EUROPEAN ACADEMIC RESEARCH
Vol. VI, Issue 12/ March 2019

Impact Factor: 3.4546 (UIF)
DRJI Value: 5.9 (B+)

ISSN 2286-4822
www.euacademic.org

Osteoarthritis & Glycaemic Status among Type 2 Diabetes Mellitus Patients

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Abstract

Osteoarthritis is a major public health problem for both developed and developing countries. Osteoarthritis is by far the most common form of arthritis. Diabetes could be an independent risk factor for osteoarthritis. Hyperglycaemia is one of the main trigger of joint degradation in osteoarthritis. This cross-sectional study was conducted among 228 type 2 diabetes mellitus patients at the out-patient department (OPD) of National Health Care Network, Mirpur, Dhaka.

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Data were collected by face-to-face interview and of reviewing medical records with the help of a semi-structured questionnaires and checklist respectively. Among all patients, 172 (75.4%) were female and 56 (24.6%) were male. Mean ± (SD) age of the patients was 55.79±7.974 years and majority (32.9%) of the patients had secondary level education. Average monthly family income of the patients was Tk. 31875.00 (±18214.179) and majority (64.5%) of them were housewives. Among all patients, 77.6% were married and most (96.9%) of them were Muslim. Majority (68.4%) of the patients came from nuclear family and most (81.15%) of them had no family history of joint pain. Of all, 42.5% were suffering from early stage of osteoarthritis and the rest 15.8% were suffering from advanced stage of osteoarthritis. 69.3% by fasting blood sugar level, 71.9% by 2 hours after breakfast sugar level, 70.6% by glycosylated hemoglobin (HbA1c) level of the patients had uncontrolled diabetes mellitus. Among the patients with uncontrolled diabetes mellitus, 69.0% on the basis of FBS, 67.1% on the basis of 2HABF and 67.7% on the basis of HbA1c suffered from osteoarthritis and these findings were found statistically significant (χ^2, $p<0.05$). Female (60.5%) developed osteoarthritis more than their counter part males (51.8%) but this discrepancy was not statistically significant (χ^2, $p>0.05$). By age, most (80%) of the patients aged (70-75 yrs) suffered from osteoarthritis in comparison to the 45-59 age group (54.2%) and this differences was statistically significant (χ^2, $p<0.05$). The study found positive association of glycaemic status of type 2 diabetes mellitus and osteoarthritis. Specific measures like diet control, periodic blood sugar monitoring and regular physical exercise should be taken to maintain normoglycaemia for prevention of osteoarthritis. Large scale follow up study should be conducted to reduce the burden of osteoarthritis in diabetic population.

Keywords: Osteoarthritis & Glycaemic Status, Type 2 Diabetes Mellitus Patients

INTRODUCTION:

Osteoarthritis (OA) is the leading cause of musculoskeletal handicap in the world. Ageing and obesity are the two main

risk factors for OA. Since prevalence of these conditions are going to exponentially expand, an epidemic of the disease in the next decade is expected, leading to a dramatic increase in the number of total joint replacements and so entails significant costs to society. In order to attenuate the individual and societal consequences, and because no disease-modifying drugs have proven their efficacy yet, any preventive policies should have a dramatic impact on the quality of life and on countries economy. A better delineation of the different risk factors of the disease should lead to a better personalisation of the preventive messages delivered by doctors and stakeholders. To date, the main OA phenotypes described in the literature are ageing, post-traumatic, hormonal, genetic and metabolic OA (Berenbaum F 2011).

In contrast to various complications of diabetes mellitus which are life threatening, rheumatological manifestations lead to considerable morbidity**.** Other rheumatological diseases, which are common in the general population, have increased prevalence in the diabetic population. These are osteoarthritis (OA), especially of the knee, hip and spine; osteoporosis, osteolysis of the forefoot, migratory osteolysis of the hip and knee and pseudogout. All these diseases have a severe clinical course and unfavorable prognosis in the diabetic population (Sarkar RN et al. 2003).

