Jurnal Saintika Medika
Jurnal Ilmu Kesehatan dan Kedokteran Keluarga
Faculty of Medicine UMM

Vol. 16 No. 1 June 2020
p-ISSN : 0216-759X e-ISSN : 2614-X476X
http://ejournal.umm.ac.id/index.php/sainmed

Correlation between Diabetes Mellitus Type II and the incidence of knee Osteoarthritis in Wahiddin Sudirohusodo Makassar Hospital

Merryawan Cristmos[1], Chairuddin Rasjad[1], Prihantono[1], Seweng Arifin[1]

[1]Department of Surgery, Faculty of Medicine, Hasanuddin University, Makassar, Indonesia

Email : cristmos.bambang@gmail.com

Receive : Jan 15th2020. Revised : March 4th2020. Published: Jun 27th2020

DOI: https://doi.org/10.22219/sm.Vol16.SMUMM1.10654

ABSTRACT

This research is aimed to find out the correlation between DiabetesMellitus Type II and the incidence of knee osteoarthritis in Wahiddin Sudirohusodo Makassar Hospital.

This research was a case-control conducted on outpatients in the Orthopedic Division of the Department of Surgery, Wahiddin Sudirohusodo General Hospital. There were 51 cases and 51 controls were randomly selected using secondary data from medical records in the period of May 2017 to May 2018.

The results indicate that the patients have an average age of 55.15 + 8.78 years with the majority female gender of 72 people (70,6%). The patient had a mean blood sugar level of 195,84 + 83,4. Bivariate analysis between knee OA and DM type II obtained the value of Odd Ratio i.e. OR = 4.320 (95% Confidence Interval 1.791-10.425).There is a significant correlation between knee osteoarthritis and type II DM with the incidence of knee osteoarthritis (p = 0.002). Type II Diabetes Mellitus increases the risk 4 times to knee osteoarthritis OR = 4.320(95% Confidence Interval 1.791-10.425).

Keywords : osteoarthritis , diabetes mellitus

INTRODUCTION

Osteoarthritis (OA) is the most common degenerative joint disorder and is a major public health problem. It is estimated that about 10% of men and 18% of women worldwide aged over 60 have symptomatic OA. In the United States, it is estimated that 2.5% of the adult population of more than 50 million people in the United States will be affected by OA in 2020 and will be a major cause of morbidity and physical limitations among individuals aged 40 years and over. (Shen, 2014)

A variety of risk factors have been identified in the initiation and progression of OA, including age, sex, traumatic injury, obesity, metabolic dysfunction, and genetic and environmental factors. (Shen, 2014).One of the metabolic disorders thought to be a risk factor for the progression of OA is diabetes mellitus. The diagnosis of DM is established on the basis of examining elevated blood glucose levels. (Ozougwu, 2013)

According to the WHO report, Indonesia ranks fourth largest in the number of people with diabetes mellitus with a prevalence of 8.6% of the total population while the position of the order above is India, China, and the United States. (Perkeni, 2015)

A random sample of 927 male and female population aged 40-80 years was conducted. And the results obtained that the level of arthroplasty due to OA 17.7 per 1000 people in patients with type 2 DM and 5.3 per 1000 people without type 2 DM. The probability of arthroplasty increases with the duration of type 2 DM that occurs in patients. It was concluded in the study that type2 DM is an independent risk predictor for OA. (Schett, 2014)

In Makassar itself, cases of type 2 diabetes also increase every year. At Wahiddin Sudirohusodo Makassar General Hospital in 2016, there were reported to be only ± 10 people per day to undergo outpatient treatment. This number increased to ± 20 people in 2017. While knee OA cases in the period of 2015 were 2157 cases, 2016 as many as 2038 cases, 2017 as many as 2581 cases in the Department of Orthopedics at Wahiddin Sudirohusodo General Hospital and it is also estimated that there will be an increase every year.

