The Frequency and Risk Factors of Primary Knee OA in Qena Governorate patients

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Abstract
Background: Primary knee osteoarthritis (KOA) is one of the most widely studied diseases in medicine.
Objectives: To study the frequency and risk factors of primary knee osteoarthritis in Qena governorate patients.
Patients and Methods: Assessment of 200 primary knee osteoarthritis patients was done through clinical , radiological findings and evaluation of risk factors as age, sex, family history, and weight. In addition to, Severity of knee osteoarthritis according to Kellgren-Lawrence Grading Scale which was classified severity of knee osteoarthritis depending on size of knee joint space ,developing of osteophyes, bone sclerosis and bone deformity .
Results: The primary knee OA was increased with aging . Frequency of primary knee OA was more in females, rural areas and in average and heavy workers .There was positive family history with majority of our cases (85%) . Overweight and obesity contributed to develop primary knee OA in 67.5% in our study. Knee pain, swelling, stiffness and cripitus were the most common manifestations of primary knee osteoarthritis in nearly 75% of our cases.
Conclusion: Aging, female sex, positive family history, high BMI, and increased physical activity are risk factors in osteoarthritic patients of Qena governorate.
Key words: Primary KOA; Frequency; Risk factors.

Introduction

Knee osteoarthritis (OA) is the most common progressive multifactorial joint disease and is characterized by chronic pain and functional disability. (**Hunteret al., 2014**) .Primary knee OA is thought to be caused by repetitive mechanical stress, which initiates and perpetuates degeneration (**Rosenthal, 2012**) .

Secondary OA is initiated by prior trauma, sepsis, or inflammatory conditions with resultant joint instability, the incongruity of the articular surface, and/or altered cartilage metabolism and matrix composition (**Buckwalter et al., 2014**).

Risk Factors for Knee OA are classified to modifiable and non modifiable risk factors. Modifiable risk factors are articular trauma, occupation, prolonged standing and repetitive knee bending, muscle weakness or imbalance, weight and health – metabolic syndrome.

Non-modifiable risk factors are gender - females more common than males, age, genetics and race (**Manlapaz et al., 2019; Hulshof et al. , 2019**)

Exploring the differences of prevalence, incidence, and risk factors of knee OA in age, gender, region, and others can help us understanding the potential etiology of knee OA. However, there is a paucity of the epidemiologic data of knee OA in the global population. Age is the most strongest factor associated with OA development, thus with global aging process, the burden of KOA to the health care systems worldwide is expected to increase (** Martel-Pelletier et al., 2019) .**

The role of radiological findings to predict the clinical outcomes in KOA remains controversial, and evidence suggests that the degree of pain and disability are only weakly explained by the radiographic severity itself (**Serbanet al. , 2016) .**

The degree of central pain sensitization might be affected by the duration of symptoms in KOA patients (**Foucheret al. , 2019).**

They now range beyond non-steroidal anti-inflammatory drugs (NSAIDs) and acetaminophen for mild arthritis to braces, physical therapy, weight loss, transcutaneous electrical nerve stimulation (TENS) units, and intra-articular cellular injections(**McAlindon et al., 2014) .**

Knee OA is incurable except knee arthroplasty which is an effective treatment at an advanced stage of the disease, however, which is responsible for substantial health costs (**Bannuru et al. ,2019).**

Patients and methods

The current study is a descriptive cross-sectional study which was conducted in the department of rheumatology and rehabilitation Qena University Hospital.

200 primary knee OA patients were diagnosed according to the American College of Rheumatology criteria for the classification and reporting of OA of the knee .(** Altman and Asch,1986**).

Age > 30 years , Primary knee OA patients are resident at Qena governorate, and by excluding Secondary knee OA and Overlap syndromes .

The steps of this work were progressed through clinical assessment and radiological evaluation.

