



Observational Study on osteoarthritis of the knee

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Abstract

Knee Osteoarthritis (KOA) is a common cause of functional impairment reducing independence in the elderly and increases cost.

Aims: *To assess factors associated with KOA*

Settings and Design: *demographic and clinical data collected in a questionnaire.*

Methods and Material: *Prospective cross-sectional study was performed over a period of 12 months. Patients attending orthopaedic clinic at Benghazi Medical Centre [BMC] with knee pain were included.*

Statistical analysis: *Data were analysed by SPSS-version 23. Descriptive statistics to present numbers and percentages and Inferential statistics (χ^2) used to find difference in distribution of variables between groups, P -value ≤ 0.05 was considered significant.*

Results: *Six Hundred and Sixty-Four (664) patients with KOA were included, 76.7% females and 23.3% males. 78.6% of the females were housewives, 40% of the males were retired, 38.7% of these were heavy labourer. 26.2 % were diabetic, 32.4 % were hypertensive. Bilateral KOA were 40%, 60.1%, and 76.8% in patients aged ≤ 40 , 41-60 years and >60 years respectively. Right knee was involved in (22%) in age group 40-60 years, left knee (38.3%) in age group ≤ 40 years ($p = 0.0001$). **Stage 4** KOA and Body Mass Index [BMI] $\geq 35 \text{ kg/m}^2$ (61% in males) and (68% in females) with ($p 0.005$).*

Conclusions: *Obesity and female gender are significant risk factors for Osteoarthritis of the knee. Age and BMI determine the severity and the bilaterally of KOA.*

Keywords: *Osteoarthritis, knee, Body weight Age, Occupation, Gender*

Keymessages of KOA

- *Average age 57 years*
- *Female predominance*
- *Obese patients have severe disease*
- *Quarter are **diabetic** and a third are **hypertensive**.*
- *Two-thirds [aged 40-60 years] have **bilateral** disease.*

Introduction:

Osteoarthritis (OA) is the most common joint disease worldwide and primarily affects the knees, hips, hands, and spine. It is a leading cause of disability among individuals above 40 years. Besides affecting patients' activity and quality of life, it causes depression, anxiety and an economic burden¹.

OA development has been linked to multiple causes, includes individual and joint-related characteristics. Individual related factors include age, sex, obesity, genetics, race/ethnicity and diet. Joint-related factors are unique to a particular joint such as injury, activity, and occupation. Similarly, causes of OA have been classified into OA development and disease progression factors². Our study evaluated the factors associated with the development of KOA in six hundred and sixty-four patients presented with clinical and radiological features of OA. Demographic, clinical and comorbidities data were collected over a period of 12 months. The prevalence of obesity has been rising alarmingly alongside an increase in predisposition to comorbidities. Overweight is a key factor for KOA and provides substantial grounds for concern of disease severity, treatment costs and productivity losses³. Felson et al reported that obese individuals have

twice the risk of developing KOA of lean counterparts⁴. Fowler-Brown et al found that a 5 kg/m² increase in BMI was associated with a 32% increase in the probability of KOA. leptin hormone has been implicated in approximately half of the total effect of obesity on KOA⁵. In a meta-analysis on the risk involved in KOA, obesity (OR=2.63, 95% CI 2.28 to 3.05) was found to be associated with KOA⁵.

Subjects and Methods: This is a prospective cross-sectional study of patients presents with KOA treated at orthopaedic department of Benghazi medical centre during the period between January and December 2018.

Data collection: Data has been collected prospectively in questionnaires by orthopaedic team. Details of demographic data, clinical history, occupation, co-morbidities [diabetes and hypertension], clinical and radiological findings of the knee joints were recorded. Patients were grouped according to their BMI [Table 8 & 9]. Morbid obese BMI >35Kg/m², obese BMI 26-35 Kg/m², non-obese BMI 20-25 Kg/m², and less than normal weight BMI < 20 Kg/m². The severity of KOA has been assessed using Kellgren-Lawrence classification.

