



ASSOCIATION BETWEEN MICROALBUMINURIA AND MICROVASCULAR COMPLICATIONS IN TYPE 2 DIABETICS.

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ABSTRACT

INTRODUCTION: Microvascular complications influence the quality of life and pose a significant burden on the diabetic patients. Microalbuminuria is associated with glomerular pathology and increased level of risk of complications.

MATERIAL & METHODS: Present study was a hospital based observational study done at Bidar Medical College Hospital where 200 diabetic patients visiting the Medicine OPD were selected for the study of 6 months. A pre designed proforma was used to get the demographic, clinical data and in detail clinical examination was done. Relevant investigations were done. Data was compiled and analyzed.

RESULTS: There was a male preponderance with one third being in age group of 51-60 years age group. Mean duration of diabetes was 17.52 years and the mean age of onset of diabetes was 32.3 years. Prevalence of microalbuminuria was found in one thirds (33.5%, n=67). And with regards to microvascular complications, the incidence of retinopathy, neuropathy and nephropathy was 13% (n=26), 27% (n=54) and 21% (n=42) respectively. Among patients with Microalbuminuria, retinopathy was seen in 28.4%, neuropathy in about two thirds (62.7%) and nephropathy in half the proportion of study population (49.2%) respectively.

CONCLUSIONS: Statistically significant association was found between incidence of microvascular complications and presence of microalbuminuria. Hence adequate monitoring and follow up of diabetic patients is extremely important apart from medications to prevent or anticipate complications at an early stage.

KEYWORDS: Diabetes, Microalbuminuria, Microvascular complications

INTRODUCTION

Diabetes mellitus is a chronic disease due to deficiency of Insulin or when the body cannot effectively use the insulin it produces. Complications which arise due to diabetes could macrovascular or microvascular and it is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation. Macrovascular complications include Coronary Heart Disease, Peripheral Arterial Disease, Cerebrovascular disease and Microvascular complications include

Retinopathy, Neuropathy and Nephropathy. Other non-vascular complications include infections, cataract, glaucoma, gastroparesis etc. [1]

According to World Health Organization (WHO), the number of people with diabetes rose from 108 million in 1980 to 422 million in 2014. In 2019, diabetes was the direct cause of 1.5 million deaths and 48% of all deaths due to diabetes occurred before the age of 70 years. [1] In India, about 50.9 million people suffer from diabetes and the figure likely to go up to 80 million by 2025. According to the recent National Family Health Survey (NFHS-5) 2019-21 estimates, the overall prevalence of diabetes among men was 15.6% and among women 13.5%. [2] And in the state of Karnataka, it was similar to National figures with 15.6% and 14% prevalence in men and women respectively. [3]

One of the most important pre requisites for management of diabetes mellitus is adherence to medication and life style changes including dietary restrictions and physical exercise. Regular monitoring of blood sugar levels by blood sugar estimation and HbA1c will help in assessing. These are important to keep the blood sugar control and thereby prevent complications which might be macrovascular or microvascular complications. [4]

Microvascular complications influence the quality of life and pose a significant burden on the patient and medical services. Existing literature on reported prevalence of microvascular complications range from 5% to 37% with an increasing trend in India due to higher prevalence of the diabetes. [5,6,7] In one study by Dipika Bansal, the prevalence of any microvascular complications was 18.04%; with neuropathy found in 8.2%, retinopathy (9.5%) and nephropathy in 2.8%. [8]

Microalbuminuria is defined as urinary albumin excretion rate higher than normal but lower than 200 µg/min in the absence of urinary tract infection and acute illness. Microalbuminuria is associated with glomerular pathology and increased level of risk to renal and cardiovascular complications. American Diabetes Association recommends that at least two morning urine specimens collected within 3 months of each other should be abnormal. In this context, the present study has been designed with an objective to determine the association between microalbuminuria and microvascular complications in type 2 diabetics. [9, 10, 11]

MATERIAL & METHODS

Present study was a hospital based observational study done at Bidar Medical College Hospital, Karnataka. The study was conducted in collaboration with Department of General Medicine where patients visiting in the medicine OPD were selected consecutively. Total duration of the study was for 6 months.

Inclusion criteria: Diabetic patients meeting the guidelines mentioned by American Diabetes Association (ADA).

