

An Association between Type 2 Diabetes and Osteoarthritis**Mahidhar Reddy¹, Sarfaraz Syed², Samhitha Reddy³**¹Assistant Professor, Department of Orthopaedics, Govt Gen Hospital, Kadapa, A.P.²Assistant Professor, Department of Orthopaedics, Govt Gen Hospital, Kadapa, A.P.³Associate Professor, Department of General Medicine, Balaji Medical College, Renigunta, Tirupati, Andhra Pradesh

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Conflict of interest: Nil

Abstract:**Background:** Type 2 Diabetes Mellitus (T2DM) and Osteoarthritis (OA) are known to frequently coincide, whether any causal relationship between the two disorders exists is a question of research interest.**Aims and Objectives:** To find an association between Type 2 Diabetes and Osteoarthritis.**Material and Method:** This is a cross-sectional study conducted on 100 patients at department of Orthopaedics in collaboration with department of General Medicine, at Govt. Gen Hospital, Kadapa for the duration of one year, between October 2022 to October 2023 on patients with diabetes and Osteoarthritis, after getting informed consent from patients, approved by institutional ethical committee and after following inclusion and exclusion criteria.**Results:** 100 patients divided into two group, Osteoarthritis with T2DM and Osteoarthritis without T2DM, Correlation between the knee injury and osteoarthritis outcome score and duration of diabetes mellitus and level of HbA1c showed statistically significant correlation (P-value<0.001).**Conclusion:** T2DM can be considered as an independent predictor of severe OA also type 2 diabetes is independently associated with advanced OA of knee.**Keywords:** Type 2 Diabetes Mellitus, Osteoarthritis, Hyperglycemia.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Type 2 diabetes mellitus is a highly prevalent complex disease with a genetic background and the intervention of environmental risk factors, especially poor lifestyle habits that lead to overweight and obesity. The prevalence of the disease markedly increases with age, with >10% of the population aged 65 years having T2DM.

The disease combines several defects, among which include a defect in insulin secretion by pancreatic beta-cells, and cellular insulin resistance mainly present in skeletal muscles and the liver but also in other tissues [1,2]. Prolonged hyperglycemia, both in fasting and postprandial states, leads to advanced glycosylated end products (AGEs), oxidative stress and low grade inflammation, and results in damage to the vessels, mainly in the heart, kidneys, eyes, nerves, but also other tissues [3].

Osteoarthritis (OA) is the most common form of arthritis and is a leading cause of disability globally. The prevalence of both diseases (DM and OA) is rising due to the aging of the general population and the increasing prevalence of obesity. T2DM may influence OA development

through two major pathways, involving a systemic low-grade inflammatory state and oxidative stress resulting from insulin resistance and chronic hyperglycemia. Although the development of OA primarily correlates with age and body weight, there is growing evidence of the potential role of T2DM in the development of OA [4-6], with a prevalence of diabetes of 30% among individuals with OA compared to a prevalence of 13% among the general population [7]. However, the association between T2DM and OA remains unclear and controversial. Thus in this study we are going to find an association between Type 2 Diabetes and Osteoarthritis

Material and Method

This is a cross-sectional study conducted on 100 patients at department of Orthopaedics in collaboration with department of General Medicine, at Govt. Gen Hospital, Kadapa for the duration of one year, between October 2022 to October 2023 on patients with diabetes and Osteoarthritis, after getting informed consent from patients, approved by institutional ethical

committee and after following inclusion and exclusion criteria given below.

Inclusion Criteria:

- Patient age between 35 and 90 years,
- Knee OA diagnosis based on the American Society of Rheumatology
- Patients with DM and/or OA
- Ability to cooperate and read and write in Hindi or English.

Exclusion Criteria:

- Patient age between < 30 Years.
- Presence of any inflammatory or rheumatological disease such as rheumatoid arthritis, chondrocalcinosis, psoriatic arthritis and hemochromatosis that may lead to secondary OA.

Methodology

Clinical and demographic features of all participants patients were recorded. Height and weight of all patients included in the study were questioned and body mass index (BMI) was calculated. The HbA1c levels of diabetic patients.

Study participants were grouped as Type 2 diabetes mellitus with OA and Type 2 diabetes mellitus without OA. In this study we have used Knee Injury and Osteoarthritis Outcome Score (KOOS): It consists of 42 questions. It has 5 subgroups: pain, sports, daily life activities, quality of life, other symptoms, and functional status in leisure time activities. Each subgroup is scored

between 0-100 (0 indicates that there are serious problems and 100 indicates no problems). Peker et al.[8] showed the reliability and validity of the Turkish version in 2007.

Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC): This scale consists of 24 items. It is a scale that examines the pain, stiffness, and physical function of OA. It can measure changes in the patient's condition after both surgical and pharmacological interventions. Tüzün et al.[9] determined the reliability and validity of this index in Turkish in 2005.