Epidemiological transition is underway in Bangladesh along with demographic and socio-economic transition has taken place. As a result, diabetes mellitus along with other non-communicable diseases are highly prevalent in the country at the moment. Several studies showed that type 2 diabetes mellitus accounts for multiple long term complications to the patients (Delamater A 2006).

Even among physically impaired older women, diabetes is associated with a major burden of disability. A wide range of impairments and comorbidities explains the diabetes-disability

relationship, suggesting that the mechanism for such an association is multifactorial.

OBJECTIVES:

General Objective was to assess the relationship between osteoarthritis & glycaemic status among type 2 diabetes mellitus patients. **Specific Objectives were** to determine severity of Osteoarthritis in type 2 Diabetes Mellitus Patients, to find out the factors influencing osteoarthritis in type 2 diabetes mellitus patients, to assess the glycaemic status of the patients, to determine the socio-demographic characteristics of type2 diabetes mellitus patients.

METHODOLOGY:

To assess the association between osteoarthritis and glycaemic status among type 2 diabetes mellitus patients attending at the out-patient department of NHN, mirpur, Dhaka, Bangladesh, the current study was conducted as per the following methodology:

Study Design: A cross-sectional study was conducted to assess the association between osteoarthritis & glycaemic status among type 2 diabetes mellitus patients at out-patient department of NHN.

Study period: The study was conducted from January 2013 to December 2013. Initially topic selection was started from January; protocol was developed and approved by the protocol approval committee of NIPSOM in June. In the meantime literature review was done throughout all the study period. The data was collected from 1st September to 15th September of 2013. Report writing was done from 1st week of December to 3rd

week of December. The detail work schedule has been appended as Annexure-1.

Study places: The study was conducted at out Patient Department (OPD) of National Health care Network. The study hospital was selected purposively. Because of the availability of study population i.e. type 2 diabetes mellitus patients at out-patient department of NHN. It is the institution where respective patients come from the greater Dhaka city and from different areas of the country to receive health care services at its out-patient department.

Different types of diabetic patients with different types of joint pain are also available here. There are about 10 medical officers working at the OPD of NHN and each medical officer consult with 30 patients on an average during the stipulated time period (from 8.30 A.M. to 2.00 P.M.)

Moreover, due to the constraint of time, money and other resources required for the study, the study area was selected as a convenient one for performing the study.

Study Population: Study populations were Type 2 Diabetes mellitus patients attending at the outpatient department of National Health care Network (NHN) during data collection period.

Sampling unit: Each type 2 diabetes patient attended at the out-patient department of NHN during the data collection period.

Inclusion Criteria for the patients:

- Age more than 45 years
- Diagnosed Type 2 Diabetes Mellitus patients
- Type 2 Diabetes Mellitus patients provided consent for participation in the study.

- Patients were included irrespective of sex.

Exclusion Criteria: Diabetes Mellitus patients who were not willing to provide informed consent, Other than type 2 diabetes mellitus patients and psychologically seriously ill diabetic patients.

Sampling Technique: Systematic Random sampling technique was used for collection of data in the study. As noted earlier, there were about 10 medical officers working at OPD of NHN and each doctor had to consult with 30 patients on an average during the daily consultation period. On the other hand, it took about 25 minutes to take all required information from one patient by interviewing and from the reference book of the patient. Within this interview period, a doctor consulted 3-4 patients. In this way 10-12 patients were interviewed in each day of data collection period.
As we know that:

Sampling interval=Population size/Sample size=N/n

Here, N=30 i.e. the total number of type 2 diabetes patients consulted by a doctor in a working day which was prefixed by NHN and which was the population size for each data collection day and n=10 i.e. the total number of patients were interviewed in each day which was the sample size for each data collection day.
So, sampling interval=30/10=3
The first patient was selected randomly from the number 1 to 3 & then every 3rd patient was interviewed. It is to be mentioned here that data were collected from the patients consulted by different doctors on different days.

Data Collection Technique:
After taking verbal consent from the patients following introducing and informing the study purpose and objectives, data were collected by face-to-face interview ensuring privacy and confidentiality by using the questionnaire and reviewing routinely kept medical report.

