

**Cardiovascular Risk Factors and Metabolic Syndrome in Patients with Knee Osteoarthritis**

**Mai Mahmoud Mohammed Hassan,<sup>a</sup> Mohamed Ismail Abdelkreem,<sup>b</sup> HossamEldin M. Mahmoud,<sup>c</sup> Amr Mohammed Mohammed<sup>a</sup>**

<sup>a</sup>Physical Medicine, Rheumatology and Rehabilitation Department, Faculty of Medicine, South Valley University, Qena, Egypt.

<sup>b</sup>Rheumatology and Rehabilitation Department, Faculty of Medicine, AL-Azhar University (Assiut Branch), Egypt.

<sup>c</sup>Internal Medicine Department, Faculty of Medicine, South Valley University, Qena, Egypt.

**Abstract**

**Background:** Osteoarthritis (OA) is the commonest musculoskeletal disease; the relation between knee osteoarthritis, cardiovascular risk factors and metabolic syndrome (Mets) has been previously reported but not yet thoroughly studied.

**Objectives:** to evaluate the relation between cardiovascular risk factors and metabolic syndrome and knee osteoarthritis.

**Patients and methods:** This is a hospital-based cross-sectional study, was done on 200 patients with knee OA at outpatient clinic of physical medicine, Rheumatology, and Rehabilitation Department of Qena University Hospital.

**Results:** 200 patients in this study with mean age ( $56.7 \pm 10.3$ ) P value (0.001), mean body mass index (BMI) ( $27.5 \pm 4.5$ ) P value (0.313) and mean disease duration ( $10 \pm 5.5$ ) P value (0.003). 111 of patients who have abnormal ECHO (49.1%) of them were diabetic, (85.7%) hypertensive, (58.9%) obese, (58%) hyperlipidemic, (84.8%) of them have full criteria of metabolic syndrome. 119 (59.5%) of knee osteoarthritis patients that involved in this study have metabolic syndrome.

**Conclusion:** The findings of this study showed that there is an association between cardiovascular risk factor, metabolic syndrome and knee osteoarthritis and show their significant role in the development and progression of knee osteoarthritis.

**Keywords:** Osteoarthritis knee; Metabolic syndrome; Cardiovascular disease

**Introduction**

Osteoarthritis (OA) is the commonest musculoskeletal disease. The incidence of OA elevated especially with age and leads to pain in the joints and disability. Furthermore, OA may include one or multiple joints. Besides the spine, knee, hip and hands are the common affected joints (Cross et al., 2014).

The most common used criteria in knee OA diagnosis are those, the American college of rheumatology criteria (ACR) (Altman et al., 1986). The European Alliance of Associations for Rheumatology (EULAR) [Zhang et al., 2010] and the National Institute for Health and Care Excellence (NICE). Although, some of researches have argued that these criteria were firstly added depending on patients data at secondary care presented with late

stages of OA and advanced radiographic OA changes (Peat et al., 2006). Thus its ability in diagnosis of knee OA in primary care in early stages is questioning (Damen et al., 2019).

Epidemiologic researchers have found out the significance of specific risk factors differ from type to type in OA. In addition to the genetic abnormalities, the age of patient, sex, joint trauma, and weight gain problem; specific systemic etiological factors like inflamed, infected tissue, and hyperlipidaemia are included in risk factors for OA (Thijssen et al., 2015). The metabolic syndrome also has a role in the development and progression of OA (Li et al., 2016). In particular, the association between weight gain problem and metabolic syndrome with OA has grown to be more and more evident (Stürmer et al., 2000). Furthermore, there are more patterns of osteoarthritis due to body frame composition and other different risk factors, that join in pathophysiology of OA (Sun et al., 2000). In this study, we aimed to evaluate the relation between knee OA and cardiovascular risk factors and metabolic syndrome.

### Patients and methods

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

**Type of the study:** A hospital-based cross-sectional study.

**Study Setting:** outpatient clinic of physical medicine, Rheumatology, and Rehabilitation Department of Qena University Hospital.

**Study subjects:** 200 patients with knee OA

#### a. Inclusion criteria:

Diagnosis of patients with knee OA depend on applied criteria of knee OA by the (ACR), (EULAR), and (NICE). No age limitation

#### b. Exclusion criteria:

- Other causes that develop knee arthritis
- Other autoimmune diseases.

### Study tools:

The following was done:

- Complete history (demographic data, personal history, therapeutic, family, and surgery history)
- General examination .
- Body mass index (BMI).
- Systematic examinations.
- Local examination
- Locomotor examination
- Investigations:
  - Radiographic investigation (x-ray on standing position on knee joint A-P, Lateral, and Sky line Views).
  - Investigation of the cardiovascular system ( Echocardiography).

