Association between Microalbuminuria and HbA₁C among known Type 2 Diabetic patients in puducherry population-A comparative study

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Abstract: *Diabetes mellitus is the commonest metabolic disorder and has a high prevalence in India. Diabetic nephropathy is characterized by proteinuria and is the leading cause of end stage renal disease. The prevalence of microalbuminuria predicts progression to diabetic nephropathy. This cross sectional study was carried out in the diabetic clinic at SVMCH and RC. Sixty known Type 2 diabetic patients with age 30-70 years of both genders were included in the study. Fasting, postprandial venous blood and morning urine sample was collected for analysis of blood glucose, HbA₁C and microalbuminuria levels. Statistical analysis was done using SPSS version 17.0. Pearson correlation and Chi square test was applied to observe association of microalbuminuria with different parameters. P-value < 0.05 was considered as statistically significant. Our study showed that about 70% of the patients had HbA₁C >7% and 48% of the patients had Microalbuminuria (≥30mg/day). Almost 45% of the patients with HbA₁C >7% had Microalbuminuria (≥30mg/day) which indicates persistent increase in glycated haemoglobin and microalbuminuria may be considered as risk factor in diabetic nephropathy. Therefore, regular screening for microalbuminuria and HbA₁C testing should be done in diabetic patients as an early marker of renal risk factor.*

Keywords: *Type 2 Diabetes Mellitus, Microalbuminuria, HbA₁C, Risk Factor, Nephropathy.*

I. Introduction

Diabetes Mellitus is an important metabolic disorder worldwide and is characterized by variable degree of insulin resistance, impaired insulin secretion & increased glucose levels.[1] Overall prevalence of diabetes is expected to increase worldwide by 122% (from 135 million to 300 million people) between 1995 and 2025; 90% of these people will have type 2 Diabetes.[2] The glycated hemoglobin (HbA₁C) assay is the most commonly used measure of chronic glycaemia, since its introduction more than 25 years ago.[3] HbA₁C levels in diabetes for a good control will be 6.5% and that of 7.5% will be of greater risk.[4]

Proteinuria is a key feature of diabetic nephropathy, a strong predictor of progression towards end stage renal failure. Proteinuria independently associates with coronary heart disease in patients with diabetes and reflects not only renal impairment and a key pathogenic element of disease progression, but also more generalized vascular damage.[5] Normally microalbumin 30-300mg/day or 20-200μg/min in 24 hours urine collection is characterized as microalbuminuria and the patient with microalbuminuria are referred to have incipient nephropathy.[6] Microalbuminuria is defined as an increase in urine albumin excretion above normal, but which is not detectable by conventional dip-stick testing, whilst proteinuria represents an increase in urine albumin that is detectable by conventional dip-stick testing. HbA₁c levels are higher in diabetic patients who develop micro- and macroalbuminuria, and there is strong prospective evidence that poor blood glucose control contributes to the development of albuminuria. Open analysis of UKPDS data suggested that for a 1% reduction in HbA₁c, there significantly (HbA₁C-7.5-6.6%) in those whose albumin excretion reverted to normal, and HbA₁c was significantly higher than in those who remained microalbuminuric (HbA₁C- 7.7%) or developed proteinuria (HbA₁C -8.9). [7] Allawi et al, Ko et al, Mather et al and Vijay et al. reported the prevalence of microalbuminuria among 600 type 2 diabetic patients in Chennai.[8] Huraib et al. carried out study relating prevalence of microalbuminuria with urine albumin to creatinine ratio.[9] Varghese et al. carried out study among type 2 diabetic people and found a positive correlation between microalbuminuria and HbA₁C but did not find any statistical difference between microalbuminuria and two sexes.[10] This study was undertaken to estimate the HbA₁C levels among known type 2 Diabetic patients and the prevalence of Microalbuminuria among them and to correlate the Microalbuminuria with HbA₁C levels in TYPE 2 Diabetic patients, which is a risk factor and an early indicator of diabetic nephropathy.

II. Materials And Methods

60 known Type 2 diabetic patients attending medicine out-patient department at SVMCH & RC, Pondicherry was selected for this cross sectional study. written informed consent and Institutional Ethical Committee Clearance were obtained.

Patients with duration of type 2 diabetes of ≥5 years, age between 30 – 70 years of either gender were included. Exclusion criteria of this study was patients with systemic diseases like cardiovascular diseases, cerebrovascular diseases , urinary tract infection and type I diabetes mellitus.

5ml of Fasting and 2 ml of 2 hour postprandial venous blood samples were collected for estimation of blood glucose levels. HbA_1C levels were measured by using Affinity Chromatography method with fasting blood sample with EDTA. A morning urine sample was used for estimating the microalbumin levels by Immunoturbidity method. HbA_1C levels <7% and microalbumin <30 mg/day were considered to be normal.

III. Statistical Analysis

Datas were analysed using SPSS version 17.0. Pearson correlation coefficient was calculated to find the linear relation between HbA_1C and microalbuminuria. Chi square test was also used to find out relationship between HbA_1C and microalbuminuria. P value was taken as significant at 5 percent confidence level (P<0.05).

IV. Results

Among 60 known diabetic patients 65% were males and 35% females (Figure1). Table 1 summarizes the baseline and laboratory parameters. The mean age was 54±12.7 years. The mean duration of diabetes was 7.2±5.8 years. The mean of HbA_1C was 8.5± 2.2 % and mean microalbumin was 26.3± 13.1 mg/day. Our study revealed that out of 60 diabetic patients 42 (70%) had HbA_1C ≥ 7% and 18(30%) had less than 7%. Microalbuminuria was found among 29 (48%) patients.

