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Original research article: Study of prevalence of microalbuminuria among the diabetic patients and its correlation with body mass index and hypertension among Gujarat population

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Abstract

Background: With diabetes being a rising crisis in India, people suffering from its effect on kidney is great. This study is aimed at reducing the incidence of diabetic nephropathy among the first diagnosed diabetic patients by early screening for microalbuminuria which is the earliest indicator for kidney damage.

Materials and Method: A cross sectional study among the first diagnosed diabetic is undertaken to find the incidence of microalbuminuria in them. The study sample of 138 was selected using purposive sampling method and a pre-tested structured questionnaire was used.

Result: Incidence of microalbuminuria among the first diagnosed diabetic patients is 17%. And the correlation of microalbuminuria with that of hypertension ($p<0.001$, r=0.692), body mass index ($p>0.05$ and r=0.4) and waist hip ratio ($p<0.05$, r=0.27) suggest that microalbuminuria incidence is significantly associated with hypertension and waist hip ratio.

Conclusion: The incidence of microalbuminuria 17% during first diagnosis of diabetes indicates the inadequacy in the health care system regarding the screening programs in the rural population. Thus improvements must be made in the health care system to reduce the incidence rate by effective screening program.

Keywords: microalbuminuria, dipstick, type 2 diabetes

Introduction

Diabetes being a rising crisis in India, Statistics from the World Health Organisation (WHO) project shows an increase in the prevalence of diabetes worldwide particularly in developing countries [1]. Given the high prevalence of diabetes in Indians with over 20 million diabetics already and the numbers expected to increase to 57 million diabetics by the year 2025. India and china being the largest contributors to the world's diabetic load, this could place considerable burden on the health budgets of this country. Diabetes mellitus have caused a great havoc by increasing the morbidity and mortality by mainly affecting the cardiovascular, renal, retinal system, nervous system and other [2].

In the initial stages, the kidney may leak slightly more albumin than normal amount in urine which can be sensitively detected by albumin specific dipstick test for albumin, which is known as microalbuminuria. In microalbuminuria the Albumin Excretion Rate (AER) is 30 to 300mg/day. Microalbuminuria is the earliest indicator of diabetic kidney disease and generalised vascular endothelial dysfunction [3]. In patients with known diabetes, microalbuminuria is related not only to subsequent diabetic proteinuria, but even more strongly to early death, mainly from cardiovascular disease. Retinopathy was also common among the microalbuminuric group.

It has been suggested that in both types of diabetes, hypertension enhances the development of diabetic nephropathy [5]. In NIDDM, estimates of microalbuminuria prevalence range from 15 to 20%, and nephropathy often supervenes after a shorter known duration of diabetes than in IDDM [4]. The causal risk factors for microalbuminuria are raised blood pressure and poor glycemic control and achievement of optimal glycemic level reduces the risk of albuminuria and microalbuminuria. This calls for early detection of microalbuminuria and good control of diabetes to reduce the burden of diabetic complication in the future.

Material & Methods

A Cross sectional study conducted in PDU Medical college and hospital in Gujarat for a period of 3 months from July to August 2013 on a sample of 138 first diagnosed type 2 diabetic patients. The diagnosis of diabetes was made on the basis of clinical evaluation, biochemical and ancillary investigations like FBS/PPBS, HbA1c. Patients with significant proteinuria, presence of urinary tract infection, or heart failure were excluded. In all study patients, a complete clinical work up was done including height, weight, and body mass index, waist hip ratio. The body mass index (BMI) was calculated and expressed as kg/m^2.The patients were classified as normal (BMI $\leq$ 24.9); overweight (BMI $\geq$ 25 & $\leq$ 29.9); obese (BMI $\geq$ 30) [6]. The blood pressure was recorded in the right upper arm in the sitting posture, after a five minute rest. Mean of two blood pressure measurements was used for analysis. Patients were categorised as being hypertensive if they were on antihypertensive treatment or if they had a systolic blood pressure >140 mm Hg and/or diastolic blood pressure >90 mm Hg [7]. Waist circumference

was measured and the patients are classified as two groups based on the waist hip ratio as group 1(male<1; female<0.9) and group 2 (male>1; female>0.9).Then spot urine collection is collected from the patient and checked for microalbuminuria by using albumin specific dipstick method. In case of dehydrated patients and for those after heavy exercise urine sample is collected during their next coming visit to hospital when they are normal. Statistical analysis were done using SPSS 16 version. The results are given by median and standard deviation. Correlation was made between microalbuminuria and parameters such as blood pressure, body mass index, and waist hip circumference.

Observation & Result

The 138 patients studied included 46 males and 92 females. The baseline characteristics of the study group are shown in table 1.

Table 1: Baseline characteristics

Attribute		Male (n)	Female (n)
AGE (years)	40-49	21	42
	50-59	15	28
	≥60	10	22
BMI(kg/m^2)	<25	24	41
	≥25<30	21	32
	≥30	3	17
SBP(mm/Hg)	<140	38	70
	≥140	8	22
DBP (mm/Hg)	<90	40	75
	≥90	6	17
WHR	Normal	34	59
	Abnormal	12	33

Overall 24 (17%) had microalbuminuria. Among males, microalbuminuria was positive for 6 among 46(13%) and for females it is 18 among 92(20%).

