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Estimation of HbA_{1c} and Microalbuminuria among Type 2 Diabetic Mellitus Sudanese Patients

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ABSTRACT

Diabetes mellitus is the commonest metabolic disorder and has a high prevalence in Sudan. Diabetic nephropathy is characterized by proteinuria and is the leading cause of end stage renal disease. Microalbuminuria testing is sensitive test for diabetic nephropathy. The present study aimed to estimate of HbA_{1c} and micro albumin among type 2 diabetic mellitus in Sudanese patients and to correlate with duration of disease and age. This study was a cross sectional study conducted at Gaber Abu Elezz Diabetes Center-Khartoum state- Sudan, during March and November 2015, A total of (75) patients diagnosed with type 2 diabetic mellitus were enrolled in this study, Patients with systemic diseases like cardiovascular diseases, cerebrovascular diseases and urinary tract infection or kidney disease were excluded from the study. The blood sample collected in EDTA containers to estimate HbA_{1c} levels which was measured by using (i- CHROMA), random urine specimens were collected to estimating microalbumin level of all the individuals under study. The study revealed that microalbuminuria, HbA_{1c} levels were significantly increased in comparison with the reference range, p. value (0.009, 0.000), respectively, as well positive correlation between microalbuminuria and HbA_{1c} and duration of disease, r. values was (0.603, 0.436) and p. values was (0.000, 0.000), respectively. The study revealed a clear relationship significant elevations of HbA_{1c} and urinary micro albumin levels which suggest that the monitoring of micro albuminuria levels at the early stages of type 2 diabetic mellitus Sudanese patients.

Keywords: Microalbuminuria, HbA_{1c}, Diabetes, Sudan, Neelain

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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 (HbA_{1c}) assay is the most commonly used measure of chronic glycaemia, since its introduction more than 25 years ago.^[3] HbA_{1c} 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. HbA_{1c} levels are higher in diabetic patients who develop micro- and macroalbuminuria, and there is strong prospective analysis of UKPDS data suggested that for a 1% reduction in HbA_{1c}, there significantly (HbA_{1c}-7.5-6.6%) in those whose albumin excretion reverted to normal, and HbA_{1c} was significantly higher than in those who remained microalbuminuric (HbA_{1c}- 7.7%) or developed proteinuria (HbA_{1c} -8.9).^[7] HbA_{1c} is a measure of erythrocyte haemoglobin glycation, since erythrocytes have about 120 days life span, HbA_{1c} reflects mean glycaemic value for the previous 3 months (weighted to the most recent months).^[8] It provides no information about the immediate blood glucose concentration. Blood samples for HbA_{1c} can be drawn whether or not the patient is fasting, as it does not reflect the patterns of glycaemia, the effects of food or exercise.^[9,10]

MATERIALS AND METHOD

A total of (75) Sudanese patients diagnosed with type 2 diabetic mellitus were attended in this cross sectional study , they were attended to Gaber Abu Elezz enter , Khartoum state during the period of March to November **2015** for treatment and follow up , Patients included in this study were type 2 diabetic mellitus , Patients with systemic diseases like cardiovascular diseases, cerebrovascular diseases and urinary tract infection were excluded from the study.

A bout 2.5 ml of blood was drawn fasting of 10-12 hours to test for HbA1c levels. The fasting blood sample with EDTA was used to estimate HbA1c levels. Which was measured using (**i-CHROMA**) made in china, is based on fluorescence immunoassay technology also collected random urine specimens to investigate micro albumin level of all the individuals under study, both patients were age between (**35 – 70**) years old .

RESULTS AND DISCUSSION

Data analysis was performed using SPSS (Statistical Package for the Social Science) version17.0. A total of **Seventy five** Sudanese patients diagnosed with type 2 diabetic involved of this study , The mean and Standard Deviation of HbA1c ($8.2\pm 1.5\%$) were increased significant (P-value =0.000) the mean and standard deviation micro albumin ($182.4\pm 82.9\text{mg/L}$) (P-value =0.009) and The mean and Standard Deviation of age (53.9 ± 7.8) P. value (0.237) , they were enrolled for measurement of Hba1c%, Micro albuminuria/mg/l Duration of disease/year and Age/years , considering the normal value to compare with the three parameters data gave significant for both Hba1c%, Micro albuminuria/mg/duration of disease/year with P-value 0.000 and 0.009 and 0.000respectively and no significant with Age p value 0.237 as in table I .