Kellgren-Lawrence staging of KOA Severity

Stage 0	No abnormality
Stage 1	Incipient osteoarthritis, beginning of osteophyte formation on eminences.
Stage 2	Moderate joint space narrowing, moderate subchondral sclerosis
Stage 3	≥ 50% joint space narrowing, rounded femoral condyle, extensive subchondral sclerosis, extensive osteophyte formation.
Stage 4	Joint destruction, obliterated joint space, subchondral cysts in the tibial head and femoral condyle, subluxed position

Statically Analysis: Data were analysed by SPSS-version 23 and presented by Descriptive statistics in numbers and percentages. Inferential statistics Chi square (x²) to find difference in distribution of variables between groups. P-value ≤ 0.05 indicates

a significant statistical difference exist between the compared variables.

Six hundred and six four patients with KOA were analysed. Mean age 57.3 and SD ± 11.7 years, median 58 years, range 25-90 years. 76.7% were

females and 23.3% were males [$X^2=18.157$.df=2 ; $p = 0.0001$] (Figure 1 & Table 1). 78.6% of females were housewives, 40% of males were retired, 38.7% of these were heavy labourer [$X^2=389.499$.df=4 ; $P=0.0001$] [Table 2]. 26.2 % were diabetic [$X^2=33.043$. df=2 ; $p = 0.0001$] (Table 3 & 4). 32.4 % were hypertensive [$X^2=68.10$. df=2 ; $p=0.0001$] (Table 5 & 6). KOA

were Bilateral in 40%, 60.1%, and 76.8% in patients aged ≤ 40 , 41-60 years and >60 years respectively. Right knee was involved in 22% in age group 40-60 years, left knee 38.3% in age group ≤ 40 years ($p = 0.0001$) (Table 7). Stage 4 KOA and BMI ≥ 35 km^2 in 61% males and in 68% females [$p 0.005$] Table 8 & 9.

Results

Figure 1 Male to Female Ratio

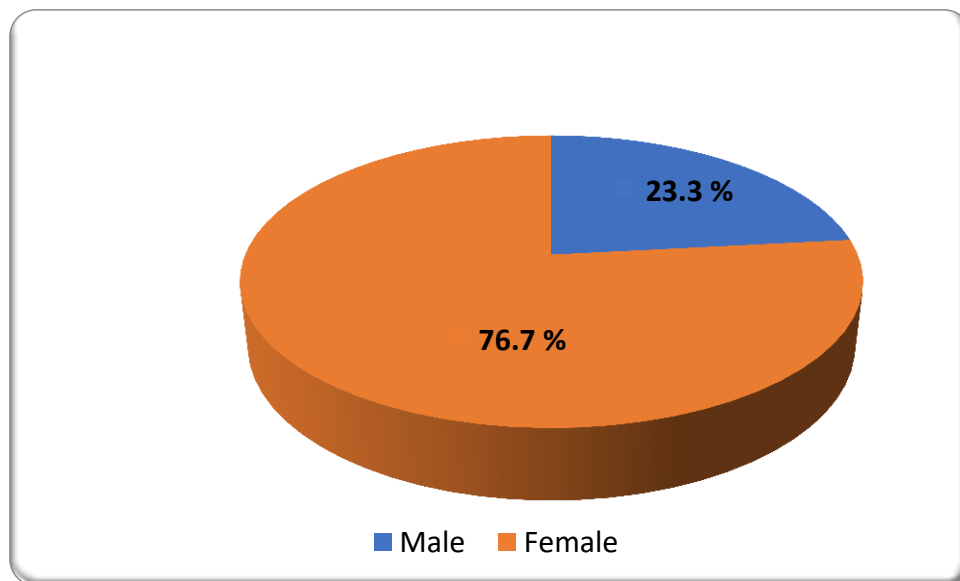


Table 1 Age & Sex Distribution

Age /years	Sex				Total	
	Male		Female			
	No.	%	No.	%	No.	%
≤ 40	25	16.1	35	6.9	60	9
41- 60	61	39.4	280	55	341	51.4
>60	69	44.5	194	38.1	263	39.6
Total	155	100	509	100	664	100