Questionnaire: It was used to collect data from the patients by interviewing specially regarding their socio-demographic characteristics, duration of the disease, involved joint pain, medicine intake and others.

Checklist: A checklist was used to collect the following information: biochemical parameters (Fasting blood sugar, Blood sugar 2hours after breakfast, HbA_{1c}), joint involved for OA, stage of Osteoarthritis.

Data Analysis:
Analysis was performed using the latest available version of SPSS software (Statistical Package for Social Sciences). For descriptive statistics means, medians, standard deviations & ranges for numerical data and frequencies & proportions for categorical data was calculated as required. For inferential statistics, $\chi 2$ test was be used to analyze the various domains. Data was presented in frequency tables, bar and pie as per need.

Ethical Issues:
At the beginning, approval was obtained from the ethical committee of NIPSOM. Before collection of data, written permission was taken from the administrative head of the selected hospital. Before interview, informed written consent was obtained from every patient after informing about the purpose of the study, its expected duration, nature, anticipated

physical and psychological risks & benefits of participation, A complete assurance was given that all information's provided by the patients will be kept confidential. The right was given to the patients not to participate and to discontinue participation at any time without penalty. Informed consent was documented appropriately.

Limitations of the Study

1. The sample size was not sufficient enough, so, the findings might not necessarily represent the study population.
2. The researcher had to depend on the respondents regarding the information about diet control, physical exercise and drug intake, joint pain relation with movement, joint swelling. So, there might have some recall bias in data in this respect.

RESULTS

The descriptive cross-sectional study was conducted among type 2 diabetes patients attending at the outpatient department of National healthcare network. The study was done among 228 patients and following findings are revealed.

Table-1: Socio-demographic characteristics of the patients

Sex	Female	172 (75.4%)
Age group	45-59	155 (68%)
Educational qualification	Secondary	75 (32.9%)
Occupation	Housewife	147 (64.5%)
Marital status	Married	177 (77.6%)
Religion	Muslim	221 (96.9%)
Type of family	Nuclear	156 (68.4%)
Family members	2-4	123 (53.9%)
Income group	20001-50000	131(57.5%)

Distribution of glycaemic status of the patients by FBS

Out of 228 patients fasting blood sugar level of 70 patients (30.7%) had controlled diabetes mellitus, while 158 patients

(69.3%) had uncontrolled diabetes mellitus which are focused on table- 1

Table-2: Glycaemic status of the patients by FBS

Glycaemic status of the patients by FBS	Frequency	Percent
Controlled DM(≤7.0mmol/l)	70	30.7
Uncontrolled DM(≥7.0mmol/l)	158	69.3
Total	228	100.0

Distribution of glycaemic status of the patients by 2HABF

Out of 228 patients 2 hours after breakfast sugar level of 64 patients (28.1%) had controlled diabetes mellitus, while 164 patients (71.9%) had uncontrolled diabetes mellitus. Which are focused on table- 2

Table- 3: **Glycaemic status of the patients by 2HABF sugar level**

Glycemic status by 2HABF sugar level	Frequency	Percent
Controlled DM(≤11.0mmol/l)	64	28.1
Uncontrolled	164	71.9
Total	228	100.0

Distribution of glycaemic status of patients by HbA1c

Out of 228 patients HbA1c level of 67 patients (29.4%) had controlled diabetes mellitus, while 161 patients (70%) had uncontrolled diabetes mellitus, which are focused on table-4

Table 4: Glycaemic status of patients by HbA1c

Glycaemic status by HbA1c Level	Frequency	Percent
Controlled (≤6.5%)	67	29.4
Uncontrolled (≥ 6.5%)	161	70.6
Total	228	100

Distribution of type 2 DM patients by osteoarthritis and educational qualification

Among the secondary, majority i.e. 47(62.7 %) of the patients developed osteoarthritis, 23(48.9%) of the graduate patients and 22(59.5%)of primary patients developed osteoarthritis. This difference of osteoarthritis by educational qualifications of the type 2 DM patients was statistically significant, [$\chi^2_{(5)}$=17.356, p<0.05]