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

### Statistical analysis

Data analyzed and processed by using SPSS version 21.0 program .Data prepared in the form of tables as mean values  $\pm$  standard deviations (SD) and compared by student t-test. Values considered significant when P values were equal or less than 0.05.

### Results

#### Demographic data in studied group

Two hundred of patients with knee osteoarthritis were involved in our study with mean age ( $56.7 \pm 10.3$ ), eighty nine of them had normal ECHO, with mean age of  $49.5 \pm 8.3$  years, 14 males (14.8%), 75 female (85.2%), mean BMI of these with normal ECHO ( $26.3 \pm 3.5$ ), one hundred and eleven had abnormal ECHO with mean age  $62.5 \pm 7.9$  years, 55 of them are male (49.5%) and 56 were female (50.5%) with mean BMI ( $27.5 \pm 4.5$ ) as shown in (Table .1, Fig.1,2, and 3).

**Relation between knee osteoarthritis patients and cardiovascular risk factors and other co-morbidities among studied groups**

Current study showed that 111 of knee osteoarthritic patients with abnormal ECHO ((49.1%) of them were diabetic, (85.7%) hypertensives, (58.9%) obese, (58%) hyperlipidemics and (84.8%) of them have full criteria of metabolic syndrome as shown in (Table.2, Fig.4).

**Relation between knee osteoarthritis patients and metabolic syndrome among studied group**

Current study showed that 119 (59.5% )of knee osteoarthritis patients that included in this study had metabolic syndrome which have a role in progression of knee osteoarthritis as shown in (Table.3, Fig.5).

**Table1: Demographic data of the study groups**

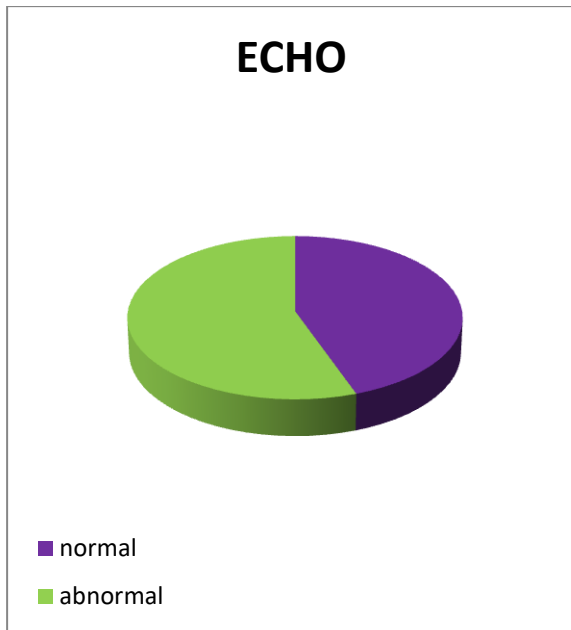
Variables		ECHO		P value
		Normal (N=89)	Abnormal (N=111)	
Age		49.5±8.3	62.5±7.9	<.0001*
Sex	Male	14 (14.8%)	55 (49.5%)	<.0001*
	Female	75(85.2%)	56 (50.5%)	
BMI		26.3±3.5	27.5±4.5	0.05*

**Table 2. Relation between knee osteoarthritis patients and cardiovascular risk factors and other co-morbidities**

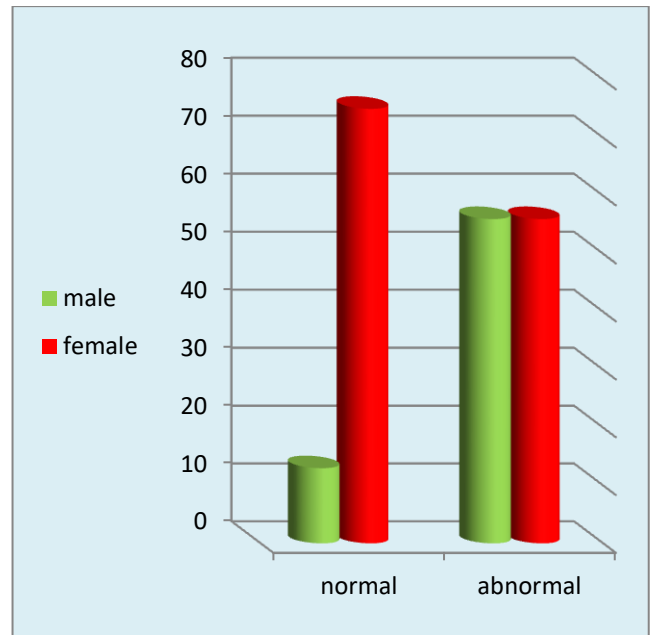
Variables		ECHO		P value
		Normal (N=89)	Abnormal (N=111)	
DM	Yes	35 (39.8%)	55 (49.1%)	.111
	No	53 (60.2%)	57 (50.9%)	
Hypertension	Yes	53 (60.2%)	96 (85.7%)	<.0001*
	No	35 (39.8%)	16 (14.3%)	
Obesity	Yes	58 (65.9%)	66 (58.9%)	.313
	No	30 (34.1%)	46 (41.1%)	
Hyperlipidemia	Yes	23 (26.1%)	65 (58%)	<.0001*
	No	65 (73.9%)	47 (42%)	
Metabolic syndrome	Yes	24 (27.3%)	95 (84.8%)	<.0001*
	No	64 (72.3%)	17 (15.2%)	

