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ORIGINAL RESEARCH

Evaluation of correlation of glycosylated hemoglobin with microalbuminuria among diabetics

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ABSTRACT

Background: The prevalence of type 2 diabetes mellitus (T2DM) is increasing worldwide and so are the disease-associated complications. The present study evaluated correlation of glycosylated hemoglobin (HbA1c) with microalbuminuria among diabetics.

Materials & Methods: 58 type II diabetics of both genders were enrolled. Blood pressure, smoking habit, family history of diabetes, renal disease and hypertension was recorded. Blood samples were analyzed for HbA1c, fasting blood glucose, postprandial blood glucose, serum urea and serum creatinine. Urine sample was analyzed for microalbuminuria.

Results: Out of 58 patients, males were 38 and females were 20. Duration of diabetes was 1-5 years in 27, 6-10 years in 20 and 10-15 years in 11 patients. Family history was positive in 23. Fasting blood glucose level was 182.4 mg/dl, PPBS level was 240.6 mg/dl and HbA1C was 9.15%. The difference was significant (P< 0.05). Microalbuminuria and glycemic control have shown a significant linear correlation with duration of diabetes (p<0.05). Also micro albuminuria has a significant negative correlation with increase in level of glycosylated haemoglobin.

Conclusion: The prevalence of microalbuminuria in diabetic patients was found to be high. Microalbuminuria has a significant negative correlation with increase in level of glycosylated haemoglobin.

Key words: microalbuminuria, Diabetes, glycosylated haemoglobin.

INTRODUCTION

The prevalence of type 2 diabetes mellitus (T2DM) is increasing worldwide and so are the disease-associated complications. Long-term complications of diabetes cause significant morbidity and mortality.[1] Complications of diabetes can be macrovascular and/or microvascular. Macrovascular complications include myocardial infarction, transient ischemic attack, stroke, and limb ischemia and microvascular complications include retinopathy, nephropathy, peripheral neuropathy, and autonomic neuropathy. Adequate glycemic control is important to delay or prevent these complications.[2]

Diabetic nephropathy is a common consequence of longstanding diabetes mellitus. The development of diabetic nephropathy has a dramatic increase on the morbidity and mortality of patients with diabetes.[3] Microalbuminuria is an earliest marker of nephropathy and

cardiovascular disease (CVD) in patients with diabetes s and defined as a urinary albumin excretion rate (AER) between 30-300 mg/24 hrs or 20-200 μg/min in a timed specimen or 30-300 mg/g of creatinine in a random specimen. Microalbuminuria develops in 30-40% of both type-1 and type-2 diabetes after duration of 20 years.[4] Although microalbuminuria is predictive of worsening microvascular disease in the kidney (5-10% per year progress to overt diabetic nephropathy), an increased albumin excretion rate (AER) reflects a generalized abnormality of vascular function and is associated with 2- 4-fold increases in cardiovascular and all-cause mortality.[5]

HbA1c is a blood glucose control marker in diabetic patients. Glycosylated hemoglobin (HbA1c) results from post-translation changes in the hemoglobin molecule, and their levels correlate well with glycemic levels over the previous six to ten weeks.[6] The present study evaluated correlation of glycosylated hemoglobin (HbA1c) with microalbuminuria among diabetics.

MATERIALS & METHODS

The present study comprised of 58 type II diabetics of both genders. They were enrolled in the study after getting their written consent.

Data such as name, age, gender etc. was recorded. Blood pressure, smoking habit, family history of diabetes, renal disease and hypertension was recorded. 5 ml of venous blood was obtained and blood samples were analyzed for HbA1c, fasting blood glucose, postprandial blood glucose, serum urea and serum creatinine. Urine sample was analyzed for microalbuminuria (immunoturbidimetric method). Results were tabulated and assessed statistically. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 58		
Gender	**Male**	**Female**
Number	38	20

Table I shows that out of 58 patients, males were 38 and females were 20.

Table II Assessment of parameters

Parameters	Variables	Number	P value
Duration of diabetes (years)	1-5 years	27	0.62
	6-10	20	
	10-15	11	
Family history	Yes	23	0.05
	No	35	
Blood glucose	FBS (mg/dl)	182.4	-
	PPBS (mg/dl)	240.6	-
	HbA1C (%)	9.15	-

Table II, graph I shows that duration of diabetes was 1-5 years in 27, 6-10 years in 20 and 10-15 years in 11 patients. Family history was positive in 23. Fasting blood glucose level was 182.4 mg/dl, PPBS level was 240.6 mg/dl and HbA1C was 9.15%. The difference was significant ($P< 0.05$).

