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Correlation between Severity of Microalbuminuria with HbA1c in type II Diabetic Patients

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Abstract
Introduction: *Type 2 Diabetes is now a a gloabal endemic and the prevalence is ever increasing with socio economic changes, more geriatric population, urbanisation, dietary changes, less physical exercise and lifestyle changes. The risk of developing microvascular complications increases wit duration and severitity of diabetes. So through this study we tried to explore the relationship between severity of diabetes with development of microalbuminuria.*
Material & Methods: *A total of 472 patients with known history of type 2 Diabetes mellitus attending almology OPD of hospital were for enrolled for the study. The study is a cross sectional study.*
The cases were subjected to detailed medical and examination after noting their detailed medical and demographic history. All patients were investigated for serum creatinine, serum urea, fasting or postprandial blood sugar levels, HbA1c levels and urine microalbumin levels.
Results: *Of the total 472 cases there were 261 males and 211 females, so the female: male ratio was 0.8:1.The majority of the patients lie in age group of 41 to 60 years. Patient were divided in 4 groups depending on the levels of microalbuminuria and most patients with significant data.*
Conclusion: *There was a statistical significant correlation between the severity of microalbuminuria and diabetes duration. Also statistically significant Association was found between HB a1c values and severity of microalbuminuria.*
Keywords: *HbA1c, diabetes duration, microalbuminuria.*

Introduction

Diabetes mellitus (DM) is a group of metabolic disorders that results in hyperglycemia because of defects in insulin secretion or its action or both[1]. It is emerging as a global endemic both in developing and developed countries[2]. It is characterized by recurrent or persistent hyperglycemia, and is diagnosed by demonstrating any one of the following: fasting blood sugar (FBS) level at or above 126 mg/dL, plasma glucose at or above 200 mg/dl two hours after a 75 g oral glucose load as in a glucose tolerance test (GTT), random plasma glucose at or above 200 mg/dl, (WHO report, 2006) [3]. The prevalence of diabetes in India is found to be 2.4% in rural and 4–11.6% in urban population[4].

Glycosylated hemoglobin (HbA1c) is a commonly used marker for determining long-term control of blood sugar. The HbA1c test is done every 3 to 4 months, and unlike blood sugar levels, the test

does not change with any recent changes in diet, exercise or medicines[5]. Higher levels, indicating poorer control of blood glucose have been associated with cardiovascular disease, nephropathy & retinopathy[6]. The HbA1c assay is the basis of treatment guidelines and is used universally to adjust therapy [7,8].

Microvascular complications are very common in diabetes, diabetic retinopathy being the most common.[9] The common microvascular complication associated with diabetes is diabetic nephropathy. Microalbuminuria is defined as albumin excretion of 30-299 mg/24 hours. Microalbuminuria term was 1st coined by Professor Harry Keen in 1964.

The association between two major microvascular complications of diabetes (nephropathy and retinopathy) has been explored and results have shown a direct corelationship between the two[5-7]. Through this study we tried to correlate the degree of severity of microalbuminuria with its diabetes duration and level of hyperglycemia.

This was an outpatient based cross-sectional study in which 472 consecutive patients with known history of type 2 Diabetes mellitus, who attended the outpatient department of medicine or diabetes OPD were enrolled. After a detailed demographic and medical history recording a detailed examination was performed in a preset proforma. Exclusion criteria included patients with gestational diabetes, acute or chronic Kidney Disease, cancer, coronary artery disease, and coexisting conditions like fever, systemic infections, malignant hypertension or congestive cardiac failure. Blood samples were collected after 10 hours of fasting and Vitros 5,1 FS machine was used for testing HbA1c (estimated by turbidimetric innovation method).

Microalbuminuria levels were measured for all patients by Hb Vario (high performance liquid chromatography). Chi square test was used to analyse the data and p value of 0.05 or less was considered to be significant.