Therefore, researchers want to conduct research on the relationship between DM type 2 with the incidence of knee OA with the population of the city of Makassar, especially at the Department of Surgery at Wahiddin Sudirohusodo Makassar Hospital.

The purpose of this study was to determine the relationship of DM type II with the incidence of knee osteoarthritis in RSUP Wahiddin Sudirohusodo Makassar.

METHOD

This research is a case-control study conducted in outpatients in the Orthopedic Division of the Department of Surgery Wahiddin Sudirohusodo General Hospital in Makassar from May 2017 to May 2018. The study sample was all outpatients in the Orthopedic Division of the Department of Surgery Wahiddin Sudirohusodo Hospital in Makassar during the period May 2017 - May 2018 with knee OA status and type 2 DM status fulfilling inclusion and exclusion criteria. Inclusion criteria were all male and female patients who came to the orthopedic surgery clinic with age ≥ 40 years, there was knee OA status in the patient's medical record, there was DM type 2 status in the patient's medical record.Exclusion criteria were patients with incomplete medical record status.

RESULTS

A total of 102 study subjects consisting of 51 patients each with a diagnosis of osteoarthritis and not having osteoarthritis were included in the study. Patients had an average age of 55.15 + 8.78 years with the majority of female sex being 69 people (68.1%). The patient had a

mean blood sugar level of 195.84 + 83.4. Complete data on patient characteristics are presented in Table 4.1.

Table 4.1. Characteristics of Research Subjects

Characteristics	N	%
Age (mean ± SD)	55,159 + 8,78	
Gender		
Male	30	29,4
Female	72	70,6
Parametric Status		
BMI (mean ± SD)	24,04+3,312	
KGD (mean+ SD)	195,84 + 83,4	
DM type 2 (+)	65	63,7
DM type 2 (-)	37	36,3
Osteoarthritis status		
Osteoarthritis	51	50
No osteoarthritis	51	50

Table 4.1. Correlation Characteristics of Research Sample and Osteoarthritis

Characteristics	Osteoarthritis (+)	Osteoarthritis (-)	P
Age (mean ±SD)	55.15± 8,78	51,68 ± 17,3	0,163*
Sex			
Male	10	20	0.053**
Female	42	30	
Parametric Status			
DMtype2(+)	40	25	0.002**
DMtype2(-)	10	27	

There is no statistical difference between the age and sex of people with osteoarthritis and non-osteoarthritis sufferers. It was found that the category of diabetes mellitus had statistically significant differences in each group ($p < 0.05$). A more complete comparison between the two groups is presented in table 2.

Table 4.2. Comparison between the two group

	Osteoarthritis	No Osteoarthritis
DM (+)	40	25
DM (-)	10	27

DISCUSSION

This research was conducted to determine the relationship between osteoarthritis and diabetes mellitus in Wahiddin Sudirohusodo General Hospital, Makassar. The data in this study are primary data from secondary data obtained through the patient's medical record. This research was conducted on 102 research subjects.

The age factor is a risk factor that is very important in the occurrence of OA, caused by degeneration of the joint surface and its use. OA is generally found in the elderly (over 50 years) because in the elderly the formation of chondroitin sulfate which is a basic substance of cartilage is reduced and cartilage fibrosis can occur (Rasjad, 2007). This study shows the average age of 55.15 + 8.78 years.

In this study, it was shown that the incidence of osteoarthritis was more common in women as many as 70.6%, although it was not statistically different (p = 0.053). According to The Framingham Knee Osteoarthritis mentions the prevalence of knee OA increases in elderly patients, and found more in women. In women, heavier OA is found, more joints are involved, and more complaints are found. Several studies have also been conducted on women who have menopause, considered reducing estrogen levels increases the risk of OA in women (Mahajan, 2005). In addition, the prevalence of Osteoarthritis in men before the age of 50 years is higher than in women, but after age more than 50 years the prevalence of women is higher for osteoarthritis than men. These differences become increasingly reduced after the age of 80 years. This is expected because in the mass age of 50-80 years women experience a significant reduction in the hormone estrogen.