Study tools: The following was done:

- Complete history (demographic data. personal history, therapeutic, family, and surgery history)
- Body mass index (BMI).
- Systematic examinations.
- Local examination: Knee joint examination.
- Investigations: Patients were investigated by radiographic investigation (X-ray on standing position on knee joint A-P and lateral views).

Severity according to X ray: The severity of knee osteoarthritis was classified according to Kellgren-Lawrence Grading Scale:

Kellgren-Lawrence Grading Scale

- Grade 1: Doubtful narrowing of joint space and possible osteophytic lipping .

Fig.1. Grade 1

- Grade 2: Definite osteophytes, definite narrowing of joint space .

Fig.2. Grade 2

- Grade 3: Moderate multiple osteophytes, definite narrowing of joints space, some sclerosis and possible deformity of bone contour.

Fig. 3. Grade 3

- Grade 4: Large osteophytes, marked narrowing of joint space, severe sclerosis and definite deformity of bone contour **(Kellgren and Lawrence, 1957 ; Kohnet al., 2016).**

Fig. 4. Grade 4

The current study had been approved by the Ethics Committee Of Faculty of Medicine, SVU, Qena, Egypt.

The ethical approval Code: SUV-MED-PRR022-2-21-1-117

Statistical analysis

- Statistical package for social sciences (IBM-SPSS), version 24 (May 2016); IBM- Chicago, USA were used for statistical data analysis.
- Data were expressed as means, standard deviations (SD), numbers, and percentages. Mean and standard deviation were used as descriptive values for quantitative data.
- Student t-test was used to compare the means between two groups, and a one-way analysis of variance (ANOVA) test was used to compare means of more than two groups.
- Pearson Chi-square test was used to compare percentages of qualitative variables
- Pearson correlation test was used to compare two quantitative variables, and Spearman correlation test was used instead if the data were non-parametric. And univariate logistic analysis and multivariate regression analysis were made for significant correlations.

For all these tests, the results were significant when the (P-value) $P < 0.05$.

Results

I. **Socio-demographic characteristics Comparison among the studied groups of osteoarthritis (Table.1):** Mean age in males with primary knee OA was 51.23 years but in females was 42.63 years. P value of age was statistically significant so there was significant relation between age and development of primary knee OA in males and females. Primary knee OA in males and females was increased in rural residence. In our study, Number of males with primary knee OA was increased with heavy work but number of females with primary knee OA was increased with average work. P value of occupation was statistically significant so there was significant relation between occupation and development of primary knee OA in males and females.

II. **History characteristics comparison among the studied groups of osteoarthritis (Table.2):** More than half males and females of primary knee OA had positive family history of knee OA . P value of family history was significant so there was significant relation between family history of primary knee OA and development of primary knee OA in males and females. Obesity contributed to develop knee OA in more than half of all cases and was significant because there were a lot of cases in our study with overweight and obesity.

III. **Severity of OA comparison among sex of the studied groups (Table.3):** More than half of males and females had knee OA in grade 3&4 ,(**Fig.1**).

IV. **Correlation between quadriceps muscle state and knee ROM (Table.4):** Quadriceps muscle weakness increased with progression of knee OA.

V. **Knee joint characteristics comparison among the studied groups of osteoarthritis (Table5):** Knee pain, swelling, stiffness and cripitus were the most significant clinical symptoms with primary knee OA in both males and females.

Table1. Socio-demographic characteristics comparison among the studied groups of osteoarthritis

Variables		Primary knee OA males	Primary knee OA females	P-value
Age (years, mean ± SD)		51.23 ± 8.829	42.63 ± 10.062	0.001*
Residence	Rural	36 (60%)	86 (61.4%)	0.849
	Urban	24 (40%)	54 (38.6%)	
Occupation	Not working	15 (25%)	38 (27.2%)	0.00001*
	Average	12 (20%)	85 (60.7%)	
	Heavy work	33 (55%)	17 (12.2%)	

Table2. History characteristics Comparison among the studied groups of osteoarthritis