Table-5: Association between osteoarthritis and educational qualification of type 2 DM patients

Educational qualification of type 2 DM patients	Osteoarthritis		Total f (%)
	Present f (%)	Absent f (%)	
Illiterate	21((91.3%)	2(8.7%)	23(100/0%)
Primary	22(59.5%)	15(40.5%)	37(100.0%)
Secondary	47(62.7%)	28(37.3%)	75(100.0%)
Higher Secondary	13(48.1%)	14(51.9%)	27(100.0%)
Graduate	23(48.9%)	24(51.1%)	47(100.0%)
Post Graduate	07(36.8%)	12(63.2%)	19(100.0%)
Total	133(58.3%)	95(41.7%)	228(100.0%)
Significance	$\chi^2_{(5)}$=17.356,p=0.004		

Distribution of the type 2 DM patients by osteoarthritis and occupation

Among the housewives 94(63.9%) of the patients developed osteoarthritis, 23(56.1%) of the retired and13 (44.8%) of service holder developed osteoarthritis. On the other hand 8(72.7%) businessman did not develop osteoarthritis. This difference of osteoarthritis by occupation of the OA patients was statistically significant [$\chi^2_{(3)}$=8.532,p<0.05]

Table-6: Association between osteoarthritis and occupation of the type 2 DM patients

Occupation of type 2 DM patients	Osteoarthritis		Total f (%)
	Present F (%)	Absent f (%)	
Service holder	13(44.8%)	16(55.2%)	29(100.0%)
Business	03(27.3%)	08(72.7%)	11(100.0%)
Housewife	94(63.9%)	53(36.1%)	147(100.0%)
Retired	23(56.1%)	18(43.9%)	41(100.0%)
Total	119(58.9%)	83(41.9%)	202(100.0%)
Significance	$\chi^2_{(3)}$=8.532,p=0.036		

Distribution of type 2 DM patients by osteoarthritis and family member having joint pain

Among the family member having joint pain 19(44.2%) of the patients having osteoarthritis. On the other hand without family member suffering 114 (61.6%) of the patients having osteoarthritis. But this difference of osteoarthritis by family member suffering of the patients was statistically significant. [$\chi^2_{(1)}$=4.364, p<0.05]

Table-7: Association between osteoarthritis and family member having joint pain

Family member having joint pain	Osteoarthritis		Total f (%)
	Present f (%)	Absent f (%)	
Yes	19(44.2%)	24(55.8%)	43(100.0%)
No	114(61.6%)	71(38.4%)	185(100.0%)
Total	133(58.9%)	95(41.7%)	228(100.0%)
Significance	$\chi^2_{(1)}$=4.364,p=0.028		

Distribution of type 2 DM patients by osteoarthritis and glycaemic status (on the basis of FBS)

Out of 228 patients,70 patients had controlled diabetes mellitus, among them24(34.3%) developed osteoarthritis. On

the other hand 158 patients had uncontrolled diabetes mellitus, 109 (69.0%) developed osteoarthritis. This difference by osteoarthritis and glycaemic status by FBS was statistically significant [$\chi^2_{(1)}$=24.033,p<0.01]

Table-8: Association between osteoarthritis and glycaemic status by Fasting blood sugar (FBS)

Distribution of glycaemic status by FBS	Osteoarthritis		Total f (%)
	Present f (%)	Absent f (%)	
Controlled	24(34.3%)	46(65.7%)	70(100.0%)
Uncontrolled	109(69.0%)	49(31.0%)	158(100.0%)
Total	133(58.3%)	95(41.7%)	228(100.0%)
Significance	χ^2=24.033$_{(1)}$,p=0.000		

Distribution of type 2 DM patients by osteoarthritis and glycaemic status (on the basis of 2HABF)

Out of 228 patients, 64 patients had controlled diabetes mellitus, among them 23(35.9%) developed osteoarthritis. On the other hand 164 patients had uncontrolled diabetes mellitus, 110 (67.1%) developed osteoarthritis. This difference by osteoarthritis and glycaemic status by 2HABF was statistically significant [$\chi^2_{(1)}$=18.361,p<0.01]

