

Correlation between urea level and HbA1c level in type 2 diabetic patients

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Abstract

The objective of this study was to determine relation between HbA1c and urea level in type 2 diabetic patients. This study was carried between March 2009 - June 2010. A total of 150 diabetic patients were included in this study, ages between (40-70 years old) chosen among male and female attending several diabetic clinics in the private sector in Khartoum state were included. Fifty healthy subjects were included as a control.

Fasting blood samples were collected for estimations of blood glucose, HbA1c, and blood urea. Urea concentration was measured by Berthelot reaction and HbA1c was measured by glycohemoglobin spectrophotometry method. By SPSS (Statistical Package for Social Sciences) and student t-test statistical analysis was determined in which statistical significance was measured as p-value less than 0.05.

HbA1c, and urea levels increased significantly ($P < 0.01$) in patients with diabetes compared to the control group. Regression and correlation analysis showed a significant positive correlation between HbA1c and serum urea levels. Insignificant changes between men and women were found.

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Introduction:

Diabetes mellitus is a major health problem worldwide. Diabetes is one of the leading causes of morbidity and mortality throughout the world. Diabetes mellitus is a major health problem worldwide. About 2.2% to 3% of the world's population suffers from type 2 diabetes mellitus ⁽¹⁾. Diabetes mellitus (DM) is a chronic metabolic disorder that can lead to severe cardiovascular, renal, neurological and retinal complications ^(2, 3). It is a serious debilitating and deadly disease that has now reached epidemic proportion and the

prevalence rates are expected to go even higher in the future. Diabetic patients may reach End Stage Renal Disease (ESRD) if diabetes mellitus is not adequately controlled. In most countries diabetic nephropathy has become the single most frequent cause of ESRD ^(4, 5).

The Glycosylated hemoglobin (HbA1c) is widely accepted and used as the most reliable test for assessment of chronic glycaemia ⁽⁶⁾. The HbA1c reflects the overall blood glucose levels over a period of 2-3 months and the major use of the

HbA1c assay is to assess changes in metabolic control that follow an alteration in treatment ⁽⁷⁾.

The nephropathy is common in diabetic patients and usually associated with vascular complications. The long-term complications of diabetes have major consequences for individual and health care providers. The blood glucose was considered as a prime test for optimizing treatment of diabetes mellitus. But the HbA1c determination is the new better method to monitor the long term glucose control irrespective of glucose measurement for patient management. It would prevent or delay the further diabetic complications. Diabetic patients with oral hypoglycemic therapy should go for HbA1c test as recommended by the American diabetes association ⁽⁸⁾.

Therefore, in the present investigation, the effect of the HbA1c in diabetes associated nephropathy is proposed to explore in Sudanese population.

Materials and methods:

Study area: The study was conducted in Khartoum state, Sudan

Study size: A total of 90 diabetic patients, ages (40-70) years old comprising males and females attending several diabetic clinics in the private sector in Khartoum state were chosen in the study. Informed consent was obtained from each patient. Fifty healthy subjects with no known history of hyperglycemia and renal disease were included as a control group.

Study Population: The study was conducted on the type II diabetic patients who have DM for 5 years and more, based on WHO criteria. ⁽⁹⁾.

Patients with type 1 diabetes mellitus, gestational diabetes and any known mental illness, macro vascular disease prior to diagnosis of type II diabetes, or the patients who refused to participate in the study were excluded. Subjects with hypertension, renal failure, cardiac problems, malaria, and/or obese were also excluded.

Samples collection: Overnight fasting blood samples were collected from the antecubital vein, by venipuncture without venous stasis, in lithium-heparin coated tube after no medications were taken for the previous 12h or longer for estimations of blood glucose, HbA1c, and serum urea.

A previously structured questionnaire was used to record the demographic features of all subjects. Age, sex and duration of DM affect.

Methods: HbA1c was estimated by glycohemoglobin spectrophotometry (from Analar Diagnosis Kits, Spain). Serum urea was estimated by the Berthelot reaction ⁽¹⁰⁾.

Statistical analysis: Statistical analysis was performed using statistical package for social sciences (SPSS). Statistical significance and difference from control and test values were evaluated by Student's t-test. Correlation coefficient and regression analysis were used to describe the effects of elevated serum HbA1c on urea.

