

CLINICAL STUDY OF ASSOCIATION OF BMI WITH NEPHROPATHY IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

BACKGROUND

Diabetes is a common disease that is associated with high mortality and morbidity from macro vascular and micro vascular complications. Whereas macro-vascular complications, particularly cardiovascular diseases, substantially reduce the life expectancy of diabetics in all age groups, micro vascular complications lead to blindness, renal failure and amputation, which require expensive health care resources. As the diagnosis of type 2 diabetes is usually preceded by years of undiagnosed hyperglycemia, at the time of first diagnosis 8% of patients already have cardiovascular disease, 37% have micro aneurysms or more severe retinopathy in one eye, 18% have retinopathy in both eyes, 18% have micro albuminuria, and 2.3% and 15.2% have polyneuropathy defined by clinical signs and according to electrophysiological criteria, respectively. We wanted to study the association of BMI with nephropathy in patients with type 2 diabetes mellitus.

METHODS

We have studied a total of 50 patients including both male and females of type 2 diabetes mellitus with respect to the various clinical presentations including urinary symptoms. Patients were categorised into two groups one with BMI <25 and another with BMI >25. These patients are evaluated for duration of diabetes, changes in weight, central obesity, dietary habits & exercise pattern. Each patient was further evaluated with complete blood count, blood urea, creatinine, FBS, PPBS.

RESULTS

In our study a total of 50 patients of type 2 diabetes mellitus were enrolled of which 22 (44%) are males and 28 (56%) are females. Of the 50 patients, 22 patients have BMI <25 of which 6 patients have diabetic nephropathy and of the 28 patients with BMI >25, 13 patients have diabetic nephropathy.

CONCLUSIONS

Our study results show that, nephropathy was noted in a total of 19 patients (38%), of which 6 (31.6%) patients have BMI <25 and the remaining 13 (68.4%) patients have BMI >25.

KEYWORDS

DM- Diabetes Mellitus, DN- Diabetic Nephropathy

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BACKGROUND

Diabetes is a chronic and prevalent disease around the world. According to a report of the International Diabetes Federation (IDF) in 2010, diabetes was estimated to be the cause of 8.8% of deaths at the ages of 22 and 97.¹ The prevalence of diabetes in has risen to over 10 present.² This disease has physical symptoms such as ocular, renal and cardiovascular complications. This disease is spreading and it is predicted that its outbreak will reach from 285 million

people in 2010 to 437 million in 2030.³ It also imposes heavy costs on health systems.⁴ More than 72% of patients with diabetes have Type 2 diabetes.⁵ The injectable insulin is prescribed and lifestyle modification and oral administration are considered for patients with type 2 diabetes if it is uncontrolled. Insulin injection will lead to better control of blood glucose, and thus better control of side effects of the disease.

In fact, the cardiovascular disease is the major cause of diabetes-related mortality and it is 2 to 5 times more common than normal people. In addition, the risk of stroke is high in these people.⁶ The cost and burden of diabetes are very expensive for countries, so that diabetics, especially those with diabetes-related cardiovascular complications, have lower levels of health.⁷ According to studies, cardiovascular risk factors are complex and multifactorial in type 2 diabetic patients. Obesity, high age, family history of diabetes, high severity of diabetes, lack of self-monitoring, lack of controlled blood glucose, unhealthy lifestyle and low

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quality of life are the most important risk factors for diabetes and its complications.⁸ Measurement of Glycated haemoglobin (HbA1c) shows the average blood glucose level over the past six weeks to three months and it is considered to be the best and most widely used long-term blood glucose control.^{6,9} People without diabetes have 4% to 6% of Glycated haemoglobin, but diabetics with moderate severity under high control have Glycated haemoglobin of 6% to 7%.¹⁰ Glycated haemoglobin values from 7% to 9% show moderate and severe disease and values higher than 9% are severe and hazardous. The treatment of type 2 diabetes aims to reduce the levels of blood glucose or range of Glycated haemoglobin to near the normal range (6 to 7 percent). Amounts of Glycated haemoglobin should be lower than 7%. Chronic increase in blood glucose is a major cause of acute, short-term and long-term complications of diabetes and can affect all body organs.^{11,12} Self-monitoring of blood glucose (SMBG) postpones the onset of cardiovascular complications¹⁰ because the increased blood glucose is the major cause of diabetes complications.¹² Self-monitoring of blood glucose is an active spontaneous process such as controlling the food intake, exercising or regular heart checking for controlling cardiovascular complications of diabetes and its monitor by patients.¹³ Studies have found that improving the self-monitoring of blood glucose can improve the health outcomes of diabetic patients and reduce complications of diabetes and reduce the hospitalization for complications associated with diabetes.¹⁴ The present study aimed to investigate the factors associated complications of diabetes in type 2 diabetes patients.