Table-9: Association between osteoarthritis and glycaemic status by 2 hours after breakfast (2HABF)

Distribution of glycaemic status by 2HABF	osteoarthritis		Total f (%)
	Present f (%)	Absent f (%)	
Controlled	23(35.9%)	41(64.1%)	64(100.0%)
Uncontrolled	110(67.1%)	54(32.9%)	164(100.0%)
Total	133(58.3%)	95(41.7%)	228(100.0%)
Significance	$\chi^2_{(1)}$=18.361,p=0.000		

Distribution of type 2 DM patients by osteoarthritis and glycaemic status (on the basis of HbA1c)

Out of 228 patients, 67 patients had controlled diabetes mellitus, among them 24(35.8%) developed osteoarthritis. On

the other hand 161 patients had uncontrolled diabetes mellitus, 109 (67.7%) developed osteoarthritis. This difference by osteoarthritis and glycaemic status by HbA1c was statistically significant [$\chi^2_{(1)}$=19.784,p<0.01]

Table-10: Association between osteoarthritis and glycaemic status by glycosylated hemoglobin (HbA1c)

Distribution of glycaemic status by HbA1c	Osteoarthritis		Total f (%)
	Present f (%)	Absent f (%)	
Controlled	24(35.8%)	43(64.2%)	67(100.0%)
Uncontrolled	109(67.7%)	52(32.3%)	161(100.0%)
Total	133(58.3%)	95(41.7%)	228(100.0%)
Significance	$\chi^2_{(1)}$=19.784,p=0.000		

Distribution of type 2 DM patients by stage of osteoarthritis and glycaemic status (on the basis of FBS)

Out of 133 patients, 24 patients had controlled diabetes mellitus, among them 14(58.3%) developed early stage of osteoarthritis. On the other hand 109 patients had uncontrolled diabetes mellitus, 26 (23.9%) developed advanced stage of osteoarthritis. This difference of stage of osteoarthritis and glycaemic status by FBS was statistically significant [$\chi^2_{(1)}$=3.162,p=0.05]

Table-11: Association between stage of osteoarthritis and glycaemic status by Fasting blood sugar (FBS)

Distribution of glycaemic status by FBS	Stage of osteoarthritis		Total f (%)
	Early f (%)	Advanced f (%)	
Controlled	14(58.3%)	10(41.7%)	24(100.0%)
Uncontrolled	83(76.1%)	26(23.9%)	109(100.0%)
Total	97(72.9%)	36(27.1%)	133(100.0%)
Significance	$\chi^2_{(1)}$=3.162,p=0.05		

Discussion:

Among all patients, 172 (75.4%) were female and 56 (24.6%) were male. Mean ± (SD) age of the patients was 55.79±7.974

years and majority (32.9%) of the patients had secondary level education. Average monthly family income of the patients was Tk. 31875.00 (±18214.179) and majority (64.5%) of them were housewives. Among all patients, 77.6% were married and most (96.9%) of them were Muslim. Majority (68.4%) of the patients came from nuclear family and most (81.15%) of them had no family history of joint pain. Out of all patients, 43 patient's (18.9%) family members were suffering from joint pain and 185 patient's (81.15%) family member were not suffering from joint pain. Out of 228 patients, 133 patients (58.3%) were diagnosed having osteoarthritis. 95 (41.7%) patients not having osteoarthritis. Among the family member having joint pain, 19 (44.2%) of the patients have osteoarthritis. On the other hand without family member suffering 144(61.6%) of the patients having osteoarthritis. But this difference of osteoarthritis by family member suffering of the patients was statistically significant ($p<0.05$). That means if any of the family members have osteoarthritis, the probability of having osteoarthritis is high.