Results

Out of the total 472 patients registered in the study, there were 261 males and 211 females. The female to male ratio was 0.8 : 1. Majority of the patients were in the age group of 41 to 60 years (54.87 %) followed by 61 to 80 years (25.63 %) with mean age being 54.43 ± 7.56 years. (Table 1)

Table 1 Demographic distribution of study population

	No. of cases	Percentage
Male	261	55.29
Female	211	44.71
Age group (years)		
20-40	62	13.13
21-40	259	54.87
61-80	121	25.63
>80	30	6.35

Out of 472 patinets were divided in4 groups , group1 containing patients with microalbumin levels less than 2.5 mg/mmol, group 2 had patients with level between 2.5 to 12.5 mg/mol, group 3 with levels between 12.5 to 25 mg/mmol and group34 had patients with microalbuminuria levels more than 25 mg/mol.The duration of diabetes was significantly correlated with the degree of microalbuminuria $p<0.05$.

Table 2

		Group I		Group 2		Group 2		Group 3	
Duration Of Diabetes (Years)	N=	No.	%	No.	%	No.	%	No.	%
		262	55.50	78	16.52	62	13.13	70	14.83
<10 years	218	172	78.8990826	31	14.22018	13	5.96330275	2	0.91743119
10-20 years	141	76	53.9007092	22	15.60284	19	13.4751773	24	17.0212766
21-40 years	84	10	11.9047619	20	23.80952	21	25	33	39.2857143
>40 years	29	4	13.7931034	5	17.24138	9	31.0344828	11	37.9310345
The chi-square statistic is 160.7393. The p-value is < 0.00001.									

Severity of hyperglycemia was graded according to HbA1c levels. Values less than 7% were considered to be good control of diabetes. Levels between 7.1 to 8.5 % - fair control and levels beyond 8.5 % were considered to be in poor control.

Table 3 shows that the prevalence of microalbuminuria is less among patients with good control of diabetes, with only 1.17% paient having clinically significant microalbuminuria as compared to those with fair (29.1 %) or poor control (941.3%) of diabetes. A statistically significant association between severity of microalbuminuria and HbA1c values was Found ($p < 0.001$) (Table 3).

Table 3

Hba1c		Group I		Group 2		Group 2		Group 3	
	n=	No.	%	No.	%	No.	%	No.	%
Good control (<=7.0%)	256	190	74.21875	56	21.875	7	2.734375	3	1.171875
Fair control (7.1-8.5%)	158	41	25.94937	38	24.05063	33	20.88608	46	29.11392
Poor control (> 8.5%)	58	5	8.62068966	13	22.41379	16	27.58621	24	41.37931
The chi-square statistic is 187.317 The p-value is < 0.00001.									

Discussion

The prevalence of type 2 DM is estimated to double by 2030[12]. Diabetes is known to be associated with both microvascular and macrovascular complications, including retinopathy, nephropathy, and neuropathy (microvascular) and ischemic heart disease, peripheral vascular disease, and cerebrovascular disease (macrovascular), resulting in organ and tissue damage in approximately one third to one half of people with diabetes[10] the higher the degree of diabetes, the more likely are the chances to develop theses complications

In our study, we found that most of patients who have microalbuminuria had fair (63 %) to poor (32%) control of diabetes mellitus, or the duration of diabetes is 20 years or more in most(62.85 %) of them.. Another Indian study have got the same results and concuded that Level of microalbuminuria increase with increase in duration of diabetes and worsening of diabetes[11] .Other cross-sectional studies, also shows that the prevalence of microalbuminuria is related with poor glycemic control.[13-16]

Our study stresses on the relationship between the control level of type 2 diabetes mellitus and microalbuminuria. It was seen that higher grades of HbA1c is associated with higher severity of microalbuminuria and so can be used as a successful predictor and warning for such patients as this high level has been correlated with many other microvascular complications of diabetes.. Our study was limited by time, so a better knowledge of this relationship could be collected with the help of more longer longitudinal clinical trials with new type 2 diabetic patients.

Conclusion

The results of our study endorses and strengthen the view that higher levels of HbA1c is associated with greater risk and severity of development of microalbuminuria and its control is essential to prevent other microvascular complications of diabetes.

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