**Table 3. Relation between knee osteoarthritis patients and metabolic syndrome**

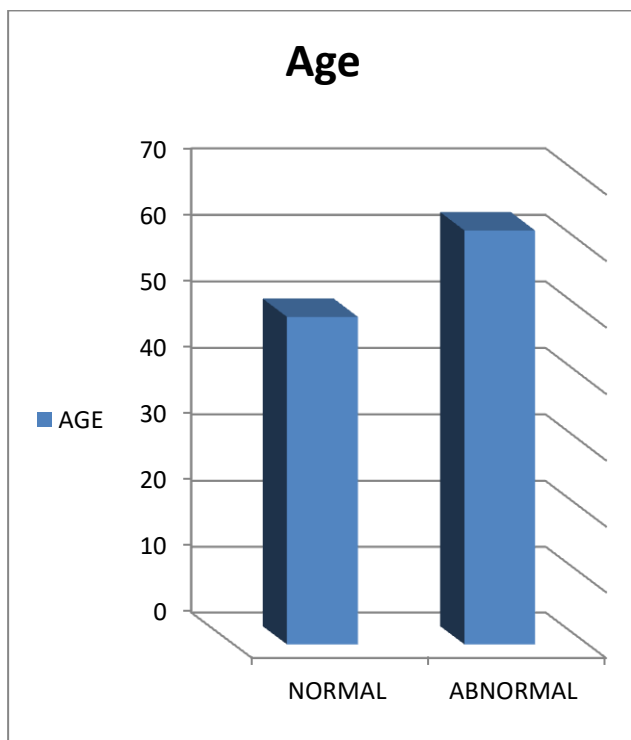
Metabolic syndrome	Frequency	Percent
Yes	119	59.5%
No	81	40.5%



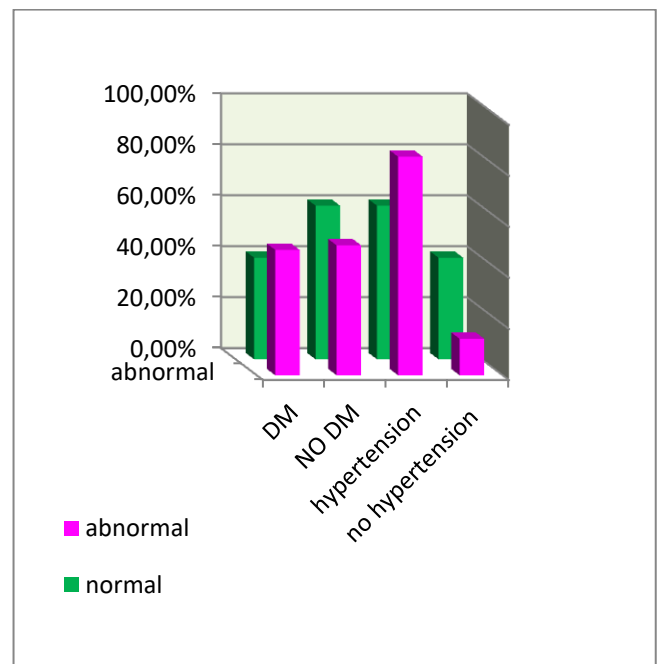
**Fig 1.**Frequency of normal and abnormal ECHO in patients with knee osteoarthritis