HYPERTENSIVES: Total number of diabetic patients with hypertension is 38 in 138. Among the 38 hypertensive diabetic patients 14 had Microalbuminuria and among 100 non Hypertensive diabetic patients 10 had microalbuminuria. The incidence is 37% and10% among the Hypertensive diabetic and non-Hypertensive Diabetic patients respectively. The incidence of Microalbuminuria among Hypertensive Diabetic patients in those with only raised systolic blood pressure is 2 among 13(15%) or only raised diastolic blood pressure is 2 among 5(40%) or both is 10 among 20 (50%). Body Mass Index: Incidence among the patients with normal BMI, overweight, obese are found to be 10 in 63, 8 in 55 and 6 in 20 i.e. 16%, 15%, 30% respectively. WAIST HIP RATIO: Based on the waist hip ratio patients are classified as Group1 (male<1; female<0.9) and Group2 (male>1; female>0.9) and incidence among the group1 and group2 is 13 among 93(14%) and 11 among 45 (41%) respectively.

Table 2: Incidence of microalbuminuria

	Total (n)	Microalbuminuria positive (n)	Microalbuminuria incidence (%)
Hypertension	38	14	37
Obesity	20	6	30
High WHR	45	11	24

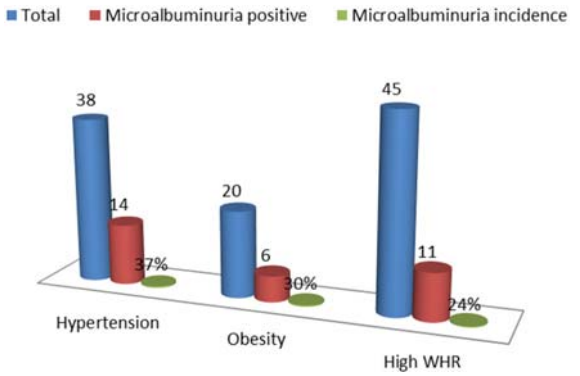

Fig 1: Incidence of microalbuminuria among the Hypertensives, obesity, High WHR

Correlating Factors

Hypertension: The association between microalbuminuria and hypertension is $p<0.001$, r=0.692. These results suggest that diastolic blood pressure is correlated to microalbuminuria more than systolic blood pressure. BODY MASS INDEX: Statistically association between Body Mass Index and microalbuminuria is $p>0.05$ and r=0.4, hence BMI is not directly associated with microalbuminuria. WAIST HIP RATIO: Microalbuminuria and waist hip ratio is positively correlated and is statistically significant ($p<0.05$, r=0.27).

Discussion

Incidence of microalbuminuria in first diagnosed diabetic patients in our study is 17% by dipstick method, whereas the incidence among newly diagnosed diabetic patients using immunoturbidimetric test was 27% in a study conducted in south India [1]. The difference in the incidence may be due to large sample size and the sensitivity and specificity of immunoturbidimetric assay compared to the albumin specific dipstick method. At the time of diagnosis of diabetes, 24 among 138 patients had microalbuminuria which is a significant and is an opportunity to find the involvement of kidney at the most early stage and taking measures to prevent its progression. Among the other parameters measured, it is probably evident that incidence of microalbuminuria is increased among hypertensive diabetic patients i.e. 14 among 38 having 37% of chances than in non-hypertensive patients i.e. 10 among 100 having a chance of 10%.The result on statistical correlation ($p<0.001$, r=0.692) between hypertension and microalbuminuria also found to be significant. This also correlates with many studies [8, 9, 10] etc. about the incidence of microalbuminuria among the hypertensive diabetic patients.

In our study the incidence of microalbuminuria among patients with BMI ≤ 24.9 kg/m^2; BMI ≥ 25 & ≤ 29.9 kg/m^2 and those with BMI ≥ 30 kg/m^2 is 16%, 15% and 30% respectively. Though obesity is a general risk factor for cardiovascular problems and many others, there is no statistical significance of incidence of microalbuminuria among the overweight and obese population in this study group ($p>0.05$). In a study [11] conducted among 25 patients with body mass index>25, Blood pressure and urinary albumin excretion rate in hypertensive patients with obesity significantly decreased with weight reduction. Hence there may indirect relevance of microalbuminuria and body mass

index. And further studies in this topic may widen our knowledge and fill the gap in the understanding.

The incidence of microalbuminuria among those with high waist hip ratio was 24% were as those with moderate waist hip ratio were 14%. This striking incidence of microalbuminuria in patients with abdominal obesity compared to general obesity was also statistically significant (p<0.05, r=0.27). In a multinational, observational study [12], 20828 hypertensive out-patients from 26 countries had participated and the suggested that increasing Waist circumference confers an incremental risk for microalbuminuria at any level of BMI, underlining the prognostic importance of abdominal fat accumulation beyond general obesity. This deviation result may be due to small group of people involved in our study or due to short term follow up or only hypertension is strongly correlated to microalbuminuria when compared to diabetes. Testing strategies involving dipstick and laboratory ACR measurements or dipstick tests had similar accuracy [13]. Anyway of the urine screening tests, the dipstick test is inexpensive, easy and rapid to perform, does not delay testing the microalbuminuria, since there is no wait for the screening test. Diabetic patients with micro- or macroalbuminuria should be carefully controlled in order to prevent or to decrease deterioration of renal function due to diabetic nephropathy. Hence steps should take for the early detection of microalbuminuria and to prevent further involvement of the kidney giving more preference to the hypertensive diabetic patients since there are at high risk.

Conclusion

Microalbuminuria screening at its earliest stage helps to reduce the occurrence of nephropathy. And for the screening purpose dipsticks are good choice since they are inexpensive and give the result soon. This also accommodates with the country's economy. The incidence of microalbuminuria 17% during first diagnosis of diabetes indicates the inadequacy in the health care system regarding the screening programs in the rural population. Thus improvements must be made in the health care system to reduce the incidence rate by effective screening program.

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