In this study, the type 2 diabetes mellitus category showed statistically significant differences in each group (p = 0.002). In the odds ratio analysis, the value is 4.320 (95% CI 1.790-10.425). So based on these results it can be concluded that type 2 DM increases the risk four times higher to experience knee osteoarthritis. 26 The study by Plaza et al explained the relationship between hand or knee osteoarthritis (OA) and DM in the Spanish population of Puerto Rico. In his research, it was found that the prevalence of OA in patients with DM and non-diabetics was 49.0% and 26.5% and female DM patients had a greater risk for OA. (Plaza, 2013)

Elevated blood glucose levels have a positive correlation with the incidence of OA. This condition seems to provide a catabolic signal that increases the activity of proteolytic enzymes that degrade matrix components and cause cartilage degradation. (Onur, 2014).

Increased plasma glucose levels react with free amino acids through the Maillard reaction, which is a chemical reaction of amino acids and decreases glucose levels which results in a non-enzymatic product to create stable conditions. The glycated proteins combine to form larger, insoluble aggregations known as advanced glycation end products (AGEs). This phenomenon occurs in collagen-rich tissues and causes mechanical and biochemical changes in these tissues. AGEs usually accumulate along with the aging process and have been studied as a mechanism that can cause primary OA. (Onur, 2014).

Diabetes mellitus is an additional factor in the pathophysiology of OA through the formation of advanced glycation end products (AGEs). AGEs accumulation is found in articular cartilage during the development of OA which results in collagen stiffness due to cross-linking AGEs. Damage to this collagen tissue can disrupt the mechanical properties of the extracellular matrix and can cause cartilage changes associated with OA. Changes in normal cartilage with the accumulation of AGEs also increase matrix degradation and decrease proteoglycan synthesis by chondrocytes. (Pottie, 2015)

The presence of abnormalities in glucose metabolism is likely to accelerate the process of OA. For example, in a study evaluating the ability of chondrocytes to regulate glucose transport capacity under extreme conditions of extracellular glucose (either less or excess), it is known that chondrocytes normal is able to regulate variations in extracellular glucose concentration, whereas chondrocytes in OA patients are not able to make these arrangements, causing accumulation glucose and high production of reactive oxygen species, which has the potential to mediate cartilage destruction. It is considered to be a pathogenic mechanism that type 2 DM can accelerate degenerative changes that facilitate the development of OA. (Schett, 2013).

This study has limitations. First, this research was conducted at the Wahiddin Sudirohusodo General Hospital in Makassar alone, so this makes the results of this study unable to describe the state of the population of Makassar in general. Then the next limitation, in this study HbA1c analysis is not done as control of blood glucose to assess whether there is a difference in the incidence of knee osteoarthritis in patients with type 2 DM with controlled and uncontrolled blood glucose.

CONCLUSION

Based on the results of this research, the mean age of knee osteoarthritis patients with type 2 diabetes is 55.15 + 8..78 years.The majority of knee osteoarthritis patients are female.There is a significant correlation between knee osteoarthritis with type 2 DM ($p = 0.002$).Type 2 DM increases the risk 3 times for the occurrence of knee osteoarthritis OR = 4,320 (95% CI 1,790-10,425).

