Cross Sectional Study of The Pattern of Abnormalities in The Knee Joint Detected by Knee MRI in Patients Evaluated at Tikur Anbessa Specialized Hospital, Addis Ababa University, Addis Ababa, Ethiopia from April–August 2017

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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 prevalence 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.

Objective:
To assess the pattern 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 in 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.
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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 for possible delayed 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. Abnormalities which were seen with higher frequency in those with a history of trauma were also seen in higher frequency in the male population.

Key words: Knee joint, disease pattern, MRI

Introduction: 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 tibio femoral compartments. The patella and the anterior part of the distal femur form the patella femoral 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 to direct trauma makes knee injuries very common throughout life. Most acute injury to the knee is 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, sub chondral cysts, and other periarticular and intra-articular lesions that are not detectable by radiography. (4)

The prevalence of abnormalities of these different joint components as detected by MRI has been studied in different centers as shown in the literature, but we have not found local studies to date. We aim to assess the pattern of these abnormalities in the knee joint as detected by knee MRI. 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)

A research conducted by Mehta R et al in India, studied the prevalence of abnormalities detected by MRI in patients of knee pain. It examined the knee MR images of fifty patients. 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 were found to be in age group between 31-40 years. Joint effusion was the most frequently found knee pathology constituting 74% in patients of knee pain followed marrow edema.
Daniel Zewdneh Solomon et al. Cross Sectional Study of the pattern of abnormalities in the knee joint detected by knee MRI in patients evaluated at Tikur Anbessa Specialized Hospital, Addis Ababa University, Addis Ababa, Ethiopia From April–August 2017 (62%). Meniscal lesion (44%) and features of osteoarthritis (40%) were the other common pathologies. The study showed that menisci lesions (44%) were more common as compared to ligament lesions (14%). Out of the study population, 4% patients were suffering from intra-articular tumors. (11)

Another study conducted by Mustafa Z. Mahmoud et al 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.

Their ages ranged between 5 to 53 years, with a mean age of 30±11.4 years. Males represent 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 was in 20-29 years which accounted for 22 cases (37.9%).

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

Ligament lesions were demonstrated in (36.2%) of the knees, meniscal lesions were detected in (37.9%) and joint effusion developed in (63.8%). Subchondral edema and tumor were found equally in (1.7%). Bone marrow edema and bursitis presents in (5.2%) of conditions and bony contusion presents in (15.5%). Findings of osteoarthritis such as bone erosion, osteophyte changes were seen in (12.1%) and Baker cyst was diagnosed in (10.4%). Knee joint effusion was 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)

Another Indian paper published by DH Shetty et al studied MR appearances of various conditions affecting the knee and identified the common lesions. Anterior cruciate ligament (ACL) (36.5%) and medial meniscal tears (MM)(36.5%) were the most frequent injuries followed by lateral meniscal tear (17.3%). Meniscal tears seen commonly were grade III in medial meniscus and grade I in lateral meniscus.

Discoid menisci were seen in six cases. The study also found five patients with intra-articular tumors where MR demonstrated internal hemorrhage, intra-articular, marrow and soft tissue extension. (13) An article published in the Kerala Journal of Orthopedics, India, assessed the Correlation between MRI and arthroscopic findings in injuries of knee joint in 80 patients where males comprised 65.31% of the cases and females 34.68%. 23 (28.75%) showed medial meniscal and 11 patients (13.75%) showed lateral meniscal tears on MRI. (14)

An article published in the Turkish Journal of Trauma and Emergency Surgery evaluated MRI findings in traumatic knees in 49 patients with knee and found that bone contusions were the most common finding in the injuries, n:33 (67%). The other findings were respectively, the 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 patients (14.28%) and bone fractures in 5 patients (10.2%). (15)

A paper published by Lluí`s Puig et al, tilted Factors affecting meniscal extrusion, studied the MRI 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 meniscus was extruded in 18.8% of cases at an average of 15% of the meniscal size. (19)

A study done by Michel D. Crema et al, published in 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)

Although there are numerous researches done to evaluate the prevalence of these knee joint abnormalities on MRI, such studies, to date, have not been done in our country to our knowledge. The aim of this paper is to study the prevalence and pattern of these abnormalities in the knee joint as detected by knee MRI.

