



EVALUATION OF PLASMA HOMOCYSTEINE LEVEL IN DIABETES MELLITUS PATIENTS IN KHARTOUM STATE

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ABSTRACT

Background: Diabetes mellitus (DM) Is metabolic disorder characterized by chronic hyper glycemia with disturbance in carbohydrate, fat and protein metabolism arising from defect in insulin secretion, action or both.^[1] The pathophysiology of DM characterized by high incidence of vascular complications, in recent years it had be reported to be associated with the vascular complications of diabetes. Elevated Hcy levels were associated with insulin resistance and nephropathy, also predict the risk of coronary events. **Objectives:** The aim of this study to measure homocysteine level in diabetes mellitus patients using ELISA and to correlate the homocystiene level with patient s, age, gender and type of diabetes. **Material and Methods:** cross sectional study was performed In Al-Mogran University Hospital, Khartoum, Sudan. A total of 30 Sudanese diabetic patient were included in this study, 15 (50%) were males and 15 (50%) were females, their age ranged between 12to 80 years. Homocystiene level were measured using immune assay ELISA. Data were analyzed by using statistical package for the social science (SPSS) computerized program version 11.5. **Results:** The present study showed that the mean of plasma homocysteine level is(15.010) which was slightly increase according to normal range (5-14 $\mu\text{mol/L}$), also the results showed that was significantly higher compared to normal range(P-value 0.00). **Conclusion:** there was slightly increased in plasma homocysteine level in diabetic patients.

KEYWORD: Diabetes mellitus (DM) homocysteine level in diabetic patients.

1. INTRODUCTION

Diabetes mellitus (DM)

Is metabolic disorder characterized by chronic hyper glycemia with disturbance in carbohydrate, fat and protein metabolism arising from defect in insulin secretion, action or both.^[1]

Type I diabetes

Is a result of cellular mediated autoimmune destruction of the beta –cell of the pancreas, causing an absolute deficiency insulin secretion. Type one constitutes only 10% to 20% of all cases of diabetes and commonly occurs in childhood and adolescence. This disease is usually initiated by an environmental factor or infection in individuals with a genetic pre disposition. Characterized of type one diabetes include abrupt onset, insulin dependence and ketosis tendency.^[2]

Treatment of the patient is depend on exogenous insulin administration sustain life and prevent diabetic ketoacidosis.^[3]

Type II diabetes

Characterized by hyperglycemia as a result of an individual resistance to insulin with an insulin secretary

defect. This resistance result in a relative not an absolute insulin deficiency, type two constitute the majority of the diabetes cases. Most patient in this type are obese or have an increase body fat, risk increase with an increase with age and lack of physical exercise adult onset with ketoacidosis seldom occurring.^[2]

Treatment: patient may be controlled by diet, exercise, oral hypogluceic agent or may require insulin administration.^[3]

Other specific type of diabetes

These are associated with certain conditions including genetic defects of beta cell function or insulin action, pancreatic disease, disease of endocrine origin, drug or chemical induced insulin receptor or abnormalities and certain genetic syndromes.^[2]

Gestational diabetes mellitus (GDM)

Any degree of glucose intolerance recognition during pregnancy. Causes include metabolic and hormonal changes, this disease is associated with increase prenatal complication and an increase this for the development of diabetes in later years.^[2]

Pathophysiology of DM

On both type one and two diabetes, the individual will be hyperglycemia which can be severe can also occur after the renal tubular transporter system for glucose become saturated, this happens when the glucose concentration in plasma exceeds roughly 180 mg/dl in an individual with normal renal function and urine output. As hepatic glucose over production continuous, the plasma glucose concentration reaches a plateau around 300mg/dl to 500 mg/dl provide renal output is maintained glucose excretion will match the over production causing the plateau.^[4]

Homocysteine

Homocysteine (Hcy) is a four-carbon amino acid with a free thiol group, which is formed by demethylation of methionine, an essential amino acid derived from diet. Normal total Hcy (tHcy) concentrations range from 5-14 $\mu\text{mol/L}$. Hyperhomocysteinemia (HHcy) has been classified into moderate (plasma tHcy concentrations of 15-30 $\mu\text{mol/L}$), intermediate (plasma tHcy concentrations of 31-100 $\mu\text{mol/L}$), and severe (plasma tHcy concentrations 100 $\mu\text{mol/L}$). Both acquired and genetic factors can have an impact on plasma tHcy.