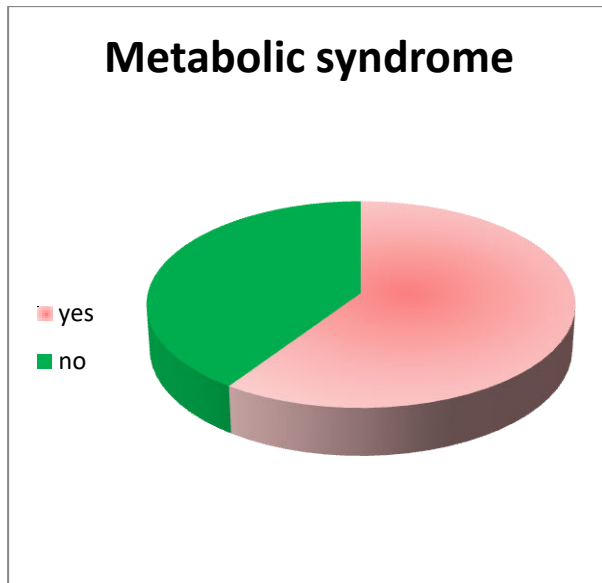
**Fig. 3.** Sex distribution in patients with knee OA related to ECHO



**Fig .2.** Age distribution in patient with knee OA according to ECHO



**Fig. 4.** Hypertension and DM in patient with knee OA related to normal and abnormal ECHO



**Fig. 5. Metabolic syndrome frequency in patient with knee osteoarthritis**

### Discussion

Our study which included 200 patients shows an association between cardiovascular risk factor and patients with knee osteoarthritis and also shows that patients who have CVS risk factors have other comorbidities, 111 of them who have abnormal ECHO also were ((49.1%) of them diabetic, hypertensive (85.7%), (58.9%) obese, (58%) hyperlipidemic, (84.8%) of them have full criteria of metabolic syndrome.

Our results were supported with the study of Veronese et al., as they reported that more subjects with OA than those without OA had hypertension, atrial fibrillation (Veronese et al., 2016)

Previous studies conducted by Doubova et al., Prieto-Alhambra et al., & Sheng et al., show incidence estimates of high blood pressure in knee osteoarthritis with a selection from 19.7% to 55.5%. Also, they found prevalence of diabetes in osteoarthritis from 5.2% to 18.6%. (Doubova et al., 2015) (Prieto-alhambra et al., 2014) (Sheng et al., 2012)

Also, Navarro et al., proved that the incidence of hypertension, diabetes

extensively elevated in patients suffer from KOA and also the incidence of obesity elevated in those patients as in comparison to the control group. They found that patients presented with KOA have higher rate of complications of cardiovascular disease like ischemic heart disease as compared with the control ( $p < 0.05$ ) when they analyzed their clinical history (Navarro et al., 2012).

The study of Li et al., showed that prevalence of hypertension was higher in patients with osteoarthritis with significant value compared to the control group and other risk factors as obesity, dyslipidemia and metabolic syndrome were higher also in osteoarthritic patients. (Li et al., 2016)

The study of Calvet et al., showed a high prevalence of cardiovascular diseases in patients with OA compared with the control people. (Clavet et al., 2016).

Also The study conducted by Sellam & Berenbaum., revealed that patients with MetS develop OA early and have extensive pathological changes and sever pain in the joints, when compared to patients not having Mets (Sellam & Berenbaum et al., 2013).

In our study, as regard the relation between metabolic syndrome and knee osteoarthritis 119 (59.5%) of knee osteoarthritis patients that included in this study have metabolic syndrome which have a role in progression of knee osteoarthritis.

In accordance with our results, previous studies held by Courties et al., proved that there is a strong association between MetS and knee OA. Also they reported that MetS found in 59% of patients suffer from OA and in 23% not having OA, this done in a cohort study of 7,714 people without selection of a specific age (Courties et al., 2015).

Similarly, Wang et al., reported that MetS have a role in development and progress

of KOA, even after adjusting most of the factors that may have a role in the development of KOA. MetS was found in 59% of patients with KOA, whereas it was 23% in people not having KOA (Wang et al., 2016).

Inoue et al., revealed that the KOA was in a strong association with MetS; and the risk of MetS in the patients with knee OA was 2.196 ( $P = 0.034$ ) fold the risk in the non-knee OA group. (Inoue et al., 2011)

Furthermore, Hasandokht et al., stated that hyperlipidemia, female gender and metabolic syndrome were in high frequency rate in the patients with osteoarthritis compared to people without osteoarthritis ( $P < 0.05$ ). (Hasandokht et al., 2019)

Similarly, a study of Afifi et al., revealed that a high prevalence of OA in patients with MetS 83.3% than in the control people was 63.3% ( $P = 0.034$ ). (Afifi et al., 2018).

### Conclusion:

The findings of this study show that there is an association between cardiovascular risk factor, metabolic syndrome and knee osteoarthritis and show their significant role in the development and progression of knee osteoarthritis

### Limitations of our study

- Small sample size.
- Need follow up longer.

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