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Original Article

Prevalence and associated factors for microalbuminuria among newly Diagnosed Type II Diabetes Mellitus in a rural area in Tamil Nadu

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ABSTRACT

Diabetes is a global problem. The problem statement of diabetes and its complications globally accounts 6.6%, in India 9% in urban population and in TamilNadu it is around 10%.Diabetes is one of the most common non communicable diseases found in our country as well as globally because of urbanization. Currently, 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. To study the prevalence of microalbuminuria in patients with newly diagnosed type II diabetes mellitus and to find out factors like age, sex, obesity, smoking, alcohol, hypertension and lipid parameters have any relationship with microalbuminuria. A cross sectional study was conducted at the outpatient diabetic clinic at Vinayaka Missions Medical College Hospital, Salem between May 2013 and August 2014. We selected 200 rural based newly diagnosed diabetic patients attending the diabetic clinic of our hospital. Early morning urine samples from all patients were collected in sterile urine containers. Then microalbuminuria levels were measured using A15 Biosystems analyzer, the method used was Immunoturbidometric assay. Among the 200 study population 58 of the newly diagnosed diabetic patients had microalbuminuria which shows the prevalence is 29%. Smoking and alcohol habits, high BMI, hypertension are the factors which showed a statistical significant association for the development of microalbuminuria among the newly diagnosed diabetic patients (P<.05). The fasting blood glucose, HbA1C and serum triglycerides are the laboratory parameters which showed statistical significant association with microalbuminuria P(<.05). Routine screening for urine albumin in all newly detected diabetic patients is necessary, which would help us in early detection and treatment and in such a way it reduces the burden of diabetic kidney disease in future.

Keywords: microalbuminuria, diabetes mellitus, prevalence.

INTRODUCTION

Diabetic nephropathy is a major health problem in diabetic patients. The natural history of diabetic nephropathy has generally been viewed as a descending path from normoal buminuria to end-stage renal disease (ESRD) through an intermediate stage marked by microalbuminuria and overt proteinuria.[1,2] Diabetes is a global problem. The problem statement of diabetes and its complications globally accounts 6.6%, in India 9% in urban population and in Tamil Nadu it is around 10%.Diabetes is one of the most common non communicable diseases found in our country as well as globally because of urbanization. Another 2.5% of diabetics are estimated to have the disease without knowing its existence to them.[3] normally, protein is not present in the urine when measured by routine Dipstick Quantitative Test. This is because glomerulus generally prevents large molecules from entering renal filtrate. Normally less than 150 mg of proteins per day are excreted in urine. About 1/3RDof protein is comprised of urine albumin, 1/3RDof small globulins, and 1/3RD of Tamm Horsfall Protein. Most of the proteins are normally reabsorbed by the proximal tubular epithelial cells. The Microalbuminuria is also defined as urinary albumin to creatinine ratio. A ratio of greater than 30-300 mg/gm. of creatinine is considered as Microalbuminuria.[4] The central abnormality in Diabetic nephropathy is renal extracellular matrix accumulation in the

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mesengium. Diabetic kidney disease is one of the most frequent causes of End Stage Renal Disease (ESRD).[5] One of the central functions of the kidney is the excretion of low molecular weight, water-soluble, plasma waste products into the urine, whereas macromolecules the size of albumin and larger, are retained. The flow of the glomerular filtrate is thought to follow an extracellular route, passing through the endothelial fenestrate, then across the glomerular basement membrane, and finally through the slit diaphragm between the foot processes of podocytes. It has been recently hypothesized that microalbuminuria leading to proteinuria and end-stage renal disease is mainly due to an altered glomerular filtration barrier at the podocyte level. However, arterial hypertension and abnormalities of blood lipid concentrations and structure are also important antecedents of such complications in diabetes mellitus. Interestingly, it has been suggested that hyperglycemia, arterial hypertension, and dyslipidemia cause disorders of the albumin excretion rate by damaging the podocyte and slit diaphragm protein scaffold with overproduction of and extracellular release of oxygen radical species at the glomerular level.[6]

Currently, India leads the world with the largest number of diabetic subjects and this is expected to further rise in the coming years.[7,8] Hence studies on diabetes related complications are essential to assess the burden of diabetes. In this study we report on the prevalence of microalbuminuria among rural based type 2 diabetic patients and their associated factors.

