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Association Between Knee Osteoarthritis with Type 2 Diabetes Mellitus in H.Adam Malik Hospital and Dr.Pirngadi Hospital Medan, Indonesia.

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ABSTRACT

The case control study was conducted in patients in orthopedics division Department of Surgery Adam Malik Hospital and Dr.Pirngadi Hospital in Medan. 51 cases and 51 control randomly chosen using secondary data from medical records in period January 2015 until December 2015. The mean age of the patients was 55,15 ±8,78 years old with a majority of female as many as 69 patients (68,1%). The patients had mean blood glucose level as 195±83,4. The bivariate analysis between knee osteoarthritis (OA) and type 2 diabetes mellitus (DM) to get the Odd Ratio is OR 3,957 (IK 95% 1,691-9,259). There is a significant relationship between knee OA with DM type 2 (p=0,002).Type 2 DM increases the risk three times to the occurrence of knee OA with an OR of 3,957 (IK 95% 1,691-9,259)
Keywords: knee osteoarthritis, diabetes mellitus type 2, blood glucose level

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INTRODUCTION

Osteoarthritis (OA) is one of the most common disabling diseases and has become developing problem because its increasing of the prevalence in the worldwide. The main phenotypes described are age related, hormonal, posttraumatic and metabolic OA [1]. Pain is the predominant symptom although it is known that there is no correlation between the degree of severity of the pain and alteration in joint cartilage on photo-based examination [2]. One of the metabolic disorder thought to be a risk factor for progression of OA is diabetes mellitus (DM). diagnosis of DM is established based on examination of blood glucose level [3]. Lack of physical activity resulted in a decrease in muscle mass and also changes in dietary source of energy, particularly increasing in fat intake, the decrease in starches intake and simple sugars consumption and low consumption in fiber will contributed in to an increased risk of 4 to 5 times to develop diabetes mellitus [4]. Eymard et al [5] reported that mean annualized of joint space narrowing (JSN) was greater for patients with type 2 diabetes than without diabetes (0,26[-0,35 to -0,17] vs 0,14 [-0,16 to -0,12] mm; p=0,001). This association remained significant after adjustment for sex, age, BMI, hypertension and dyslipidemia (p=0,018), so type 2 DM was a predictor of joint space reduction in patients with established knee OA.

In Medan, North Sumatera, cases of type 2 DM has increased every year. In Adam Malik Hospital in 2010, it was reported that only ±40 patients who seeking treatment. This number increased to ±60 patients in 2014. Whereas the cases of knee OA in the period of 2011 to 2013 in the department of orthopedics H.Adam Malik Hospital were 145 cases in total and its expected to increase annually [6].

This study aimed to investigate the correlation between incidence of knee OA with type 2 DM in Medan, North Sumatera, Indonesia population, particularly in H.Adam Malik Hospital and in Dr.Pirngadi hospital.

MATERIAL AND METHODS

Population and Samples

Population

Population in this study were all the patients at Orthopedics Division, Department of Surgery in H.Adam Malik hospital and Dr.Pirngadi hospital, Medan, in the period of January until December 2015.

Samples

The samples study were all the patients at Orthopedic Division Department of Surgery H.Adam Malik hospital and Dr. Pirngadi Hospital with OA knee and type 2 DM who meet the inclusion criteria and exclusion criteria. The size of samples is obtained by using the formula :

$$n=\{\frac{z\alpha+z\beta}{0,5\text{In }[(1+r)/(1-r)]}\}^2 + 3$$

$$n=\{\frac{1,64+1,28}{0,5\text{In }[(1+0,4)/(1-0,4)]}\}^2 + 3$$

n=51 samples
description :
n = size of samples
Zα = standard deviation α
Zβ = standard deviation β
r = correlation

Inclusion and exclusion criteria

Inclusion criteria including all the patients who came to orthopedic department by the age of ≥ 40 years old and there are knee OA and type 2 DM in patients medical records. The exclusion was the patients with an incomplete medical records.

Statistical Analysis

Univariable analysis performed by using mean (standard deviation, SD), median (25th and 75th percentiles) for continuous data and frequency and percentages for caterogical data. Bivariable analysis performed using chi square test. To determine the relationship between knee OA with type 2 DM are determined by Odds Ratio (OR) with confident interval 95%.