Exclusion criteria: Patients with preexisting renal disease, patients with nephropathy, pregnant patients, patients with other medical conditions such as congestive cardiac failure

Sample size was estimated using the formula $4pq/l^2$. Where p is prevalence of diabetes taken as 14.8% from the data on diabetes prevalence from Karnataka as per National Family Health Survey 5 report. [3] $N=4pq/l^2$ where p=14.8%, q=100-p (85.2) and l taken as Absolute error of 5%. After substitution, the sample size came as 200.

A pre designed proforma was used to get the demographic, clinical data and in detail examination including examination of fundus and complete CNS examination. In detail history about diabetes including age of onset of diabetes, duration, treatment and blood sugar monitoring was also taken. Height and weight was measured in all patients using standard guidelines and Body mass index (BMI) was calculated. Blood pressure was measured in sitting position and JNC 8 criteria were used to define hypertension status. Patients already diagnosed as hypertension previously or blood pressure level of more than 140/90 mm of Hg was considered as Hypertensives.

Fundus examination was done to find out diabetic retinopathy for any evidence of microaneurysms, exudates and hemorrhages. With regard to diagnosis of Peripheral neuropathy, any evidence of neuropathic pain, tingling sensation or numbness in extremities, or absence of ankle jerks along with diminished vibrations or pinprick sensation in hands or feet was checked on examination.

The following investigations were done:

Fasting blood sugar (FBS) and postprandial blood sugar, HbAa1c, Blood urea and serum creatinine, lipid profile, urine examination, ECG, Carotid Doppler and nerve conduction studies and Microalbumin levels.

Criteria for diagnosis of Diabetes mellitus: As per American Diabetes Association (2006). Three ways to diagnose diabetes are possible, and each in the absence of unequivocal hyperglycemia, must be confirmed on a subsequent day, by any one of the three methods.^[12]

- (i) random blood glucose of 200mg/dl or higher in the presence of classic symptoms of the disease which are polyuria, polyphagia and weight loss
 - (ii) fasting blood glucose of 126 mg/dl or higher
 - (iii) 2 hour post lunch glucose of 200 mg/dl or higher during an oral glucose tolerance test (OGTT)
- Criteria for defining Microalbuminuria:^[9,10]

Microalbuminuria was estimated and defined with values <30 normoalbuminuric, 30-300 microalbuminuric and >300 as macroalbuminuric.

Study was approved by the Institutional Ethical Committee. Purpose of the study was explained to the study participants and informed consent was taken prior to the start of the study. Confidentiality over the identity and data was ensured.

Data entry was done using Microsoft Excel 2015 version and analysis using EPI INFO version 7. Categorical data was presented in percentages and proportion and numerical data using mean and standard deviation. Association between variables was assessed using chi square test with p value less than 0.05 considered being statistically significant.

RESULTS:

Out of the total 200 study participants, males and females were 114 and 86 respectively with sex ratio being 1.3:1. One thirds (34%, n=68) belonged to 51-60 years age group with mean age being 58.41±7.2 years. Family history of diabetes mellitus was seen in 17% (n=34). With regards to risk factors, one fourth (24%, n=48) of them were obese, 31% (n=62) leading sedentary lifestyle and 22% (n=44) were hypertensives. Addictions including smoking and alcohol were present in 26% (n=52) and 38% (n=76) respectively in the study population. Waist circumference (WC) and waist hip ratio (WHR) which are the indicators of central obesity were more than cut off limits in about one thirds (21% & 19%) respectively.

In the present study, the mean duration of diabetes was 17.52 years and the mean age of onset of diabetes was 32.3 years. Majority of them were on oral hypoglycemic medications (54%) and more than one third (35%) were on both Insulin and oral hypoglycemic drugs. But more than one fourth of them (26%) were not taking medications properly. And among them 16% were using same medications including the dosage since many years. Regular monitoring of blood sugar levels was not followed by about 15% of study population. These factors probably might have lead to the blood sugar levels not being under control and could have led to complications including microvascular.

Microalbumin levels were assessed and present study found that out of 200 study population, the prevalence of microalbuminuria was found in one thirds (33.5%, n=67).And with regards to microvascular complications in study population, the incidence of retinopathy, neuropathy and nephropathy in the was seen in 13% (n=26), 27% (n=54) and 21% (n=42) respectively. [Table 1, 2].