Sl. No.	Type	Factors
01	Genetic	Genetic Markers, Family History
02	Demographic	Age, Sex, Ethnicity
03	Behavioural and Lifestyle	Obesity, Physical Inactivity, Diet, Stress, Urbanisation
04	Metabolic Determinants	IGT, Gestational Diabetic Mellitus, DM in offspring/ giving birth to large baby, IUGR-Over Nutrition

Table 1. Epidemiological Risk Factors for Type II Diabetes Mellitus¹⁵

Development and progression of microvascular complications influenced by many other components of metabolic syndrome like blood pressure and obesity.^{16,17,18} Similar to the trend of raising diabetic population in developing countries including India, the prevalence of obesity is also rapidly raising.^{19,20} Excess of the body fat and low muscle mass may explain the high prevalence of hyper-insulinaemia and Type II DM in Asian Indians.^{21,22} Prevalence of Type II DM is as high as 50% among the offspring of Type II DM patients in India and it is the highest reported all over the world.²³

Sl. No.	Type of Antibody	Sensitivity	Specificity
01	Anti-glutamic acid decarboxylase antibodies (GAD 65)	70-90%	99%
02	Anti-Insulin Antibodies (IAA)	40-70%	99%
03	Tyrosine Phosphatase Antibodies	50-70%	99%

Table 2

Across the world, diabetic nephropathy is the leading cause of Chronic Kidney Disease and ESRD requiring dialysis. 50% of patients with diabetes of 20 years or more duration and those with more than 10 years of proteinuria will have overt diabetic nephropathy.²⁷ In India, diabetes is responsible 30% of all Chronic Kidney Disease (CKD) cases.²⁸ Among South Indians, prevalence of nephropathy is shown to be 9.4%.²⁹ Obesity, BMI is the independent predictor of diabetic nephropathy.³⁰

We wanted to study, the association of BMI with diabetic nephropathy in patients with type 2 diabetes mellitus, the prevalence of nephropathy in patients with diabetes mellitus and the association between BMI and Diabetic Nephropathy.

METHODS

Study Design

Cross sectional observational study.

Study Setting

Patients attending medical Out Patient Department & in patients in Govt. General Hospital & Medical College Anantapur.

Study Period

October 2018 to March 2019.

Sample Size

50 Cases.

Inclusion Criteria

1. All adult patients of age >20 yrs.
2. Both male and female patients.
3. Both type 1 and type 2 diabetes.
4. Patients who are willing to participate in the study by giving written informed consent.

Exclusion Criteria

1. Patients with Congestive Heart Failure.
2. Urinary Tract Infection.
3. Pregnancy.
4. Prostatomegaly.
5. Fever.
6. Known Renal Disease.
7. Patients who are not willing to participate in the study by giving written informed consent.

All patients who satisfied the inclusion criteria are thoroughly evaluated by clinical history and physical examination for the micro vascular complications and subjected to relevant investigations and data recorded in the proforma specially designed for the study. Results are analysed and were compared with the results available in the literature. BMI is calculated using the formula: $\text{Wt. in Kg} \div \text{Ht in m}^2$ (ponderal index) BMI ≥ 25 are Obese and BMI < 25 are no obese (modified ATP III) A 24 hour urine collection done after educating the patient and total protein estimation done by - Photometric measurement of turbidity

produced by adding sulfosalicylic acid. 24 hr. urine protein >500 is considered positive for nephropathy.³¹ Other routine investigations including F.B.S., P.P.B.S., Serum cholesterol, R.F.T., were done in our hospital. Informed, written consent is obtained from the patients who are willing to participate in the study in the language known to them. All the investigations are done at free of cost to the patients in the institution. And hence no financial burden imposed on patients.