Variables		Primary knee OA of males	Primary knee OA of females	P-value
Family history of knee OA	Yes	43 (71.7%)	127 (90.7%)	0.00055*
	No	17 (28.3%)	13 (9.3%)	
Obesity	Average	23 (38.3%)	42 (30%)	0.0006*
	Overweight	8 (13.3%)	45 (32%)	
	Obese	13 (21.7%)	41 (29.4%)	
	Morbid obese	16 (26.7%)	12 (8.6%)	

Table 3. Severity of OA comparison among sex of the studied groups

Variables		Sex		P-value
		Female	Male	
Severity of OA (according to Kellgren-Lawrence Grading Scale)	Grade1	15 (25%)	15 (10.7%)	0.033*
	Grade2	12 (20 %)	48 (34.3%)	
	Grade3	22 (36.7%)	48 (34.3%)	
	Grade4	11 (18.3%)	29 (20.7%)	

Table4 . Correlation between quadriceps muscle state and knee ROM

Knee ROM			
Spearman's correlation	**Quadriceps muscle state**	**Correlation Coefficient**	0.930**
		P-value	0.001

Table5. Knee joint characteristics comparison among the studied groups of osteoarthritis

Variables		**Primary knee OA of males**	**Primary knee OA of females**	**P-value**
Knee swelling	**Yes**	40 (66.7%)	113 (80.7%)	0.0318*
	No	20 (33.3%)	27 (19.3%)	
Knee stifness	**Yes**	39 (65%)	116 (82.9%)	0.0056*
	No	21 (35%)	24 (17.1%)	
Knee cripitus	**objective**	22 (36.7%)	30 (21.4%)	0.0244*
	Objective and subjective	38 (63.3%)	110 (78.6%)	
Walk difficult	**NAD**	25 (41.7%)	65 (46.4%)	0.819
	Walk difficulty	22 (36.7%)	48 (34.3%)	
	Inability to walk (need assistance or wheel chair)	13 (21.6%)	27 (19.3%)	
Knee pain	**Mild**	10 (16.7%)	47 (33.6%)	0.049*
	Moderate	27 (45%)	53 (37.8%)	
	Severe	23 (38.3%)	40 (28.6%)	
Site of knee affection	**Bilateral**	42 (70%)	86 (61.4%)	0.476
	Unilateral RT	10 (16.7%)	33 (23.6%)	
	Unilateral LT	8 (13.3%)	21 (15%)	

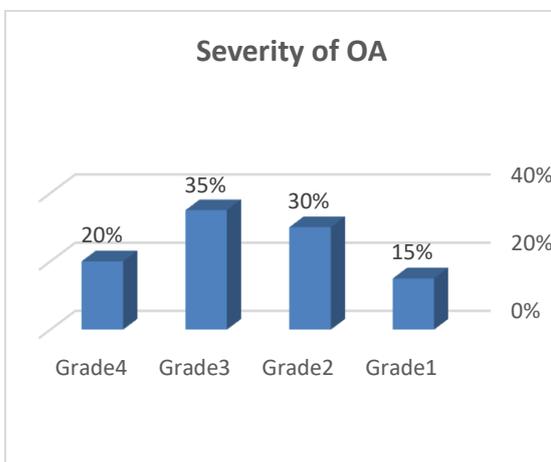| Quadriceps muscle state	No weakness	27 (45%)	63 (45%)	
	Moderate weakness	22 (36.7%)	48 (34.3%)	0.911
	Severe weakness	11 (18.3%)	29 (20.7%)	
Knee ROM	Full	27 (45%)	63 (45%)	1
	Limited	33 (55%)	77 (55%)	
Presence of Baker's cyst	Yes	17 (28.3%)	38 (27.1%)	0.863
	No	43 (71.7%)	102 (72.9%)	
Presence of Heberden nodes of DI	Yes	33 (55%)	75 (53.6%)	0.853
	No	27 (45%)	65 (46.4%)	
Presence of Bouchard nodes of PIP	Yes	11 (18.3%)	28 (20%)	0.785
	No	49 (81.7%)	112 (80%)	

Fig.1. Severity of OA among the studied groups.