Table 2: Distribution of patients according to occupation and sex

Occupation	Sex				Total	
	Male		Female			
	No.	%	No.	%	No.	%
Heavy Labor	60	38.7	92	18	152	23
Hand craft	33	21.3	3	0.6	36	5.4
Housework	0	0	400	78.6	400	60.2
Retired	62	40	12	2.4	74	11.1
Student	0	0	2	0.4	2	0.3
Total	155	100	509	100	664	100

Table 3 Patient distribution according to diabetes and age

History of diabetes	Age group/years						Total	
	≤40		41- 60		>60			
	No.	%	No.	%	No.	%	No.	%
Yes	4	6.7	72	21.1	98	37.3	174	26.2
No	56	93.3	269	78.9	165	62.7	490	73.8
Total	60	100	341	100	263	100	664	100

Table 4 Distribution of patients according to diabetes and sex $X^2= 0.298$. $df=1$; $p=0.585$.

History of diabetes	Sex				Total	
	Male		Female			
	No.	%	No.	%	No.	%
Yes	38	24.5	136	26.7	174	26.2
No	117	75.5	373	73.3	490	73.8
Total	155	100	509	100	664	100

Table 5 Distribution of patients according to hypertension and sex. $X^2=2.577$. $df= 1$; $p=0.108$

History of hypertension	Sex				Total	
	Male		Female			
	No.	%	No.	%	No.	%
Yes	42	27	173	34	215	32.4
No	113	73	336	66	449	67.6
Total	155	100	509	100	664	100

Table 4 Distribution of patients according to hypertension and age

History of hypertension	Age group/years						Total	
	≤40		41- 60		>60			
	No.	%	No.	%	No.	%	No.	%
Yes	2	3.3	83	24.3	130	49.4	215	32.4
No	58	96.7	258	75.7	133	50.6	449	67.6
Total	60	100	341	100	263	100	664	100

Table 5 Distribution of patients according to affected side and age.

Affected side	Age group/years						Total	
	≤40		41- 60		>60			
	No.	%	No.	%	No.	%	No.	%
Both knee joints	24	40	205	60.1	202	76.8	431	64.9
Right side	13	21.7	75	22	29	11	117	17.5
left side	23	38.3	61	17.9	32	12.2	116	17.6
Total	60	100	341	100	263	100	664	100

Table 6 Distribution of patients according to Stage of the disease and weight - male. $X^2=3.459$. $df=6$; $p=0.484$

Body mass index	Stage of the disease								Total	
	Stage I		Stage II		Stage III		Stage VI			
	No.	%	No.	%	No.	%	No.	%	No.	%
Normal weight	0	0	2	14.3	3	21.4	9	64.3	14	100
Obese	2	2.9	3	4.4	24	34.8	40	57.9	69	100
Morbid Obesity	1	1.4	4	5.6	23	31.9	44	61.1	72	100
Total	3	1.9	9	5.8	50	32.3	93	60	155	100

Table 7 Distribution of patients according to Stage of the disease and weight - female

Body mass index	Stage of the disease								Total	
	Stage I		Stage II		Stage III		Stage VI		No.	%
	No.	%	No.	%	No.	%	No.	%		
Normal BMI	1	50	1	50	0	0	0	0	2	100
Normal weight*	0	0	1	7.1	6	42.9	7	50	14	100
obese	2	1.7	9	7.5	45	37.2	66	54.6	121	100
Morbid Obesity	9	2.4	26	6.8	82	22	256	68.8	372	100
Total	11	2.2	36	7.1	133	26.1	329	64.6	509	100

Discussion

The overall average age of our patients was 57 years old (median 58, SD Range 25-90). When we consider the gender, presentation was significantly more in males in the age group ≤ 40 and > 60 versus female dominance in the age group between 40 and 60 . Male gender tends to present at a younger age. Osteoarthritis of the knee joint increased with age , at age ≤ 40 years was 6.7% , at age 41-60years was 21.1% and at age >60 years was 37.3% , this difference was statistically significant (p = 0.0001) in keeping with the literature which demonstrated the incidence of knee OA increases by age and further increase with longer lifetime ⁶.