Graph I Assessment of parameters

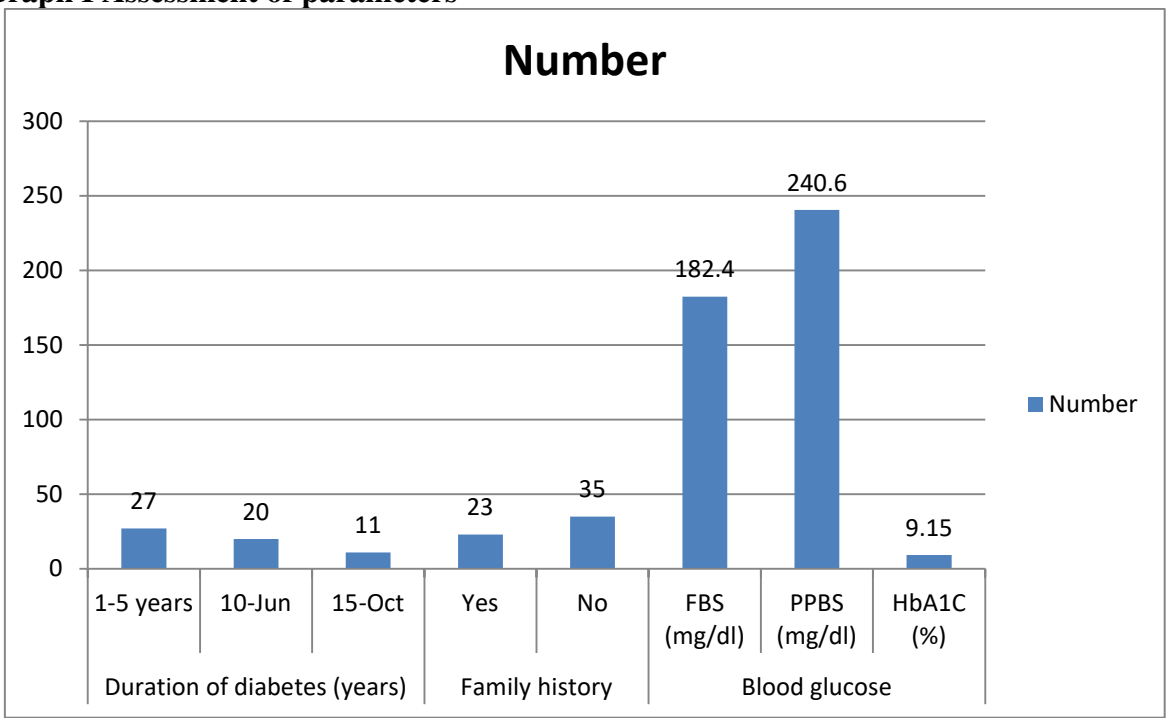

Table III Correlation between HbA1c and microalbuminuria

		HbA1C	Microalbumin uria (mg/l)
HbA1C	Pearson correlation	1	-0.075
	Sig. (2-tailed)		0.612
Microalbumin uria (mg/l)	Pearson correlation	-0.075	1
	Sig. (2-tailed)	0.612	

Table III shows that microalbuminuria and glycemic control have shown a significant linear correlation with duration of diabetes ($p<0.05$). Also micro albuminuria has a significant negative correlation with increase in level of glycosylated haemoglobin.

DISCUSSION

Diabetic nephropathy is one of the most common causes of chronic kidney disease (CKD) leading to endstage renal disease (ESRD) and its prevalence is increasing because of the increasing burden of T2DM.[7] For early detection of diabetic nephropathy, the American Diabetic Association (ADA) recommends screening for microalbuminuria once a year for diabetic patients. Previously, a 24-hour urine collection was used for measurement of urinary albumin excretion. However, a spot morning sample for urinary albumin:creatinine ratio (UACR) is now used for screening of microalbuminuria.[8] It is convenient and correlates well with 24-hour collection results in adults. UACR has a direct relation to diabetic control and glycosylated hemoglobin (HbA1c) is a useful tool to assess diabetic control. HbA1c levels ≥ 6.5% are diagnostic for diabetes mellitus and levels < 7.0% are recommended in diabetic patients.[9] The present study evaluated correlation of glycosylated hemoglobin (HbA1c) with microalbuminuria among diabetics.

We found that out of 58 patients, males were 38 and females were 20. Sana et al[10] reported the prevalence of microalbuminuria in type 2 diabetics along with its association with diabetic control. A total of 133 patients with T2DM were consecutively included and their co-morbidities, body mass index, mode of treatment of diabetes (oral hypoglycemic drugs and/or insulin), duration since diagnosis of T2DM, and hemoglobin A1c (HbA1c) levels were recorded. The mean age of the participants was 54.5 ± 10.3 years which included 60.9%

males and 39.1% females. The overall incidence of diabetic nephropathy was 30.1%, with 25.6% having microalbuminuria and 4.5% having macroalbuminuria. Pearson correlation test was used to compare UACR and duration of diabetes (p=0.034) and HbA1c.

We found that duration of diabetes was 1-5 years in 27, 6-10 years in 20 and 10-15 years in 11 patients. Family history was positive in 23. Fasting blood glucose level was 182.4 mg/dl, PPBS level was 240.6 mg/dl and HbA1C was 9.15%. Naveen et al[11] studied evaluation on Hba1c and microalbuminuria as early risk marker for nephropathy in type 2 diabetes. The mean Hba1c, microalbuminuria and serum creatinine was highest in uncontrolled diabetes i.e. (8.01+0.83), (12+49.89), (2.18+1.12) when compared to control diabetes (6.49+0.37), (47.31+39.15)and (0.85+0.32) respectively so it concluded that risk of microalbuminuria increase with poor glycemic control.

We found that microalbuminuria and glycemic control have shown a significant linear correlation with duration of diabetes ($p<0.05$). Also micro albuminuria has a significant negative correlation with increase in level of glycosylated haemoglobin. Kare et al[12] evaluated the prevalence of microalbuminuria in patients with diabetes mellitus patients. A total of 60 type-2 diabetes patients were enrolled in the study. Average duration of diabetes among study group was 8 years and most of the patients were between 6-10 years. In type 2DM patients, microalbuminuria and glycemic control have shown a significant linear correlation with duration of diabetes.

Hsu et al[13] a study on Hba1c variability is associated microalbuminuria in type 2 diabetes in a 7 years study included 821 middle aged normoalbuminuric individuals with type 2 diabetes who were followed up till 2010. The incidence of microalbuminuria was 91.9/1000 persons for Q1-Q4 adjusted Hba1c SD respectively. So, it concluded that Hba1c variability even measured as early as 2 years is independently associated with development micro albuminuria in patients with type 2 diabetes.

CONCLUSION

Authors found that the prevalence of microalbuminuria in diabetic patients was found to be high. Micro albuminuria has a significant negative correlation with increase in level of glycosylated haemoglobin.

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