Statistical Analysis

Analysis done in EXCEL using EPI Info software. Chi Square test was applied to know the statistical significance between the proportions. In all cases where Chi Square test can't be applied because the expected values in any of the cells is less than 5, Fisher's 1-Tailed corrected P values are used.

RESULTS

Female	Male	Total
28	22	50

Table 3. Total Patients Included in the Study

BMI	Male	Female	Total
<25 (Non-Obese)	16	6	22
≥25 (Obese)	6	22	28

Table 4. Showing Male & Female Patient Distribution According to BMI (<25, ≥25)

Percentage prevalence of obesity according to BMI is- 56% of the study population, 78% of females and 27% of males. Which is statistically significant.

	Male	Female	Total	Percentage
Nephropathy present	8	11	19	38%
Nephropathy absent	14	17	31	62%

Table 5. Gender Wise Distribution of Nephropathy

38% of the total study population, 85% of females and 81.8% of males have nephropathy

BMI	Nephropathy Present	Nephropathy Absent
<25	6 (31.6%)	16
>25	13(68.4%)	15

Table 6. BMI & Diabetic Nephropathy Distribution

Diabetic nephropathy stood first in the list of diseases causing end stage renal disease and those requiring dialysis both in west and in Asian countries.³² Prevalence of overt DN is 2.2% in a recent population based study in Indians while micro albuminuria was present in 26.9 per cent, in one of the south Indian population based studies it was found to be 9.4%.³³ As many as 50% patients with 20 year duration of diabetes will have the evidence of DN.³⁴

DISCUSSION

In our study it is observed that as BMI increases risk of Diabetic Nephropathy increases similar to the Chi-yuan et al,³⁰ but it was a long term follow up study for a period of 20 years the main drawback was follow up some patients

were died of other complications and the strength of the study was huge number of patients involved, broad distribution of BMI among a large, diverse sample of screened ambulatory adults with comprehensive, longitudinal follow-up for ESRD.

Compared to Martina Tomic et al³⁵ similar finding is that women have higher BMI than males, the other findings of the study is that they observed with increasing obesity leads to deterioration of HbA1c and a significant increase in LDL-cholesterol, systolic and diastolic blood pressure, which are not done in our study, our study could have been included other parameters like HbA1c and Cholesterol levels for better comparison. However, we believe that the overall association between increased BMI and risk for Diabetic Nephropathy is the important finding in our study, more so than quantifying how much of this association is independent of hypertension or diabetes. We used a missing data category in our statistical analysis, and this approach is problematic in most instances. However, since data on education level, smoking status, and history of myocardial infarction are missing. Since our study was conducted among outpatient & inpatients of single centre with only 50 patients our results may not be generalizable to other populations. Because this is an observational study, we could not assess whether intentional weight loss will reduce the risk for Diabetic Nephropathy. Brochner-Martensen et al³⁶ & Chagnac A et al³⁷ shows that obese persons who lose weight have a reduction of absolute glomerular filtration rate, consistent with reversal of glomerular hyperfiltration. Morales E et al³⁸ have shown that weight loss is associated with a decrease in proteinuria, a major risk factor for future loss of glomerular filtration rate.

CONCLUSIONS

Prevalence of microvascular complications is high among diabetics. Nephropathy and retinopathy show equal prevalence as we also studied retinopathy in same group of patients. Females show higher Prevalence of Nephropathy compared to males. There is an increase in prevalence of Nephropathy with increase in BMI.

Limitations

Prevalence of all the complications in study population is high compared to the population-based studies as this study is conducted in a tertiary hospital which is a referral centre.

Abbreviations

DM- Diabetes Mellitus, FBS- Fasting Blood Sugar, PPBS- Post Prandial Blood Sugar, DN- Diabetic Nephropathy.

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