Subjects and methods:

The study was conducted at Tikur Anbessa Specialized Teaching Hospital, College of Health Sciences, Addis Ababa University, Addis Ababa Ethiopia. The hospital provides a tertiary level referral treatment with over 1000 beds and is open

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24hrs for emergency services. The study was conducted from April-August 2017 G.C. It was a hospital - based prospective cross-sectional study conducted for all patients who had knee MRI during the study period and had no history of surgery.

MRI acquisition of the knee was conducted by using a Philips Achieva MR machine with a superconducting magnet and field strength of 1.5 Tesla. Patients were placed in a 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. A slice thickness of 4mm was used in all scans. The study population was all patients with knee MRIs evaluated at the orthopedics clinic during the study period. All patients with knee MRI taken during the study period with no history of surgery were included in the study. Patients with surgery to the knee were excluded from the study.

Then data was collected using 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. Proper questionnaire designing and pre-testing of the questionnaires was done on 5% of participants for the sake of clarity of the questionnaire and to assure the data quality. 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. Written ethical clearance letters was obtained from the IRB. Information regarding the study subjects was kept confidential by maintaining anonymity.

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

Of the 49 patients included in the study, joint effusion was seen in 32 (65.3%), bone marrow edema in 22 (45.8%) 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 1: Frequency and percentage of genders

<table>
<thead>
<tr>
<th>Sex</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>23</td>
<td>46.9</td>
</tr>
<tr>
<td>Male</td>
<td>26</td>
<td>53.1</td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2: Distribution of the study population in to age groups

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-30</td>
<td>13</td>
<td>26.5</td>
</tr>
<tr>
<td>31-45</td>
<td>13</td>
<td>26.5</td>
</tr>
<tr>
<td>46-60</td>
<td>16</td>
<td>32.7</td>
</tr>
<tr>
<td>&gt;61</td>
<td>6</td>
<td>12.2</td>
</tr>
</tbody>
</table>

Table 3: Distribution of most common knee pathologies detected by MRI

<table>
<thead>
<tr>
<th>Knee pathologies</th>
<th>Male No.</th>
<th>Male %</th>
<th>Female No.</th>
<th>Female %</th>
<th>Total No.</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint effusion</td>
<td>17</td>
<td>65.4</td>
<td>15</td>
<td>65.2</td>
<td>32</td>
<td>65.3</td>
</tr>
<tr>
<td>Osteophytes</td>
<td>9</td>
<td>34.6</td>
<td>13</td>
<td>56.5</td>
<td>22</td>
<td>44.9</td>
</tr>
<tr>
<td>Bone Marrow edema</td>
<td>11</td>
<td>44</td>
<td>11</td>
<td>47.8</td>
<td>22</td>
<td>45.8</td>
</tr>
<tr>
<td>Meniscal extrusion</td>
<td>6</td>
<td>23.1</td>
<td>9</td>
<td>39.1</td>
<td>15</td>
<td>30.6</td>
</tr>
<tr>
<td>Subchondral cysts</td>
<td>4</td>
<td>15.4</td>
<td>8</td>
<td>34.8</td>
<td>12</td>
<td>24.5</td>
</tr>
<tr>
<td>Meniscal Tear</td>
<td>5</td>
<td>20</td>
<td>5</td>
<td>21.7</td>
<td>10</td>
<td>20.8</td>
</tr>
<tr>
<td>Ligament abnormality</td>
<td>8</td>
<td>32</td>
<td>5</td>
<td>21.7</td>
<td>13</td>
<td>27.1</td>
</tr>
<tr>
<td>Bone fracture</td>
<td>5</td>
<td>20</td>
<td>3</td>
<td>13</td>
<td>8</td>
<td>16.7</td>
</tr>
<tr>
<td>Tendon Abnormality</td>
<td>5</td>
<td>19.2</td>
<td>1</td>
<td>4.3</td>
<td>6</td>
<td>12.2</td>
</tr>
<tr>
<td>Intra-articular mass</td>
<td>1</td>
<td>3.8</td>
<td>2</td>
<td>8.7</td>
<td>3</td>
<td>6.1</td>
</tr>
</tbody>
</table>
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: Distribution of bone marrow edema in different anatomic regions of the evaluated Knee MRIs During the study period