REFERENCE

Bay-Jensen, A.C. Slagboom, E. Chen-An, P. Alexandersen, P. Qvist, P.Christiansen, C. Meulenbelt, I. Karsdal, M.A. 2012. Role of hormones in cartilage and joint metabolism: understanding an unhealthy metabolic phenotype in osteoarthritis. Menopause. 20 (5) : 578-586

Bennell, K.L and Hinman, R.S. 2011. A review of the clinical evidence for exercise in osteoarthritis of the hip and knee. *Journal of Science and Medicine in Sport*. 14: 4-9

Cubukcu, D. Sarsan, A. Alkan, H. 2012. Relationship between Pain, Function and Radiographic Findings in Osteoarthritis of the Knee: A Cross-Sectional Study. *Arthritis.*1-5

Kohei, K. 2010. Pathophysiology of type 2 diabetes and its treatment policy. *JMAJ*.53 (1) ; 41-46

Mahajan, A. Verma, S. Tandon, V. 2005. Osteoarthritis. *JAPI*. 53: 634-641

Onur, T. Wu, R. Metz, L. Dang, A. 2014. Characterization of osteoarthritis in a small animal model of type 2 diabetes mellitus. *Bone Joint Res.* 3: 203-2011

Ozougwu, J.C. Obimba, K.C. Belonwu, C.D. Unakalamba, C.B. 2013. The pathogenesis and pathophysiology of type 1 and type 2 diabetes mellitus. *Journal of Physiology and Pathophysiology*. 4(4) : 46-57

Paradowski, P.T. 2014. Osteoarthritis of the Knee: Assessing the Disease. *HealthCare Current Reviews*. 2 (2): 1-4

PERKENI. 2011. Konsensus Pengelolaan dan Pencegahan Diabetes Mellitus tipe

2 di Indonesia. Jakarta: Pengurus Besar Perkumpulan EndokrinologiIndonesia

Plaza, M.M. Santana, L.E.C. Font, Y.M. Mayor, A.M, Vila, L.M. 2013.Association of hand or knee osteoarthritis with diabetes mellitus in a population of Hispanic from Puerto Rico. *J. Clin. Rheumatol.* 19 (1) : 1-16

Pottie, P. Presle, N. Terlain, B. Netter, P. Mainard, D. Berenbaum, F. 2015.Obesity and osteoarthritis: more complex than predicted! *Obesity and osteoarthritis.*1403-1407

Purnamasari, D. 2014. Diagnosis dan klasifikasi Diabetes Mellitus. *Buku Ajar IlmuPenyakit Dalam*. Interna Publishing. Jakarta: 2323-2327

Rasjad, C. 2007. Kelainan Degeneratif Tulang dan Sendi. *Pengantar Ilmu BedahOrtopedi.* Yarsif Watampone. Jakarta: 196-219

Rizaldi, M.B. 2014. Karakteristik penderita osteoartritis lutut di RSUP Haji AdamMalik Medan.

Roach HI, Tilley S. 2007. The Pathogenesis of Osteoarthritis. In: Bronner F, Carson M,editors. *Bone and Osteoarthritis.* Vol 4. Springer. USA: 1-27

Schett, G. Kleyer, A. Perricone, C. Sahinbegovic, E. Iagnocco, A. Zwerina, J.Lorenzini, R. Aschenbrenner, F. Berenbaum, F. D'Agostino, M.A. Willeit, J. Kiechi, S. 2013. Diabetes Is an Independent Predictor for Severe Osteoarthritis. *Diabetes Care*. 36: 403-410

Shen, J, and Chen, D. 2014. On the Horizon From the ORS. *J Am Acad OrthopSurg.* 22: 467-468

Utama, H. 2009. Penatalaksanaan Diabetes Mellitus Terpadu. Edisi 2. BalaiPenerbit FKUI: Jakarta

Wild, S. Roglic, G. Green, A. Sicree, R. King, H. 2004. The global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care*. 27: 1047-1053

WHO. 2004. The Global Burden of Disease 2004 Update. Tersedia di: http://www.who.int/healthinfo/globall_burden_disease/GBD_report_2004 update_full.pdf?ua=1. Diakses pada 12 Agustus 2017

Wood, A.M. Brock, T.M. Heil, K. Holmes, R. Weusten, A. 2013. A review on the management oh hip and knee osteoarthritis. *International Journal of Chronic Disease.*