Table 1: Baseline and laboratory parameters of the study groups (n= 60)

	Minimum	Maximum	Mean	Standard Deviation
Age	31.00	77.00	53.9833	12.74322
FBS	11.80	156.00	124.9467	20.59376
PPBS	120.00	235.00	170.3333	30.57287
HbA_{1c}	5.06	13.50	8.4838	2.21972
Microalbumin	8.80	59.00	26.2467	13.11371

A positive correlation was found among 25(45%) diabetic patients with uncontrolled glycaemic status which is shown by HbA_1C ≥ 7% and microalbuminuria indicated by >30mg/day and this was evidenced by Pearson's correlation coefficient (r= 0.5590) and Chi square test. p<0.05 was considered statistically significant (Table2 & Figure2).
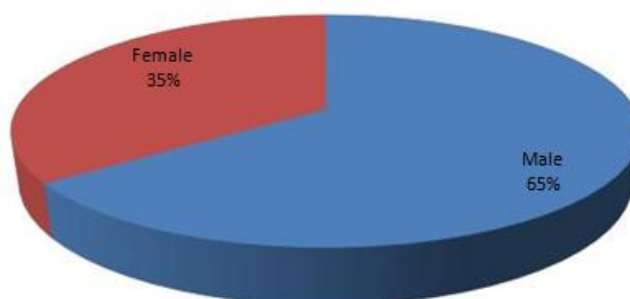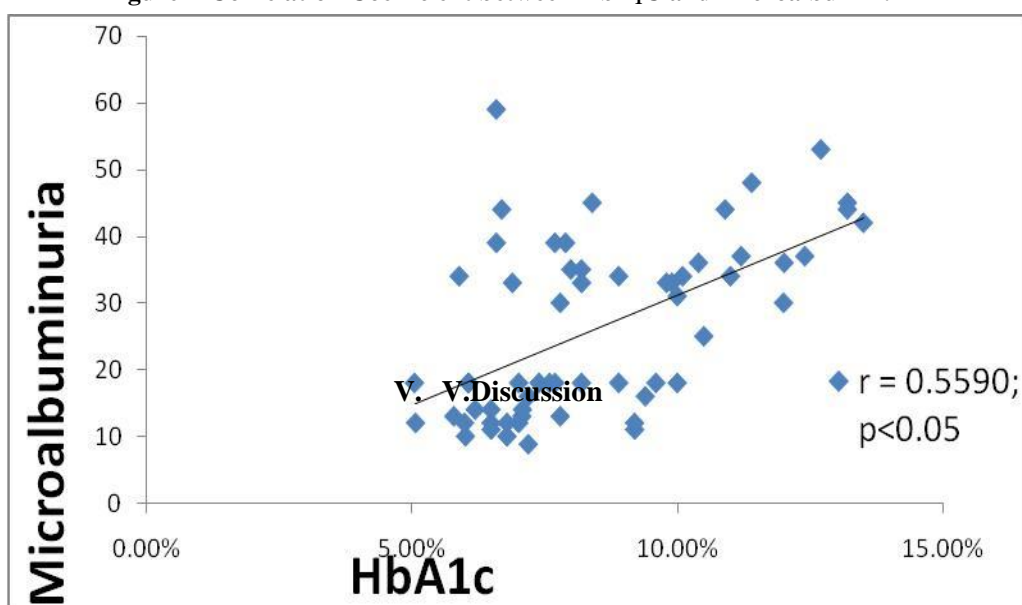
Figure1 – Gender distribution

Table 2: Correlation between HbA_1C and Microalbumin levels

Microalbumin		≤30mg/day	>30mg/day
HbA_1C		(number of patients)	(number of patients)
□7%	13	5	
>7%	18	24	

Figure 2-Correlation Coefficient between HbA₁C and Microalbumin:

Diabetic nephropathy is one of the most serious long-term complications of diabetes mellitus. Various epidemiological studies and cross-sectional studies have reported many variations in prevalence of microalbuminuria. Vijay et al. reported a prevalence of 15.7% in 600 type 2 diabetic patients in Chennai. [8] Huraib et al reported a prevalence of 16.8% among 125 type 2 diabetic patients in Saudi Arabia. [9] Varghese et al. reported a prevalence of 36.3% in 1425 type 2 diabetic patients in Chennai. [10] The variation in the prevalence of microalbuminuria can be attributed to several factors such as difference in population, the definition of microalbuminuria, the methods of measurement of microalbuminuria and urine collection etc. Huraib et al. also used immunoturbidity method for the assessment of microalbuminuria[9] which is the same method followed in the present study.

In our study among 60 known diabetic patients, the prevalence of microalbuminuria with high HbA₁C which was estimated to be statistically significant with a correlation of 45% (p<0.05). We also found that all patients with uncontrolled glycaemia was found to have a positive correlation with microalbuminuria. Thus in our study the correlation was found to be greater than previous studies.

VI. Conclusion

It was concluded that the prevalence of microalbuminuria in diabetic patients in this study was found to be as high as 45%, which needs of therapeutic and preventive measures. Being a developing country, there is a need of microalbuminuria and HbA₁C testing in both newly diagnosed as well as already diagnosed type 2 diabetic patients as an early marker of renal risk factor. The present study emphazises education about strict glycaemic control and testing for microalbuminuria which is an early indicator of diabetic nephropathy, mandatory for all type 2 diabetic patients.

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