Out of 228 patients, 133 patients (58.3%) were diagnosed having osteoarthritis. 95 (41.7%) patients did not have osteoarthritis. Out of 228 patients fasting blood sugar level,70 patients (30.7%) had controlled diabetes mellitus, among them24(34.3%) developed osteoarthritis. On the other hand, 158 patients (69.3%) had uncontrolled diabetes mellitus of which109 (69.0%) developed osteoarthritis. This difference by osteoarthritis and glycaemic status by FBS was statistically significant ($p<0.05$). So, there is significant association between osteoarthritis and glycaemic status by Fasting blood sugar (FBS). This result is consistent with a clinical and epidemiological survey conducted by Cimmino MA (1990). Another study summarized by Altman RD (2007) stated that in an epidemiologic survey of 1026 patients, the mean fasting

plasma glucose level was significantly higher in patients with OA than in normal control subjects.

133 patients out of 228 patients (58.3%) were diagnosed having osteoarthritis. 95 (41.7%) patients did not have osteoarthritis. Out of 228 patients 2 hours after breakfast sugar level of 64 patients (28.1%) had controlled diabetes mellitus, among them 23(35.9%) developed osteoarthritis. On the other hand, 164 patients (71.9%) had uncontrolled diabetes mellitus of which 110 (67.1%) developed osteoarthritis. This difference by osteoarthritis and glycaemic status by 2HABF was statistically significant ($p<0.05$). That means there is significant association between osteoarthritis and glycaemic status by 2 hours after breakfast (2HABF). The patients who are found to have uncontrolled DM by FBS, they are also found to have uncontrolled DM by 2HABF.

HbA1c reflects average plasma glucose over the previous 2–3 months in a single measure which can be performed at any time of the day and does not require any special preparation such as fasting. It is an option for assessing glucose tolerance in people without diagnosed diabetes. 133 patients out of 228 patients (58.3%) were diagnosed having osteoarthritis. Out of 228 patients, HbA1c level of 67 patients (29.4%) had controlled diabetes mellitus, among them 24(35.8%) patients developed osteoarthritis. On the other hand, 161 patients (70%) had uncontrolled diabetes mellitus of which, 109 (67.7%) developed osteoarthritis. This difference by osteoarthritis and glycaemic status by HbA1c was statistically significant ($p<0.05$). So, it can be said that patients who have uncontrolled diabetes mellitus, they are at more risk of having osteoarthritis.

It was seen that, out of 133 patients, 97(42.5%) patients were suffering from early stage of osteoarthritis, rest of the patients (15.8%) were suffering from advanced stage of osteoarthritis. It was found that majority of patients i.e. 41 patients represented the duration of type 2 diabetes mellitus

group 1-5 years, among 33 (80.5%) patients had developed early stage of osteoarthritis. On the other hand, 40 (100.0%) patients were in the duration of type 2 diabetes mellitus group 6-10 years, among 16 (40.0%) patients had developed advanced stage of osteoarthritis. Here, we can see that the stage of osteoarthritis advances with the increase of duration of T2DM. This difference of stage of osteoarthritis by distribution of duration of DM was not statistically significant($p>0.05$).However, different authors interprets this relation differently. "Musculoskeletal complications are most commonly seen in patients with a longstanding history of type 1 diabetes, but they are also seen in patients with type-2 diabetes.

Out of 133 patients, 23 patients had controlled diabetes mellitus, among them 16(69.6%) developed early stage of osteoarthritis. On the other hand, 110 patients had uncontrolled diabetes mellitus, 29 (26.4%) developed advanced stage of osteoarthritis. This difference between stage of osteoarthritis and glycaemic status by 2HABF was statistically significant ($p>0.05$). Patients who have uncontrolled DM by FBS, HbA1C, they are also prone to have uncontrolled DM by 2HABF. If the patients do not have controlled DM by 2HABF, there is a possibility to develop osteoarthritis complications.

Out of 133 osteoarthritis type 2 diabetes mellitus patients, 24 patients had controlled diabetes mellitus by FBS, among them 14(58.3%) patients developed early stage of osteoarthritis. On the other hand, 109 patients had uncontrolled diabetes mellitus, 26 (23.9%) of them developed advanced stage of osteoarthritis. This difference of stage of osteoarthritis and glycaemic status by FBS was statistically significant ($p<0.05$). In a population-based cohort study conducted by SchettG et al. (2013), patients with impaired fasting glucose showed a moderately elevated risk of arthroplasty due to severe OA ($p= 0.030$). They showed that

fasting glucose levels are higher in OA patients than in non-OA controls.

