Original Article

Study of Incidence of Microalbuminuria Among First Diagnosed Diabetic Patients and its Correlation with Body Mass Index and Coexisting Hypertension in A Tertiary Care Hospital

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ABSTRACT

Background: Diabetes is raising recently more in the developing countries due to sedentary life style and with increase in duration, complications arise affecting renal, retinal, cardiovascular and nervous systems. Diabetic nephropathy poses a great risk of renal failure and is the cause for performing dialysis. Microalbuminuria is the earliest marker for the renal and cardiovascular involvement. This study aims to study the incidence of microalbuminuria in first diagnosed diabetic patients and to correlate it with the body mass index (BMI), hypertension and waist hip circumference.

Methods: This study was conducted on 138 first diagnosed diabetic patients in a tertiary care hospital. Microalbuminuria was analyzed using dipstick method and correlation was made with parameters such as blood pressure, body mass index, and waist-hip circumference.

Result: The incidence of microalbuminuria in first diagnosed diabetic patients was 17%. Incidence of microalbuminuria is increased in hypertensive diabetic patients (37%) compared with non-hypertensive diabetic patients (10%), which was statistically significant (p=0.001, r=0.292). Incidence of microalbuminuria among first diagnosed diabetic patients was 17%. The correlation of microalbuminuria with hypertension, BMI and waist-hip ratio suggest that microalbuminuria incidence is significantly associated with hypertension than BMI and waist-hip ratio.

Conclusion: Microalbuminuria is the earliest indicator for detecting nephropathy. The incidence of microalbuminuria of 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, Diabetes Mellitus, Body Mass Index, Hypertension, Type 2 Diabetes.

Introduction

Diabetes is a rising crisis in India. India leads the world with the largest number of diabetic subjects and this is expected to further rise in the coming years. Hence studies on diabetes related complications are essential to assess the burden of diabetes.[1] The prevalence of diabetes is increasing sharply in the developing countries as people adopt more sedentary life styles. Type 1 and 2 diabetes mellitus have caused a great havoc by increasing the morbidity and mortality by mainly affecting the cardiovascular, renal, retinal system, nervous system and others.[2]

Focusing on its effect on the renal system, the main etiology being due to angiopathy of renal capillaries, which leads to chronic renal disease, which is the prime indicator for dialysis. In initial stage, 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. Microalbuminuria is the earliest indicator of diabetic kidney

disease and generalized vascular endothelial dysfunction. [3] The microalbuminuric patients had a significantly higher prevalence of ischemic heart disease compared with normoalbuminuric patients. Retinopathy was also common among the microalbuminuric group. In patients with known diabetes, microalbuminuria is related not only to subsequent proteinuria, but also even more strongly to early death, mainly from cardiovascular disease.

Diabetic nephropathy is the leading cause of end stage renal disease worldwide. Diabetic nephropathy is defined by persistent albuminuria (albumin excretion rate > 300 mg/day), declining glomerular filtration rate and rising blood pressure.[4] Microalbuminuria is considered to be an early stage of diabetic nephropathy. Nephropathy is probable cause of the elevated blood pressure found in diabetic patients. It has been suggested that in both Insulin-dependent diabetes mellitus (IDDM) and Non-insulin-dependent diabetes mellitus (NIDDM), hypertension increases the chances of development of diabetic

nephropathy.[5] In NIDDM, microalbuminuria prevalence ranges from 15 to 20% and nephropathy often supervenes after a shorter 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.

The present study aims to study the incidence of microalbuminuria in first diagnosed diabetic patients and to correlate it with the body mass index (BMI), hypertension and waist-hip circumference.

Materials and Methods

This cross-sectional study was conducted at Tagore Medical college and hospital in Chennai over a period of 2 months from July to August 2013, wherein suspected patients were diagnosed to have diabetes by random blood sugar test and subsequently confirmed by fasting & postprandial blood sugar values. All first diagnosed diabetic patients are included in this study, while patients with significant proteinuria, urinary tract infection, or heart failure were excluded from this study. In all 138 patients who were included in this study, 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 the patients are classified as normal (BMI <25), overweight (BMI >25 & <30) and obese (BMI >30). 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 categorized as hypertensive if they were on antihypertensive treatment or in the presence of systolic blood pressure >140 mmHg and/or diastolic blood pressure >90 mmHg. Waist circumference was measured midway between the lower rib and iliac crest while that of the hip at the level of trochanters and the ratio was calculated. 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. Urine microalbumin concentration was tested using albumin specific dipstick method. In case of dehydrated patients and for those after heavy exercise, urine sample is collected during their next visit to the hospital. Statistical analysis were done using SPSS software version 16. The results were given by median and standard deviation. Correlation was made between microalbuminuria and parameters such as blood pressure, body mass index, and waist hip circumference.