Table 1: Incidence of Microalbuminuria

Microalbuminuria	Number	Percentage
Present	67	33.5%
Absent	133	66.5%
Total	200	100%

Table 2: Incidence of Microvascular complications

Microvascular complications	Number	Percentage
Retinopathy	26	13%
Neuropathy	54	27%
Nephropathy	42	21%

Association between the incidence of microvascular complications and microalbuminuria was done. Among patients with Microalbuminuria, retinopathy was seen in 28.4% (n=19), neuropathy in about two thirds (62.7%, n=42) and nephropathy in half the proportion of study population (49.2%, n=33) respectively. Comparatively, the incidence of microvascular complications were lower among patients without microalbuminuria. 5.3%, 9% and 6.8% had retinopathy, neuropathy and nephropathy respectively in patients without microalbuminuria. And this difference in the incidence of microvascular complications with microalbuminuria was found to be highly significant statistically with p value being less than 0.01. [Table 3]

Table 3: Incidence of Microvascular complications in association with Microalbuminuria

Microvascular complications	Microalbuminuria		p value
	Present (n=67)	Absent (n=133)	
Retinopathy	19 (28.4%)	07 (5.3%)	0.000004*
Neuropathy	42 (62.7%)	12 (9%)	<0.000001*
Nephropathy	33 (49.2%)	09 (6.8%)	<0.000001*

*‘Chi square’ test applied p<0.05 (statistically significant)

DISCUSSION

With India being considered as the Diabetic capital of the world and the prevalence of Diabetes on the rise which is clearly evident from the National Family Health Survey (NFHS) 5 report where the estimated prevalence in India being around 14.5%; many cases still exist which might be undiagnosed or unreported as Diabetes shows the Iceberg phenomenon. With the increase in burden of diabetes, the burden of complications also is in the rise. The reasons for increased complications among diabetics include not adhering to the medication properly, not following lifestyle changes including dietary restrictions, no proper self-care such as not monitoring their blood sugar levels and other reasons. In this aspect, the present study was done with the objective to determine the association between microalbuminuria and microvascular complications in type 2 diabetics patients admitted in a teaching medical college. A total of 200 diabetic patients meeting the inclusion and exclusion criteria were included in the present study.

With regards to prevalence of microalbuminuria, in present study microalbuminuria was seen in one thirds (33.5%) study population. These findings were similar to study by Sana M A (2020)^[13] where 25.6% were having microalbuminuria and 4.5% macroalbuminuria.

Compared to present study, higher incidence of microalbuminuria (55.2%) was observed in study by Ramidha VP et al (2019)^[14] from Kerala. This difference might be due to different study areas and the difference in study design. The study design in Ramidha VP et al^[14] was retrospective chart analysis compared to hospital observational study design in present study.

Microvascular complications observed in the present study include Neuropathy which was seen in more than one fourth (27%) followed by nephropathy (21%) and retinopathy (13%). These findings slightly in contrast in study by Mustafa Hussein, Sami Menasri (2019)^[15] where higher prevalence of microvascular complications were seen. In their study, nephropathy was observed in 38.8%, retinopathy (23.9%) and neuropathy in 22.5%. Another study by Kosiborod et al (2018)^[16] found a prevalence of microvascular complications as 18.8% with most common being peripheral neuropathy (7.7%) followed by chronic kidney disease (5%) and 3.9% retinopathy.

Association between the incidence of microvascular complications and microalbuminuria was found to be statistically significant with higher incidence of complications among patients with

microalbuminuria. These findings were in concurrence with findings by Bhavya N, Kumar VA (2017)^[17] from Karnataka. Retinopathy and Neuropathy were more commonly seen in patients with microalbuminuria which was statistically significant. Ramidha VP et al (2019)^[14] from Kerala also found similar results where micro albuminurics were around 1.78 times likely to have diabetic retinopathy.

Limitation of the study: Since the study design is observational, study can only determine the association but cannot prove the causation with regards to relationship between microalbuminuria and incidence of microvascular complications. There might have been few confounding factors which probably had a role in development of these complications.

CONCLUSIONS:

Present study found a high incidence of microvascular complications among diabetic patients. Microalbuminuria was found in one thirds of the study population. Statistically significant association was found between incidence of microvascular complications and presence of microalbuminuria. Since diabetes mellitus is growing in terms of prevalence in India and the mean age of getting diagnosed as diabetes coming down, the long duration of diabetes poses a great challenges in terms of its macro and micro vascular complications. Hence adequate monitoring and follow up of diabetic patients is extremely important apart from medications to prevent or anticipate complications at an early stage. Proper advice and counselling of patients about the importance of adhering to medications, regular monitoring of blood sugar levels and periodic investigations need to be done from health care personnel point of view.

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