RESULT AND DISCUSSION

Characteristic of the Patients

102 subject comprised of 51 patients and 51 healthy people (control) included in the study. The subjects had a mean age of 55,15±15 8,78 years old with majority subjects were female (68,1%). The patients had mean blood glucose levels 195,84±83,4 mg/dL. The characteristic of the patients presented in Table.1

Table 1: Characteristic Of Subjects

characteristic	N	%
Age (mean±SD)	55,159±8,78	
Sex		
Male	33	31,9
Female	69	68,2
Parametric status		
BMI (mean ± SD)	24,04±3.312	
Blood Glucose Level (mean±SD)	195,84±83,4	
DM type 2 (+)	62	60,8
DM type 2 (-)	40	39,2
OA status		
With OA	51	50
Without OA	51	50

Age is a risk factor that has a very important role in the occurrence of OA, caused by degeneration of joint surface and its use. This present study showed that incidence of OA is more prevalent in women as many as 68,2%, although this is not statistically different (p=0,0053). Heidari [7] reported that knee OA is more important not only for its high prevalence rate compared with other types of OA but also for its presentation at earlier age groups particularly in younger age groups of obese women. Zhang and Jordan [8] reported that symptomatic knee OA occurs in 10% men and 13% in women aged 60 years or older. The number of people affected with symptomatic OA is likely to increase due to the aging of the population and the obesity epidemic. The Framingham Knee Osteoarthritis study suggest that the prevalence of knee OA increased in elderly patients and more common in female. Females are found to have more symptoms and increased hand and knee OA [9]. Roman-Blas et al [10] reported that there are dramatic rise in OA prevalence among postmenopausal women, which is associated with the presence of estrogen receptors (ERs) in joint tissues, suggest that there is a link between OA and loss of ovarian function.

Bivariate Analysis

There is no statistically difference between age and sex of subject with OA and with no OA. It is known that category DM had a statistically significant difference in each group (p<0,05).Detailed comparisons between the two groups are presented in Table 2

The similar result reported by Plaza et al [11] which investigate correlation between hand or knee OA with DM in Spain population in Puerto Rico. It was reported that the prevalence of OA in patients with DM and non DM was 49,0% and 26,5% and female diabetic patients have a greater risk. From table 2 it is known that

type 2 DM has a statistically significant relationship to the occurrence of OA. The diagnostic test type 2 DM on the incidence of OA was showed in Table. 3

Table 2: Correlation Characteristic Of The Study Sample And Osteoarthritis

Characteristic	OA (+)	OA(-)	p
Age (mean±SD)	55,15±8,78	51,68±17,3	0,163*
Sex			
Male	12	21	0,053**
Female	39	30	
Parametric status			
DM type 2 (+)	39	23	0,002**
DM type 2 (-)	12	28	

*independent T test **Chi square test

Table 3: Diagnostic Test Dm Type 2 On The Incidence Of Oa

	With Osteoarthritis	Without Osteoarthritis
DM (+)	39	23
DM (-)	12	28

OR 3,957 (IK 95% 1,691-9,259)

After bivariate analysis was performed, the odd ratios are OR 3,957 (Ik 95% 1,691-9,259). It is mean that people with DM type 2 are three times more at rosk of developing OA. DM is an additional factor in the pathophysiology of OA through the establishment of advanced glycation end products (AGEs). The accumulation of AGEs was found in the articular cartilage during the progression of OA that lead to rigidity caused by cross linking of AGEs collagen. The damage in collagen tissue may interfere the mechanical properties of extracellular matrix and could lead to changes in cartilage that associated with OA [12]. Disorder in glucose metabolism may accelerate the process of OA. For example, in a study which evaluating the ability of chondrocytes to regulate glucose transport capacity in extreme conditions of extracellular glucose (lack or excess), it is known that normal chondrocyte capable to regulate the variation of extracellular glucose, whereas in chondrocytes of OA patients are not able to do that mechanisms, thus resulting the accumulation of glucose and high production of reactive oxygen species that potentially mediated the destruction of cartilage [13]. King and Rosenthal [14] reported that tendon abnormalities may also contribute to OA. DM patients demonstrate biochemical and biomechanical changes in tendons that include decreased ruptured threshold and disordered collagen fibrils, in addition there is also mounting evidence that bone healing is defective in patients which developing DM. This might alter the bone mechanics and promote OA, and it also contribute to poor arthroplasty outcomes.

CONCLUSION

It concluded that most of OA patients in H.Adam Malik hospital and Dr.Pirngadi hospital were female, and there is a significant association between knee OA woth type 2 DM. It also concluded that people with type 2 DM has greater risk three times to develop OA.

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