Our study has demonstrated a female **predominance** (1:3) in keeping with the literature which demonstrated a range of M:F from 1:1.5 and 1:4 ⁷

In this study, almost 80% of the females were housewives in comparison to 80% of males who did a heavy laborer jobs this difference was statistically significant (p 0.000). Physical activities involving repetitive motions and high forces such as kneeling, squatting, climbing, and heavy lifting are important mechanical risk factors . Literature demonstrated that the **prevalence** was highest in participants who have a physically demanding lifestyle and active lifestyle ⁸ .Majority (78.6%) of the female were housewives , **18% of them were heavy labourer**, 0.6% hand craft , and 2.4% were retired, 40% of male were **retired heavy laborers**, **38.7% of them were heavy laborer** and 21.3% were hand craft.

Quarter of our patients presented with knee osteoarthritis were **diabetic**. **third** of patients

were hypertensive. **History of hypertension** was increased by increasing the age of patients (3.3% at age ≤ 40 years, 24.3 in 41-60 and 49.4% in >60 years. This difference was statistically significant (p 0.0001). Literature review demonstrated patients with OA often have cardiovascular disease risk factors such as **hypertension** and **diabetes** causing renal function impairment ⁹

Knee osteoarthritis can present either with a unilateral or bilateral knee joint involvement¹⁰ However, our study demonstrated that two-thirds of our patients aged 40-60 years have bilateral disease. In addition, bilaterality increases by age [40% ≤ 40 , 60.% at 41-60 years and 76.8% at >60 years]. right side was more (22%) in age 40-60 years, while left side 38.3% in age ≤ 40 years, these difference were statistically significant p = 0.0001 Very obese individuals with a **BMI of ≥ 35** have a **14- fold** higher risk of knee osteoarthritis compared to those within the healthy BMI range¹¹. Our results in agreement with *Ismail et al* ¹². Mechanical stress from a high BMI is a risk factor for the development of knee OA and it has been considered that a reduction of 2 kg/m² would cut the risk of developing knee OA by 20–30% ⁹

In this study patients presented with severe disabling Knee osteoarthritis in more than **half** of patients over 50 years were in [**stage 4**] according to Kellgren-Lawrence classification^[5] are **MORBIDLY OBESE [BMI ≥ 35 kg/m²]**. This means, patients who are over 60 years tend to be morbidly obese [**BMI ≥ 35 kg/m²]** and have **stage-4 severe disease**. This was statistically significant [p-value **0.005**] indicating that obesity and age are important risk factors for the

development of Osteoarthritis of the knee joint. **This is in keeping with literature** which demonstrated that **Weight** status play a role in KOA progression¹⁰. High **BMI** and **mechanical loading** are considered as the main mechanisms of KOA³. In terms of knee OA (KOA), Doherty et al reported factors such as **age, gender, occupation, BMI** are statistically significant play a role in the development of OA². **In our study, young patients and those with mild to moderate disease tend to be none-obese. Our results are similar to Khalid et al_ who found a significant association between osteoarthritis of the knee and obesity in females and concluded that Obesity is a significant important risk factor for Osteoarthritis of the Knee**¹³. Patel et al also reported **BMI** reported as **major risk factors** for OA knee with other factors are family history, previous injury and **occupation** work practices. Also, in other study by the Medical Research Council's Epidemiology Resource Centre at Southampton University, the findings showed for the first time that the risk of knee osteoarthritis increases progressively throughout the BMI¹⁴.

Key messages

- The average age of KOA is 57-years old
- There is Female predominance in patients presented with KOA [1:3]
- More than Half of patients are obese have a severe disease.
- Quarter of our patients are diabetic and a third are hypertensive.
- Two-thirds of patients aged 40-60 years have bilateral disease

Conclusion

Females were the largest proportion, more than half of patients both knees were affected. Comorbidity as hypertension and diabetes were present in around third of patients, which was similar in both sex. Obesity is found to be significant important risk factor for Osteoarthritis

knee, as the weight increase the degree of severity of the disease increase.

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