Result

A total of 138 first diagnosed type 2 diabetic patients were included for this study, which included 46 males and 92 females. Overall 24 patients (17%) had microalbuminuria (Figure 1). 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 was 38 out of 138. Among the 38 hypertensive diabetic patients 14 had Microalbuminuria and among 100 non-hypertensive diabetic patients 10 had microalbuminuria. The incidence is 37% and 10% amongst the Hypertensive diabetic and non-Hypertensive Diabetic patients respectively (Figure 2). The incidence of microalbuminuria is increased in hypertensive patients compared to non-hypertensive patients. 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%) (Figure 3). The statistical association between microalbuminuria and hypertension is p=0.001, r=0.292. These results suggest that diastolic blood pressure is correlated to microalbuminuria more than systolic blood pressure.

Body Mass Index (BMI): 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 (Figures 4 and 5). There are no significant changes regarding incidence of microalbuminuria among the overweight patients and those with normal BMI, but it is significantly increased among the obese patients. Statistically association between Body Mass Index and microalbuminuria is p=0.6 and r=0.04, hence BMI is not directly associated with microalbuminuria.

Waist hip ratio: Based on the waist hip ratio patients are classified as Group 1 (male <1; female <0.9) and Group 2 (male >1; female >0.9) and incidence among the group 1 and group 2 is 13 among 93 (14%) and 11 among 45 (41%) respectively (Figure 6). Though microalbuminuria appears to be incident more among the person with high waist hip ratio, but statistically the association between waist hip ratio and microalbuminuria is p=0.138, r=0.127 hence this relation was insignificant.

Anyway, difference in incidence of microalbuminuria regarding body mass index and waist hip circumference suggests that its incidence differs among different parameters of obesity index. Microalbuminuria was present in 41% of hypertensive diabetic patients with BMI >25, it was present in 37% of hypertensive diabetic patients with BMI <25.
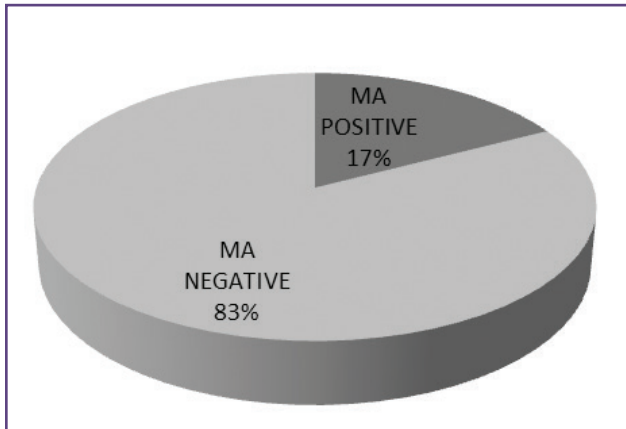
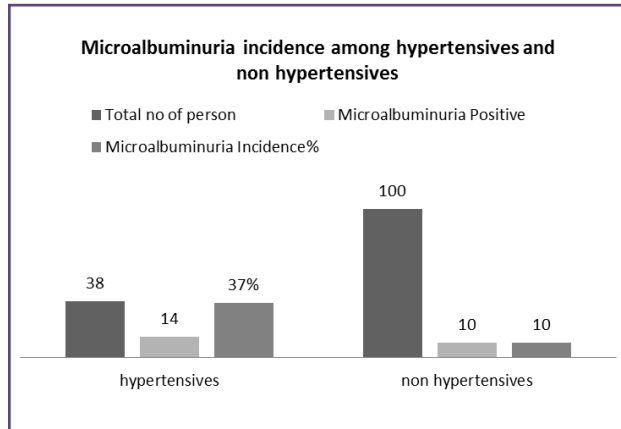**Fig. 1: Incidence of microalbuminuria among first diagnosed diabetic patients.**

Fig. 2: Incidence of microalbuminuria among hypertensives and non-hypertensives.
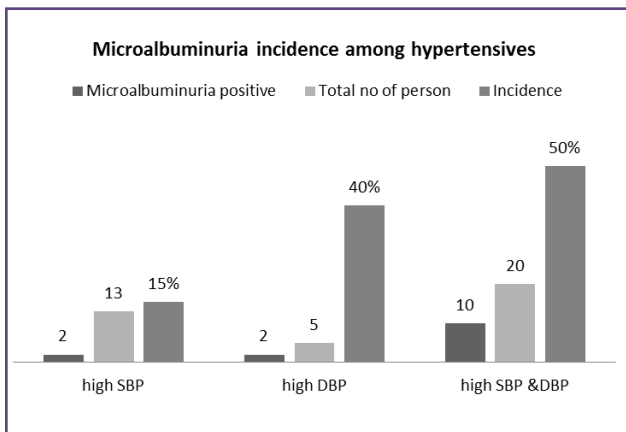

