in a Turkish Journal of Trauma and Emergency Radiology while other studies had shown a higher frequency. (13-15).
Even though our study showed a similar frequency of meniscal tears in male and female, other studies have shown a higher frequency of meniscal lesions in males. (11)

The posterior horn was involved in 8(80%) of our patients with medial meniscal tears. A study by Gul-e-khanda et al reported the posterior horn of medial meniscus as the common site of involvement in 35 patients (70%). (17) Another study by Qays A. Hassan et al also reported a higher frequency of posterior horn involvement in 61.1%. (18)

Meniscal extrusion was seen in 15 (30.6%) patients. The frequency of medial meniscal extrusion was 28.6% and that of lateral meniscal extrusion was 4.1%. A study done by Lluı´s Puig et al which assessed the factors affecting meniscal extrusion reported a similar higher frequency of medial meniscal extrusion. The results showed 68.5% of the medial menisci to have some degree of extrusion and the lateral meniscus were extruded in 18.8% of cases. (19)
Similar results showing higher frequency of medial meniscal extrusion were seen in a study done by Michel D. Crema et al which was published in RSNA journal. This study reported a 44.2% medial meniscal extrusion and 9.4% for the lateral meniscus. The higher frequency for both menisci seen in this study could be explained by the higher sample size of the study and the included population having osteoarthritis or risk factor for it. (20)
Our study showed a higher frequency of meniscal extrusion in females, occurring in 39.1% of the female population and 23.1% in the male. Even though this is not a statistically significant association, other reviewed researches have showed association of the female sex with meniscal extrusion. (21)
Meniscal extrusion was also seen with higher frequency in those patients with a history of trauma seen in 36.8% and 9.1% in those without trauma.

Ligament abnormality was seen in 13(27.1%) of the study population. Out of these, ACL tears were the commonest occurring in 10.4% followed by LCL tear 8.3% and PCL tear 6.2%. The study conducted by Mustafa Z et al reported the frequency of ligament lesions to be 36.8%. (12) A higher frequency of ACL tears at 36.5% and 28.75% had been reported in two publications in the Indian journal of radiology. (13,14)
Ligament abnormality was seen with higher frequency in patients with a history of trauma. It occurred in 54.5% of our patients with trauma history and 18.9% with no trauma history. This showed a statistically significant association (p-value=0.02). This was explained in a study that showed injury to the knee as a risk factor for ligament injury. (22)
Ligament abnormality was also seen with higher frequency in the male population, 32% males and 21.7% females. This finding was also seen in the studies mentioned above. (11) This can possibly be explained by male population engaging in more athletic activities and higher rates of trauma. Contrary to this, a study by Mustafa Z. et al showed a higher frequency of ligament lesion in females. (12) This differing finding was not explained.

Our study showed bone fracture in 16.7% of the study population. The frequency of fracture was higher in those patients with a history of trauma occurring in 63.6% while only one patient without trauma had fracture. This showed a strong statistically significant association of fracture with a history of trauma (p-value=0.0002). A higher frequency was also seen in males occurring in 20% as compared to 13% in the female population.

Tendon abnormality occurred in 6% of the study population. All tendon abnormalities were seen in patients with a history of trauma. This was explained by researches that showed tendon abnormalities to be typically caused by trauma. (24) Tendon abnormalities were also higher in the male population occurring in 19.2% as compared to 4.3% in females. This can possibly be explained by the higher rate of sporting activities and trauma in the male population.

Chapter 7

Conclusion

Our study showed that joint effusion, bone marrow edema and osteophytes were the most common knee pathologies seen which was similar with other study findings.

Features of osteoarthritis like osteophytes and meniscal extrusions were seen with higher frequency in our study. Even though the higher peak age of our study population could be the possible explanation for this difference, further studies are needed to consider the possible causes.

The features of osteoarthritis were also seen with higher frequency in the female population. Even though this finding is similar with researches that showed osteoarthritis to be more frequent in females, the possible causes for this finding in our population need to be investigated further.

Bone fracture, ligament abnormality and tendon abnormality showed a statistically significant association with a history of trauma. These pathologies were also seen with higher frequency in the male population. The higher likelihood of the male population to engage in sporting activities and to sustain trauma were considered as possible explanations.

Chapter 8

Recommendations

- Considering our health seeking behavior as one possible cause for the older mean age of our study population and the higher frequency of osteoarthritis, we recommend early evaluation so as to pick these pathologies early.

- Studies to look in to the reasons for the higher frequency of the features of osteoarthritis in the female population are recommended.

- Even though the occurrence of similar abnormalities in those with a history of trauma and in the male population were possibly explained by the male population to engage in sporting activities and sustain trauma, further studies are recommended to look into other possible causes.

- The lack of pediatric patients in our study population should also be taken into account as a serious limitation in terms of giving a wider picture as to pattern of diseases and makes our study findings less representative of this age group; hence further study with a larger sample size incorporating this age group is recommended.

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Annexes

Data Collection Format

Patient MRI No _____
1. Socio-demographic Data
1.1 Age 1. <15yrs 2. 15-30 3.31-45 4. 46-60 5. >60

1.2 Sex: 1.Male_____. 2. Female____.

2. History of trauma associated with the current compliant
1. Yes____. 2. No___.

3. MRI Findings

3.1 Bone abnormality

3.1.1 Is there bone marrow edema
1. Yes_____. 2. No_____.
3.1.1.1 If Yes, Site of bone marrow edema
1. Femur 2. Tibia 3. Patella

3.1.2 Is there bone fracture
1. Yes____. 2. No____.
3.1.2.1 If yes, site of fracture
1. Femur 2. Tibia 3. Patella
3.1.2.1.1 Specify any specific type of fracture _____.

3.4 Soft Tissue Abnormality

3.4.1 Is there ligament abnormality
Yes____. 2. No_____.
3.4.1.1 Type of ligament abnormality
1. ACL tear 2. PCL tear 3. MCL tear 4. LCL tear
3.4.1.1.1 If ACL tear, specific Type
1. Partial Thickness Tear 2. Full Thickness Tear

3.4.2 Is there meniscal lesion
1. Yes 2. No
3.4.2.1 If meniscal lesion, menisci involved and grade
1. Medial meniscus 1.Grade I 2.Grade II 3.Grade III
2 Lateral meniscus 1.Grade I 2.Grade II 3.Grade III
3.4.2.2 If meniscal extrusion, type of meniscus involved
Medial meniscus 2.Lateral meniscus

3.4.3 Is there tendon abnormality
1. Yes 2. No
3.4.3.1 If yes, the tendon involved
1. Patellar tendon 2. Quadriceps tendon 3. Other_____.
3.4.3.1.1 Specify type of tendon abnormality_____.

3.5 Is there joint effusion
1. Yes 2. No
3.6 Is there osteophyte
1. Yes 2. No
3.7 Is there sub-chondral cyst
1. Yes 2.no
3.8 Is there an intra-articular mass/tumor
1. Yes 2. No
3.8.1 If yes, likely diagnosis .