METHODOLOGY

A cross sectional study was conducted at the outpatient diabetic clinic at Vinayaka Missions Medical College Hospital, Salem between May 2013 and August 2014. We selected 200 rural based newly diagnosed diabetic patients attending the diabetic clinic of our hospital. Patients with urinary tract infection (UTI), heart failure, and patients with renal and liver were excluded from the study. Early morning urine samples from all patients were collected in sterile urine containers. The urine samples were centrifuged to get supernatant (creatinine urine samples were diluted with distilled water 1/50). Then microalbuminuria levels were measured using A15 Biosystems analyzer, the method used was Immuno turbidometric assay. Creatinine levels were measured by using A15 Bio-System analyzer, the method used was Jaffe method. Fasting blood sample was drawn after ten hours overnight fast, and collected in vials containing fluoride/oxalate, then glucose levels were measured using CHEM 7 from ERBA, the method used was enzymatic colorimetric end point method.

In the course of processing case histories, the factors considered were the duration of DM, hypertension history, smoking habits and the number of visits during the previous year. Hypertension was defined as having blood pressure ≥ 140/90; the mean of 2 blood pressure readings was considered, or currently undergoing anti-hypertensive treatment. Body mass index (BMI) was calculated as weight kg/height (m)2: BMI 18-24.9 was considered normal, 25-29.9 overweight, and ≥ 30 as obese. Laboratory findings included: fasting plasma glucose, HbA1c, serum triglyceride, total cholesterol (LDL, HDL), BUN and creatinine. HbA1c was measured by HbGold analyzer (Drew company), which uses slow pressure conjunction exchange chromatography in conjunction with gradient elution to separate human haemglobin subtypes and variants from haemolysed whole blood. Glucose, Chol, TC, HDL, LDL (direct assay) were measured using the enzymatic assay (Pars Azemon kit and Hitachi 902 Autoanalyser system).

RESULTS

Table 1: Age and sex wise distribution of the study population

Age group	Gender		Total
	Male	Female	
30 – 40 yrs	13 (18.8%)	24 (18.3%)	37 (18.5%)
41 – 50 yrs	18 (26%)	44 (33.5%)	62 (31%)
51 – 60 yrs	26 (37.6%)	43 (32.8%)	69 (34.5%)
61 – 70 yrs	10 (14.4%)	7 (5.3%)	17 (8.5%)
>70 yrs	2 (2.8%)	13 (9.9%)	15 (7.5%)
Total	69 (100%)	131 (100%)	200 (100%)
Mean±SD	44.3±4.6	48.7±5.8	

Table 1 shows the age and gender wise distribution of the study population. It is seen from the table that female population was more than the male and majority of them were in the age group between 40 – 60 years and the mean age among the male was 44.3 years and for females it is 48.7 years. Among the 200 study population 58 of the newly diagnosed diabetic patients had microalbuminuria which shows the prevalence is 29%.

Table 2: Factors influencing albuminuria among the study population

Factor	Microalbuminuria (N=58)	Normal albumin (N = 142)	P Value
H/O smoking	23 (39.6%)	21 (14.7%)	**0.0001**
H/O alcohol	24 (41.3%)	18 (12.6%)	**0.005**
Mean BMI	29.45	25.23	**0.004**
Hypertension	33 (56.8%)	39 (27.4%)	**0.00001**
Mean Age	45.67	44.86	0.645

P value derived by applying Chi-square test.

Table 2 shows the various factors influencing microalbuminuria among the study population. It is seen from the table that the history of smoking and alcohol had a strong significant association in the development of microalbuminuria among the newly diagnosed diabetic patients. Patients with hypertension are more to develop microalbuminuria than the patients with normotension (p<.0001). BMI also found to have statistically significant association in the development of microalbuminuria (p=.004). The mean BMI among normal albumin patients was 25.23 whereas among microalbuminuria patients it is 29.45.