Statistical Analysis:

Collected data were entered in Microsoft excel 2016 for further statistical analysis. Categorical data were expressed in terms of frequency and proportion and quantitative data were expressed in terms of mean and standard deviation. Chi-square test was used to find association between variable and in the groups, while t-test were used to find mean difference between the group among the variables. Pearson correlation coefficient obtained to find level of HbA1c and other parameters. P-value<0.05 considered as statistical significant at 5% level of significance.

Results and Observation

In the present study we have included total 100 patients divided into two groups, Osteoarthritis with T2DM and Osteoarthritis without T2DM, their demographic profile as given bellow in table 1

Table 1: Demographic profile of study population

Parameters	Osteoarthritis		P-value
	With T2DM	without T2DM	
Age (Years)			
mean± SD	57.64 ± 10.45	54.21 ±11.73	0.1258
Gender			
Male	11(12%)	14(28%)	0.868
Female	39(88%)	46(72%)	
Body Mass Index			
mean± SD	31.14 ± 8.42	32.32 ±9.74	0.5185
Duration of Diabetes Mellitus (Years)			
mean± SD	10.17 ± 7.45		
HbA1c			
mean± SD	8.17 ± 3.12		

Above table showed demographic profile of study population in both the groups, we have observed there were no statistical significant difference in age, gender and body mass index between the groups.

Table 2: Mean Distribution of Knee injury and osteoarthritis outcome score and functional ambulation score

Parameters	Osteoarthritis		P-value
	With T2DM	without T2DM	
Knee injury and osteoarthritis outcome score			
Pain	55.72±17.12	36.12±13.80	0.001
Symptoms	44.08±16.25	61.42±18.47	0.001
Activities and Daily Living	33.47±17.19	57.12±15.42	0.001
Quality of Life	23.17±18.42	47.8±21.86	0.001

Sports	16.74±13.4	36.42±21.43	0.001
Functional Ambulation Score n(%)			
3	7(14%)	30(60%)	<0.001
4	9(18%)	14(28%)	
5	34(68%)	18(36%)	
Kellgren-Lawrence scale			
Grade 1-2	31(62%)	8(16%)	<0.001
Grade 3	18(36%)	37(74%)	
Grade 4	1(2%)	6(12%)	

Table 3: Correlation between knee injury and osteoarthritis outcome score with duration of DM and HbA1c

Knee injury and osteoarthritis outcome score				
	Duration of DM		HbA1c	
	r	P	r	P
Pain	0.54	<0.001	-0.51	<0.001
Symptoms	0.57	0.001	-0.43	0.001
Activities and Daily Living	0.48	<0.001	-0.41	0.001
Quality of Life	0.43	<0.001	-0.44	0.001
Sports	0.49	0.001	-0.40	0.001

Correlation between the knee injury and osteoarthritis outcome score and duration of diabetes mellitus and level of HbA1c showed statistically significant correlation as shown in above table.

Discussion

While T2DM and OA are known to frequently coincide (along with obesity/overweight, and frequently in the context of MetS), whether any causal relationship between the two disorders exists is a question of research interest. Analysis of studies involving more than 1 million participants shows a clear association of T2DM and OA, and an elevated risk of OA is demonstrated in patients with T2DM even when controlled for body weight. Studies finding an association between T2DM and hand OA raise the question of whether DM impacts on the pathophysiology of OA beyond that which may easily be explained, e.g. the mechanical impact of overweight/obesity (which often accompanies T2DM) on lower limb OA. An association between pain in erosive hand OA and diabetes requires further investigation.[10]

Although it is common in diabetic patients, the relationship between DM and OA development has not been established definitively on evidence-based medicine. However, studies at the molecular level showed that adipokine hormone has a potential contribution to the development of OA [11]. In our study, it was found that knee functional indices and quality of life were worse in diabetic patients compared to non-diabetic patients with gonarthrosis. It was observed that the diagnosis duration of T2DM and Hb A1c level were correlated with knee functional index, quality of life scales. The correlation of the knee functional indexes of the diabetic patients with T2DM

diagnosis and Hb A1c were calculated. While there was a weak negative correlation between Hb A1c and KOOS components (pain, quality of life, sports, daily activities, symptom duration), and positive correlation was observed with duration of T2DM. There are studies evaluating knee function and quality of life in diabetic patients. Annet Eitner et al.[12] performed and compared the KOOS test in 23 diabetic and 47 non-diabetic patients. There was a statistically significant difference between the two groups. Moreover, a statistically significant relationship was detected between HbA1c and KOOS test [12]. Elena Zonova and colleagues [13] compared 52 patients with diabetic OA and 28 patients in terms of pain, quality of life, WOMAC total index, As a result, a numerically significant difference was found between the indices between the two groups.

In our study, the FAS were below 5 in 50 diabetic patients (64%). There was a statistically significant difference between the two groups in the comparison of the control group and FAS, these results were similar to studied by Kaymaz et al. Although the relationship between DM and knee OA was shown in our study, prospective studies are needed to confirm this situation. Therefore, the cross-sectional nature of our study is an important limitation.

Conclusion

From the overall results and observation and after discussion with other studies we can conclude that, T2DM can be considered as an independent predictor of severe OA also type 2 diabetes is independently associated with advanced OA of knee.

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