Shown Tables:

Table 1:descriptive statistics of patients

Variables	Mean	Std. Deviation
Age/years	53.9	7.8
Duration of disease/years	9.3	4.5

Table 2:mean concentration of HBA1c and Microalbuminuria with normal value

Parameters	Mean±SD	R.V	P-value
HBA1c	8.20 ± 1.5	6.5	0.000
Microalbuminuria	182.40 ± 82.9	165 (30-300)	0.009

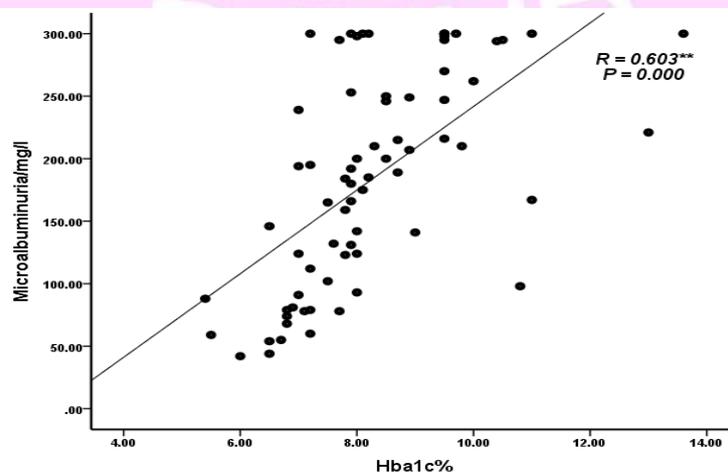


Figure (1) Association of HbA1C with Microalbuminuria in Type 2 Diabetes

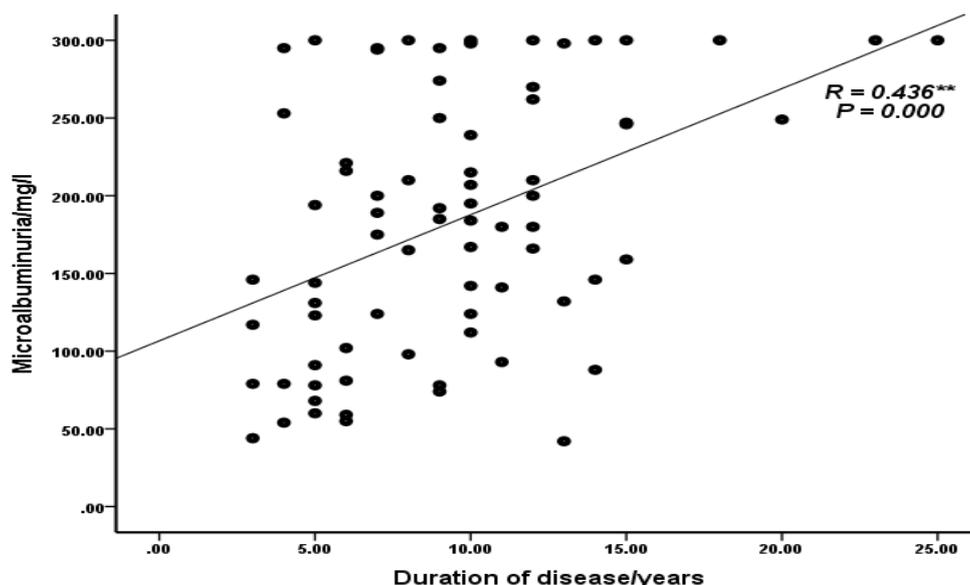


Figure 2: Association of Microalbuminuria and duration in Type 2 Diabetes

In the present study, Seventy five Sudanese diabetic patients of type 2 were studied. A statistically significant positive correlation was found between the microalbuminuria and HbA1c level and No statistically correlation was found between the prevalence of micro albuminuria and the age of patients in the present study which was similar to findings reported by Allawiet al.^[11] However, the study from India by Varghese et al^[12]

Our finding is in concordance with that of reported a statistically significant correlation between the prevalence of microalbuminuria and the age among 1425 type 2 diabetic patients. Also disagreed with results were also found from Pakistan Naz et al reported the finding from the patients from Rawalpindi/Islamabad.^[13]

We also found that all patients with uncontrolled glycaemia was found to have a positive correlation with microalbuminuria. Thus in current study the correlation was found to be greater than previous studies.

in the present study which was similar to findings reported by 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.^[14] Huraib et al. carried out study relating prevalence of microalbuminuria with urine albumin to creatinine ratio^[15].

Different 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.^[16] Huraib et al. also used immunoturbidity method for the assessment of microalbuminuria^[17] which is the same method followed in the present Varghese et al. reported a prevalence of 36.3% in 1425 type 2 diabetic patients in Chennai.^[18] 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 study.

In our study among 75 known diabetic patients, the prevalence of microalbuminuria with high HbA_{1C} which was estimated to be statistically significant with ($p < 0.05$). 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.

CONCLUSION

It was concluded that microalbuminuria in diabetic patients in this study was found to high which needs of therapeutic and preventive measures. Being a developing country, there is a need of microalbuminuria and HbA_{1C} testing in both newly diagnosed as well as already diagnosed type 2 diabetic patients as an early marker of renal risk disease.

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