Discussion

The aim of study is to find the frequency and risk factors of primary knee osteoarthritis in Qena governorate. This study was conducted on 200 patients suffering from knee OA, diagnosed according to ACR classification criteria .All participants were subjected to history taking, clinical examination (general and local) and x-rays.The mean age of our study group was nearly 50 years, with a standard deviation of 9.8 years and a range from 30-65 years. This was close similar to study done by **(Ganvir et al., 2013; Plotnikoff et al., 2015; Liu et al., 2016)** which observed that the percentage of people with osteoarthritis increased as the age increases and the age is positively correlated with the prevalence of knee OA.

About half of our cases were average working. Among the remaining half, the majority had no work (26.5%) with only 25% had heavy work. In **(Ganvir et al., 2013)** study the prevalence of OA was much higher in occupational knee bending. In **(Sasidharan et al., 2014)** study which examined 50 cases (unemployed

26, employed 24). According to (**Lee et al., 2015**) a low level of education was also found to be a significant factor associated with osteoarthritis from our data. We do not know if subjects with a lower level of education were involved in work requiring more physical labor or joint loading, although it is a possible explanation since overload on the joints could be a risk factor for osteo-arthritis.

In our study family history of osteoarthritis was found in 85 % of our cases. And in **Kellgren** showed that the first-degree relatives of probands had twice higher risk than others. (**Sasidharan et al., 2014**) study also found that family history is significantly related to prevalence of OA. But a study by (**Mangat et al.,1995**) reported presence of family history in only few of their patients (13.7%) , and in the genetic OA and progression study by (**Riyazi et al.,2005**) in multiple sites showed the evidence of familial hereditability of OA of hand, hip, and spine, but not in knee.

We found that more than half of our cases were overweight and obese (67.5%) with (32.5%) fall in the (average weight) group. And in the studies done by (**Lohmander et al. ,2009**) which carried out a large-sample follow-up survey on discharged patients in Sweden over 10 years. They found that BMI, waist circumference, waist–hip ratio, weight and percentage body fat, which are all closely related to weight, showed a positive correlation with the prevalence of knee OA and **Blagojevic et al. (2010)** also comfirm that. Another study done by **Jiang et al. (2012)** arrived at the conclusion that obesity is a risk factor for knee OA by systematically analyzing the correlation between BMI

and knee OA in 21 independent reports. And these results were supported by (**Wills et al., 2012**) who suggested that the risk of knee OA accumulates from exposure to a high BMI through adulthood. Majority of (**Litwic et al., 2013**) study subjects (55.9%) were obese; It was similar **to** (**Martin et al., 2013**) study. The result of (**Plotnikoff et al., 2015**) study indicate that overall sample and females, being obese was strongly associated with knee and hip OA prevalence. Obesity is a well established modifiable risk factor of knee OA.(**Liu et al., 2016**) result also indicated that the population with high BMI showed a significantly increased prevalence of knee OA &. it showed that BMI is a risk factor for OA as prevalence of OA knees increased with increase in BMI, indicated that the population with high BMI showed a significantly increased prevalence of knee OA, with the increase in waist circumference being closely related to the prevalence of knee OA in females. This may be because the pressure exerted on the articular cartilage increases, which accelerates degeneration**. (Park et al., 2017)** also confirm that weights are positively correlated with the prevalence of knee OA, which is in agreement with the results of most other epidemiological surveys. However, some studies as (**Koonce et al., 2013**) have indicated that obesity is also positively correlated with the prevalence of OA in non-load-bearing joints such as in the hand. This means that the load on the joint cannot completely explain the relationship between obesity and knee OA.

Conclusion

In the current study, we observed that frequency of primary knee osteoarthritis in Qena governorate is increased with aging, female sex,

positive family history, high BMI, or increased physical activity.

Conflict of interest

The authors of the study have no conflict of interest related to this publication.

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