In case of HbA1c level, out of 133 patients, 24 patients had controlled diabetes mellitus, among them 16(66.7%) developed early stage of osteoarthritis. On the other hand 109 patients had uncontrolled diabetes mellitus, 28 (25.7%) developed advanced stage of osteoarthritis. This difference between stage of osteoarthritis and glycaemic status by HbA1c was not statistically significant ($p>0.05$). However, HbA1c level increases with the age of the DM patients stated by Aydeniz A (2008). Little RR et al. (1988) summarizes that the elevated HbAlc level identified those patients who were at greatest risk of developing chronic diabetes complications

CONCLUSION

This cross-sectional study was conducted among type 2 diabetes mellitus patients attending at the out-patients department of National Healthcare Network, Dhaka from January to December 2013. The study was conducted to assess the association between osteoarthritis and glycaemic status among type 2 diabetes mellitus patients. The study showed that female was predominant among the type 2 diabetes mellitus patients and majority of female patients developed osteoarthritis. The study revealed that middle age groups were predominant but elderly developed osteoarthritis. About one third of the patients had secondary level education but most of illiterate developed osteoarthritis. Majority of patients were housewives. Most of the patients were Muslims, married, came from nuclear family and in middle income group. The study showed that majority of the diabetic patients was suffering from osteoarthritis and most of them with duration of 1-5 years. . Most of the patients were having no family history of joint pain. Majority of the patient were suffering from knee osteoarthritis, related with movement

and without joint swelling. Majority of the patients were suffering from early stage of osteoarthritis and rest of them were suffering from advanced stage of osteoarthritis. By fasting blood sugar level,69.3% patients had uncontrolled and 30.7% had controlled, by2 hours after breakfast sugar level, 71.9% had uncontrolled and 28.1% had controlled and by glycosylated hemoglobin level, 70.6% of the patients had uncontrolled and 29.4% had controlled diabetes mellitus. Osteoarthritis was significantly higher in uncontrolled glycaemic status patients in comparison to the controlled glycaemic status patients. So, more controlled glycaemic status, less chances of osteoarthritis in diabetic population. Osteoarthritis was significantly higher in housewives in comparison to another occupation. By age most (80%) of them between 70-75 yrs developed osteoarthritis than the 45-59 age group and this differences was statistically significant (χ^2,$p<0.05$). Osteoarthritis was significantly higher in middle income group in comparison to higher or lower income group and this differences was not statistically significant (χ^2, $p>0.05$). The association between osteoarthritis and family member having joint pain was statistically significant (χ^2,$p<0.05$). So, Osteoarthritis in all its heterogeneous forms appears to be strongly genetically determined. Genetic factors account for at least 50% of cases of osteoarthritis in the hip and hands and a smaller percentage in the knee. The Universal anti-diabetic treatment like diet control, physical exercise and drug should compliance with the patients for optimal control of glucose level. Control of glycaemic status for diabetes patients is very essential to combat various co-morbidities like osteoarthritis.

Recommendations

1. To combat osteoarthritis as a co-morbidity of diabetes mellitus, it is important to ensure the multidisciplinary approach to the diabetic patient.

2. To minimize the osteoarthritis related disability special attention should be given to the middle aged, middle classgroup of the patients, as the majority of the patients were in these groups were showing uncontrolled diabetes mellitus having osteoarthritis.
3. To prevent diabetes related osteoarthritis, the patients should be disciplined in respect of diet control, physical exercise and regular intake of drug to maintain the strict glycaemic control.
4. To reduce disability, awareness should be created in diabetic population, especially in illiterate female and proper emphasis should be given on this vulnerable group.
5. To ensure good control of diabetes mellitus and osteoarthritis policy makers should be given special attention for resource allocation, diagnostic facilities and treatment facilities at all level of health care services of the country.

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