<table>
<thead>
<tr>
<th>Involved Bone</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femur</td>
<td>18</td>
<td>37.5</td>
</tr>
<tr>
<td>Tibia</td>
<td>8</td>
<td>16.7</td>
</tr>
<tr>
<td>Patella</td>
<td>7</td>
<td>14.6</td>
</tr>
</tbody>
</table>

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 rest two had meniscal root tears. There was no isolated anterior horn tear.

Table 5: Distribution and Grade of Meniscal Tear

<table>
<thead>
<tr>
<th>Involved Menisci</th>
<th>Grade of Meniscal Tear</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grade I</td>
<td>Grade II</td>
</tr>
<tr>
<td>Medial Meniscus</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Lateral Meniscus</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

From the 15 patients with meniscal extrusion, 14 had medial meniscal extrusion while lateral meniscal extrusion occurred in 1 patient. Out of the 15 patients, 9(39.1%) were female while the male accounted for 6(23.1%).

Table 6: Distribution of Meniscal Extrusion among the sexes

<table>
<thead>
<tr>
<th>Involved Menisci</th>
<th>Sex</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Medial Meniscus</td>
<td>6</td>
<td>23.1</td>
</tr>
<tr>
<td>Lateral Meniscus</td>
<td>1</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Out of the 13 patients 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: Distribution of ligament abnormalities in the evaluated Knee MRIs during the study period

<table>
<thead>
<tr>
<th>Ligament abnormality</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL Tear</td>
<td>5</td>
<td>10.4</td>
</tr>
<tr>
<td>PCL Tear</td>
<td>3</td>
<td>6.2</td>
</tr>
<tr>
<td>MCL Tear</td>
<td>2</td>
<td>4.2</td>
</tr>
<tr>
<td>LCL Tear</td>
<td>4</td>
<td>8.3</td>
</tr>
<tr>
<td>ACL Degeneration</td>
<td>4</td>
<td>8.3</td>
</tr>
<tr>
<td>PCL Degeneration</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 8: Distribution of bone fracture in different anatomic regions of the evaluated Knee MRIs During the study period

<table>
<thead>
<tr>
<th>Involved Bone</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femur</td>
<td>2</td>
<td>4.2</td>
</tr>
<tr>
<td>Tibia</td>
<td>5</td>
<td>10.4</td>
</tr>
<tr>
<td>Patella</td>
<td>2</td>
<td>4.2</td>
</tr>
</tbody>
</table>

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.

Regarding patients with no history of trauma, out of the 49 study subjects, 22.4% (n, 11) had a history of trauma associated with the current compliant while the remaining 75.6% (n,38) had no history of trauma.

Joint effusion was seen in 65.5% (n,25), osteophytes in 52.6% (n,20) and bone marrow edema in 40.5% (n,15) patients accounting for the three commonest pathologies. These were followed by meniscal extrusion 36.6% (n,14), subchondral cyst 31.6% (n,12), meniscal tear 21.6% (n,8) and ligament abnormality 18.9% (n,7).

An intra-articular mass was seen in 3(7.9%) of the patients. There was no tendon abnormality and bone fracture was seen in 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 1 patient.

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

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

In this group 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 intraarticular 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 fractures were seen in the tibia occurring in 4(36.4%) of the 7 patients with fracture.

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

Both 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 those of the patella and the popliteus muscle.

Discussion:

Magnetic resonance 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 MRI of the knee, the majority were male 26 (53.1%), while females accounted for 23 (46.9%). In keeping with a study by Mehta R (11) which 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). The likelihood of males to engage in more sporting activities and being prone to accidents as compared to females were put as possible explanations.

A contrasting result was however, reported by Mustafa Z. et al where males 48(82.8%) had more knee MRI than male 10(17.2%). (12)

Joint effusion was the most frequent finding seen in 32 (65.3%) patients. Other studies have also shown joint effusion to be the most common finding in knee MRIs. Mehta et al 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 in these studies.