Table 3: Investigatory findings among the study population

Investigation	Microalbuminuria (N=58)	Normal albumin (N = 142)	P Value
Fasting blood glucose (mg/dl)	165.45±8.43	132.62±7.35	**0.0001**
HbA1C (gm%)	7.8±0.98	6.53±0.84	**0.0031**
Serum Cholesterol (mg/dl)	188±12.1	189±14.3	0.329
Serum LDL (mg/dl)	108±8.2	110±9.34	0.481
Serum HDL (mg/dl)	45.3±4.31	47.53±5.12	0.076
Serum triglycerides (mg/dl)	215.32±10.62	191.18±9.38	**0.0001**

P value derived by applying student T test

Table 3 shows the findings of the various laboratory investigations done on the study population. The newly diagnosed diabetic patients were classified into microalbuminuric patients and normal albumin patients. The glucose and lipid parameters were measured. It is inferred from the table that the fasting blood glucose and the HbA1C levels were among the microalbuminuria patients when compared to the patients with normal albumin levels and this difference was found to be statistically significant (p<.05). Among the various lipid parameters the statistically significant difference was seen in the triglycerides level alone between the microalbuminuric and normal albumin level patients, whereas the other lipid parameters did not show a significant difference between the two groups.

DISCUSSION

Various studies have reported the prevalence of Microalbuminuria in type-2 DM patients, which, however, varies widely (15-38%). Earlier studies on Asian immigrant Indians and native Indians have suggested a high prevalence of microalbuminuria.[9-11] Gupta et al reported a prevalence of 26.6% in 65 type 2 north Indian non-proteinuric patients,[9] while John et al reported a prevalence of 19.7% from a tertiary hospital in Vellore, south India[12] and Vijay et al reported that 15.7% had proteinuria among 600 type 2 diabetic patients studied at a diabetic centre in Chennai city.[13] Studies in the white UK population revealed a prevalence of microalbuminuria of 7%–9%,[14,15] while in Mexican Americans, it was 31%,[16] Pima Indians 26%,[17] Nauruans 42%,[18] and Hispanic Americans 35%.[19]

This variation in prevalence can be attributed to factors such as differences in populations, in the definitions of microalbuminuria, method of urine collection, etc.The prevalence of Microalbuminuria in our patients with type-2 diabetes mellitus was 29% which is similar to results of other studies.[20,21,10]

In the present study the prevalence of microalbuminuria across the genders were not statistically different and it is in par with the study done by A Vargese etal.[22] A high percentage of diabetic patients (60.0%) having FBS > 120 mg/dl had microalbuminuria which was in par with the studies done by Hashim etal and Bhoomika P etal.[23,24]

Gupta et al reported HbA1c to be associated with microalbuminuria,[9] and it was almost similar to the result in the present study. High prevalence of hypertension was found in the microalbuminuria group and was correlated with it ($p<0.001$). Bruno et al have reported high blood pressure levels among MA patients.[25] Other studies also have reported similar results.[26,27] Increased blood pressure, particularly systolic blood pressure, induces systemic artiole dysfunction in the kidney and damage to glomerrular filtration membrane; this is most important reason for increased urine protein excretory rate.[28]

In the present study BMI was found to be a predictive factor for the occurrence of microalbuminuria among the newly diagnosed diabetic patients and some studies had proven obesity to be a potential risk factor for albuminuria[15] and few others had postulated that it has only a little effect on the development of microalbuminuria.[13,21]

We also found more smokers in the MA group ($p<0.04$). Some studies revealed, that in type-2 DM, the risk of albuminuria is higher in smokers and former smokers, than in the non-smokers.[25,29] The role of metabolic control in the development of diabetic nephropathy has been justified by several studies, the most convincing being the DCCT study.[30]

The increase in triglyceride levels was even more marked in both groups and a significant difference was found between the two groups ($p<.0001$) The role of hyperlipidemia in the development of diabetic nephropathy has been described in several studies. In the vast majority of the studies, cholesterol and triglycerides showed a positive correlation with the degree of albuminuria, while HDL cholesterol was found to have a negative correlation with it[25,31,32] while some of the studies produced no such result, a high prevalence of microalbuminuria was detected in type2 DM patient. One of the limitations of this study is that it is a clinic based study. This could have introduced some degree of referral bias. However the prevalence of microalbuminuria is similar to that reported in other studies.

CONCLUSION

The prevalence of microalbuminuria among the newly diagnosed diabetic patients was 29% and the factors associated for the development of microalbuminuria in these patients were smoking, alcohol, obesity, hypertension and increased triglycerides level. So, this study insists on routine screening for urine albumin in all newly detected diabetic patients which would help us in early detection and treatment, in such a way it reduces the diabetic kidney disease in future.

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