Fig. 3: Incidence of microalbuminuria among persons with only high systolic blood pressure (SBP), only high diastolic blood pressure (DBP) and those with both.
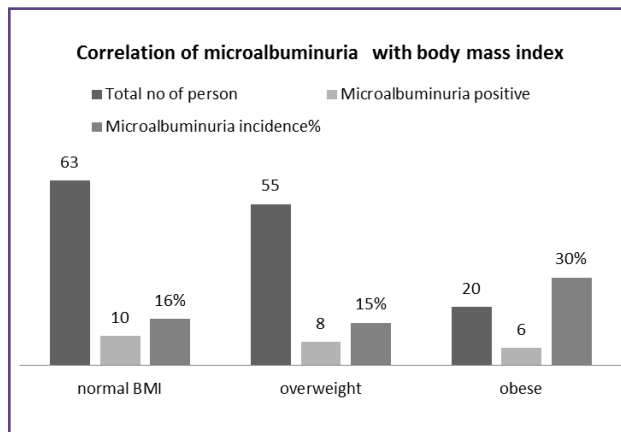

Fig. 4: Incidence of microalbuminuria among person with normal BMI (<25), overweight (BMI >25 & <30) and obese (BMI >30).
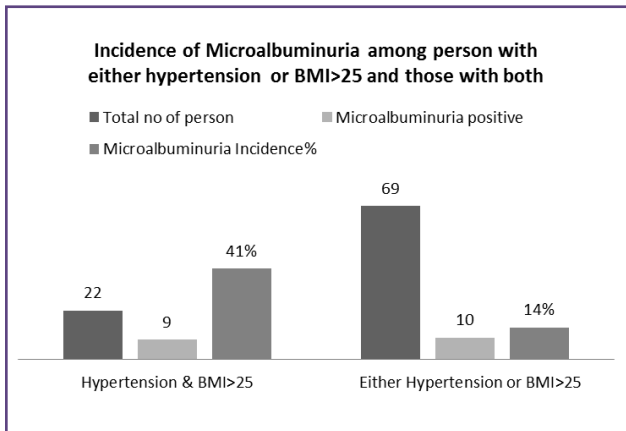

Fig. 5: Microalbuminuria incidence among person with either body mass index (BMI) >25 or hypertension and those with both.
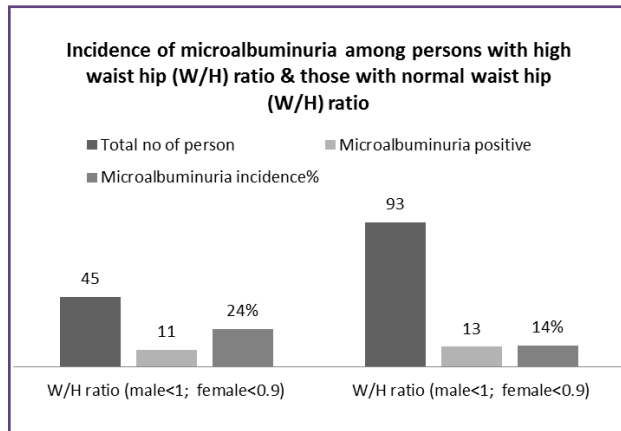

Fig. 6: Incidence of Microalbuminuria among persons with high waist hip (W/H) ratio and those with normal waist hip (W/H) ratio.

Discussion

Incidence of microalbuminuria in the initially diagnosed diabetic patients in this study was 17% by dipstick method, whereas the incidence among newly diagnosed diabetic patients using immunoturbidometric 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 immunoturbidometric assay compared to the albumin specific dipstick method. The prevalence of microalbuminuria increased with the increase in duration of diabetes. Altogether 27.5% of the newly diagnosed diabetic subjects had microalbuminuria by immunoturbidometric assay kits. 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=0.292) between hypertension and microalbuminuria also found to be significant. This also correlates with many studies about the incidence of microalbuminuria among the hypertensive diabetic patients.[6,7,8]

In this study, the incidence of microalbuminuria among patients with BMI <25; BMI >25 & <30 and those with BMI >30 is 16%, 15% and 30% respectively. Statistical association of Body mass index and microalbuminuria is p=0.6 and r=0.04, hence Body mass index is not directly associated with microalbuminuria. 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 a study 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.[9] 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 was 14%. Though there was striking incidence of microalbuminuria in patients with abdominal obesity compared to general obesity, there is no statistical correlation (p=0.138, r=0.127) between microalbuminuria and waist-hip ratio in our study. In a multinational, observational study, 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.[10] 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 Albumin creatinine ratio (ACR) measurements or dipstick tests had similar accuracy. The costs of using dipstick tests were overall lower than laboratory ACR-based testing.[11] Anyway of the urine screening tests, the dipstick test is inexpensive, easy and rapid to perform, des 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

Incidence of microalbuminuria is significantly associated with hypertension than body mass index and waist hip ratio. Microalbuminuria is the earliest detector for the kidney involvement as well as cardiovascular involvement and screening for it in the earliest stage helps to reduce the occurrence of nephropathy. The incidence of microalbuminuria of 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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