Bone marrow edema and osteophytes were the next common findings seen in our study, equally occurring in 22 (44.9%) patients. Mehtal R, et al showed bone marrow edema to be the second commonest finding occurring in 62% while Mustafa’s study found it to be the most common finding occurring in 67%. These papers showed osteophytes to be less frequent, reported in 40% and 12.1% of their study populations. (11,12) The younger mean age group of their studies as compared to ours could be the possible explanation for the lower frequency 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
Our study shows a higher frequency of osteophytes in females 13(56.5%) than in males 9(34.6%), similar to Mustafa ‘s report of 71.4% in females (12). The finding that overall frequency of osteoarthritis being more common in women than men had been reported in another study by Heidari B which discussed risk factors, causes and pathogenesis (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 tears (24.48%) had been reported in a paper published in the Turkish Journal of Trauma and Emergency Radiology while other studies had shown a higher frequency. (13-15).

Even though our study showed similar frequency of meniscal tears in males and females, other studies had shown higher frequency of meniscal lesions in males. (11)

The posterior horn was involved in 8(80%) of the patients with medial meniscal tears. A study by Gul-e-khanda et al reported the posterior horn of the medial meniscus as the most common site of involvement reported 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 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 another study by Michel D. Crema et al which was published in RSNA’s radiology journal which 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. This was also shown in other studies. (20, 21)

Meniscal extrusion was also seen with higher frequency in those patients with a history of trauma (36.8%) in contrast to those without trauma (9.1%).

Ligament abnormality was seen in 13(27.1%) of the study population, of which, ACL tears were the commonest occurring in 10.4% followed by LCL tear 8.3% and PCL tear 6.2%. The study by Mustafa Z et al also reported the frequency of ligament lesions to be 36.8%. (12) Similar higher frequencies of ACL tears had been published in the Indian Journal of Radiology which reported a frequency 36.5% and 28.75%. (13, 14)

Ligament abnormality was seen with a higher frequency in 54.5% of our patients with a history of trauma and 18.9% of our patients with no trauma history. This finding was similar to other studies which explained injury to the knee as a risk factor for ligament tear. (22, 24).

This abnormality was seen with higher frequency in the male population (32%) and 21.7% in females. This finding was also seen in other similar study that showed higher frequency in males. (11) This can possibly be explained by males engaging in more athletic activities and higher rates of trauma. On the contrary, the 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 history of trauma occurring in 63.6% while only one patient without trauma had fracture. 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 the tendon abnormalities were seen in patients with a history of trauma. This can be explained (as also shown by other researches) by trauma. (24). Tendon abnormalities were also higher in the male population occurring in 19.2% as compared to 4.3% in females. This higher frequency can again possibly be explained by the
higher rate of sporting activities and trauma in the male population.

Although most of the studies in our references used small study samples, we admit that the sample size of our study subjects is relatively small and this will be a very significant limitation affecting the strength of our conclusion but as this is a descriptive study; we feel it will shed light as to the pattern of knee injuries and be used as a motivating effort for future large-scale studies. The limitation we have to mention is that the study was not able address the patterns of knee pathologies in the pediatric population for lack of adequate subjects for inclusion in the study.

**Conclusion and Recommendations:**

Our study showed that joint effusion, bone marrow edema and osteophytes were the most common knee pathologies seen.

Features of osteoarthritis like osteophytes and meniscal extrusions were seen with higher frequency in our study. Even though the older mean age of our study population could be the possible explanation for this difference, further studies are needed to consider the possible causes. The cause for the older mean age of our study population as compared to other studies should also be investigated further. Considering our health seeking behavior as one possible cause, we recommend for early evaluation to pick these pathologies early.

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 which were seen with higher frequency in those with a history of trauma with a higher frequency in the male population. Even though the higher likelihood of the male population to engage in sporting activities and to sustain trauma were considered as possible explanations, further look into the possible causes is recommended.

As mentioned above, we recommend a separate study for the pediatric population to assess the pattern and mechanisms of injury especially in school age children and adolescents.

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