Results:

The results showed that there were significant variations between diabetic patients and the control group (p value<0.05) in both results of

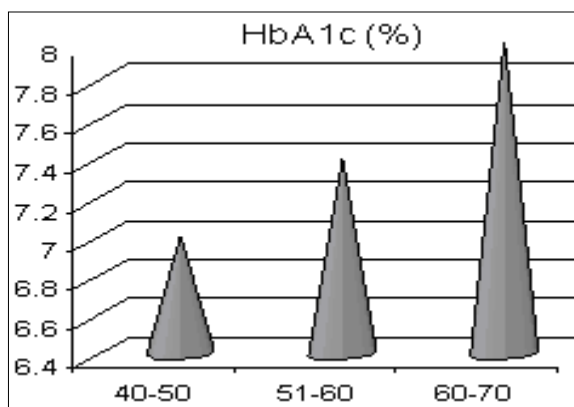
urea and Hb A1c. Also there was a significant correlation between urea and HbA1c

Table (1): results between DM group and control group:

Type	HbA1c (%)	Urea (mg/dl)
Control	6.73	29.55
Diabetes Mellitus	7.45	47.9
P value	<0.05	<0.05

In this study the highest level of Hb A1c (8.6%) was reported among the 60 - 70 age groups, while the lowest level (6.9%) was reported among the 40-50 age group (figure 1). This difference was found to be statistically significant (P value=0.04).

Figure (1): Results of HbA1c in DM group according to age:



* Significant changes between (60-70years) and (40-50years) age groups

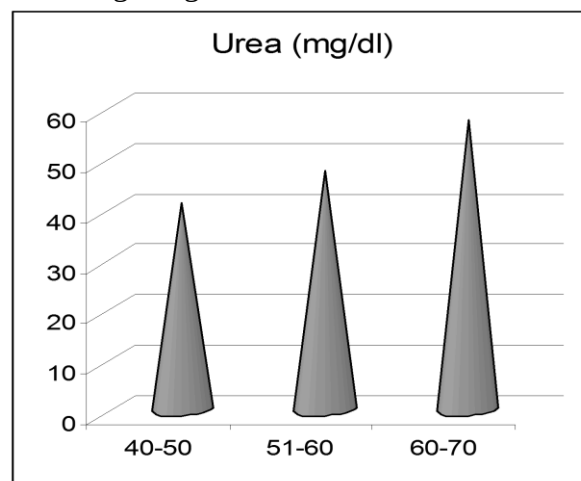
In this study the highest level of urea (56 mg/dl) was reported among the 60 - 70 age groups, while the lowest level (38 mg/dl) was reported among the 40-50 age group (figure 2). This difference

Discussion:

In the present investigation, diabetes mellitus type II associated nephropathy showed significant elevated levels of HbA1c in blood. The present study (table 1), HbA1c and urea levels were increased significantly (P<0.05) in DM compared

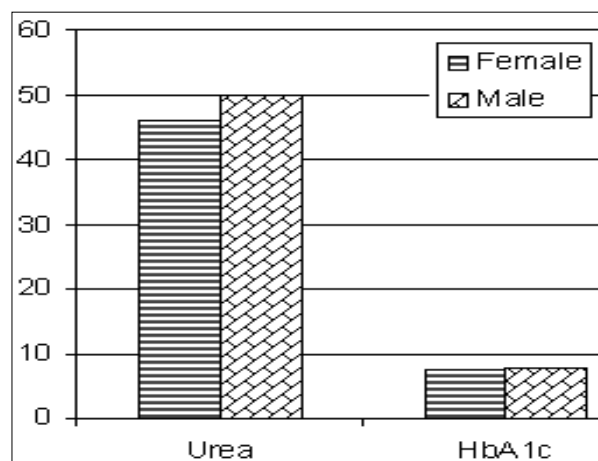
was found to be statistically significant (P value<0.05).

Figure (2): Results of urea in DM group according to age



The result revealed that the highest levels of urea and HbA1c (50 mg/dl, 8.7% respectively) were reported among male diabetic patient compared to female (45mg/dl urea and 8.5% HbA1c) (figure 3). This difference was found to be statistically insignificant (P value=0.5).

Figure (3): Results of urea and HbA1c in DM subjects according to sex



to the control group. This was in agreement with Murugan ⁽⁸⁾ who reported that there was a strong relationship between fasting blood sugar level, postprandial blood sugar level and HbA1c level in diabetic patients. Also table 1 showed that there was a significant correlation between urea and

HbA1c. Similarly, it has been reported that the blood glucose and HbA1c levels considerably increase in diabetic patients ⁽¹¹⁾. The findings of the current study are also in agreement with Bernadette *et al* ⁽¹²⁾ who investigated the elevated levels of HbA1c in diabetes. Previous studies ^(8, 13, and 14) also reported that urea level is elevated in DM patients.

The age had a significant increasing affect ($P<0.05$) on the levels of HbA1c and urea (diabetic patients) in the elderly group (60-70years) compared to the youngest study group (40-50years) (figure 2 and figure 3). Many studies proved that the urea levels are increased by age ⁽¹⁵⁾ which in line with our findings; but we disagree with Wiener *et al* ⁽¹⁶⁾ who reported that HbA1c raises but insignificantly affected by age. In this study, the levels of urea and HbA1c was not affected significantly ($p>0.05$) by sex (figure 3). These findings were in agreement with Yang *et al* ⁽¹⁷⁾ and Waleed *et al* ⁽¹⁸⁾.

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