Male gender, aging, smoking, impaired renal function, and some medications such as Corticosteroids and Cyclosporine are some examples of the acquired causes and classic homocytinuria and C677T homozygote mutation of 5,10-methylenetetrahydrofolate reductase (MTHFR) are the main genetic ones. Vitamin B12, vitamin B6, and folate, all of which have dietary origins, are three main cofactors in Hcy metabolism. Deficiencies in these supplements are more prevalent in the most developing countries and may account for many cases of moderate hyperhomocysteinemia.^[6]

Clinical feature

It includes sweating, drowsy, volume depletion, hyperventilating and neurological abnormality.^[5]

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MATERIAL AND METHODS

A cross sectional study carried out at faculty of Medical Laboratory Science, Al-Neelain University, with a sample comprised of 30 diabetic Sudanese participants, recruited from Al-Mogran University Hospital, Khartoum, Sudan. Assigned to two groups as follow, the first group included (9) Type1 diabetic patients, 66 % male and 34 % female. The second group included (21) Type2 diabetic patients, 42 % male and 58 % female.

Patients with liver or renal disease were excluded.

Blood specimens were taken from each participant diabetic patient. 3 ml of venous blood was collected in EDTA container. The blood samples then centrifuged and the plasma transferred to new containers. Immune assay ELISA was used to measure plasma homocysteine level, after diluted the standard then prepare the sample dilution and pipetting 40 μL in testing well then covered with adhesive strip and incubated for 30 min at 37 $^{\circ}\text{C}$, centrifuged, washed and added enzyme(HRP conjugate reagent excepted blank well, then incubated, washed and added 50 μL chromogen solution to each well after that added 50 μL of stop solution to each well, finally the absorbance read at 450 nm.

Data were analyzed by using statistical package for social sciences (SPSS) version 11.5 one sample T. test and independent sample test.

RESULTS

The result showed that the mean \pm SD for plasma homocysteine in over all subjects was (15.01 \pm 1.44) which was slightly high according to normal range (5-14 $\mu\text{mol/L}$). Also results of the study showed that the plasma homocysteine of the diabetic patients were significantly higher as compared to normal range (P value 0.000).

The correlation results between plasma homocysteine and age of the patients showed no statistically significant correlation (p-value 0.46). Also we found that the correlation between plasma homocysteine and duration of the diabetes mellitus showed no statistically significant correlation (p-value 0.099).

Also the correlation results between plasma homocysteine and Type of the diabetes mellitus showed no statistically significant correlation by independent test (p-value 0.349).

Table 1: The mean of HOMOCYSTEINE level among types of diabetes mellitus.

Group	HOMOCYSTEIN LEVEL Micromol/L		P.Value
	Mean	STD	
Type 1	14.6	1.27	0.349
Type 2	1.5	1.46	

DISCUSSION

Hyperhomocysteinaemia is known to be a risk factor for vascular occlusive diseases. Elevated levels of plasma homocysteine have been found in patients suffering from peripheral vascular occlusions, such as coronary artery disease, cerebral vascular accidents and deep-vein thrombosis as well as from ocular vascular occlusions such as retinal vein and retinal artery and anterior ischaemic optic neuropathy.^[7]

In recent prospective studies on large populations, significantly higher concentrations of homocysteine were found in the groups of patients with diabetes.^[8]

This study was carried out in Al-Mogran University Hospital, Khartoum, Sudan. And aimed to assess the homocysteine level among diabetic Sudanese patients, it included 9 type1 diabetes and 21 type2 diabetes.

The present study revealed that slightly increase plasma homocysteine level (15.01 ± 1.44) were statistically significant compared with normal range 5-14 $\mu\text{mol/L}$ (p value 0.00), were no significant correlation existed between plasma homocysteine and patients age (p value 0.046), duration of diabetes (p value 0.09) and type of diabetes (p value 0.349).

Numerous studies dealing with a possible correlation between hyper homocysteinemia and vascular complications in subject with diabetes mellitus have appeared in past few years.

First study in 2004 done by *M Goldstein et al.*, who studied 179 diabetic patients and reported that the Homocysteine level (P value 0.001) was increase, second study in 2012 done by *Muhammed Khalid Shaikh, et al.*, who studied 100 diabetic patients and reported that the Homocysteine level (P value 0.03) was increase.

While study in 2001 done by *Mario cotellesa et al.*, who studied 112 diabetic patients and reported that low total plasma homocysteine concentrations.

The major limitations in the present study are the small sample size, and relatively short study period. So further studies are needed to define the role of tHcy level.

CONCLUSION

In summary we conclude that plasma homocysteine slightly Increased in diabetic patients and these change are not influenced by the gender of the patient, their age, type or duration of diabetes.

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