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Original Research

Assessment of total antioxidant status in relation to oxidative stress in type II diabetes patients

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ABSTRACT:
Background: Diabetes mellitus (DM) is characterized by chronic hyperglycemia and disturbances of carbohydrate, lipid and protein metabolism due to deficiencies in insulin secretion and /or insulin action. The present study was conducted to assess total antioxidant status in relation to oxidative stress in type II diabetes. **Materials & Methods:** 82 type II diabetes patients and healthy subjects of both genders were subjected to assessment of malondialdehyde levels and total antioxidant status. **Results:** The mean malondialdehyde (MDA) level in group I was 3.65 µM and in group II was 1.94 µM. The mean total antioxidant status (TAS) in group I was 0.47 mM and in group II was 1.70 mM in group II. The difference was significant (P< 0.05).**Conclusion:** There was decreased TAS status and increased MDA levels can be considered as an early marker of the pathogenesis of complications in type 2 diabetes mellitus.
Key words: Diabetes mellitus, Hyperglycemia, Malondialdehyde

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INTRODUCTION

The prevalence of diabetes in the Middle East countries is among the highest in the world. Diabetes mellitus (DM) is characterized by chronic hyperglycemia and disturbances of carbohydrate, lipid and protein metabolism due to deficiencies in insulin secretion and /or insulin action.[1] Diabetic patients have defect in antioxidant defence mechanism, free radicals and oxidative stress may be responsible for diabetes itself, and its complications. Taking into consideration the importance of antioxidants to diabetic patients we have planned this study to assay their total antioxidant status.[2]

Reactive oxygen species (ROS) are the sparks of the oxidative metabolism. Oxidative stress is the price we pay for using oxygen. ROS are generated under physiological conditions and are thought to be the signalling molecules for the expression of ROS specific scavengers. They are also involved in defence mechanisms as seen in phagocytosis, neutrophil function, and shear-stress induced vasorelaxation. Excess generation of ROS in oxidative stress has pathological consequences including damage to proteins, lipids and DNA.[3]

Oxidative stress, defined as excess formation and/or insufficient removal of highly reactive molecules such as reactive oxygen species (ROS) and reactive nitrogen species (RNS), increases in diabetes when free radical production exceeds the body's ability to neutralize them.[4] Excess generation of free radicals has been associated with tissue damage and complications in diabetic patients. Despite the agreement on the increase of free radicals in diabetic patients, the level of antioxidants in diabetic patients has been reported to decrease, increase, or stay the same. The effect of diabetes on total antioxidant levels seems to be complicated by the effect of diabetes on individual antioxidant systems.[5] The present study

was conducted to assess total antioxidant status in relation to oxidative stress in type II diabetes.

MATERIALS & METHODS

The present study comprised of 82 type II diabetes patients of both genders. They were enrolled in the study once they gave written consent. Equal number of healthy subjects was also taken in the study.

Demographic data of each subject was recorded. A thorough clinical examination was carried out. All underwent fasting and random blood glucose evaluation. 1ml of venous blood sample was collected into tube with oxalate-fluoride mixture for estimation. Fasting and random blood glucose were estimated using glucose oxidase method. Malondialdehyde levels and total antioxidant status was assessed. Colorimetric assay with Cayman kit Cayman's antioxidant assay Kit was used to measure the total antioxidant capacity of plasma. Results were tabulated and analysed using chi- square test. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of subjects

Groups	Group I	Group II
Status	Diabetics	Healthy
M:F	52:30	42:40

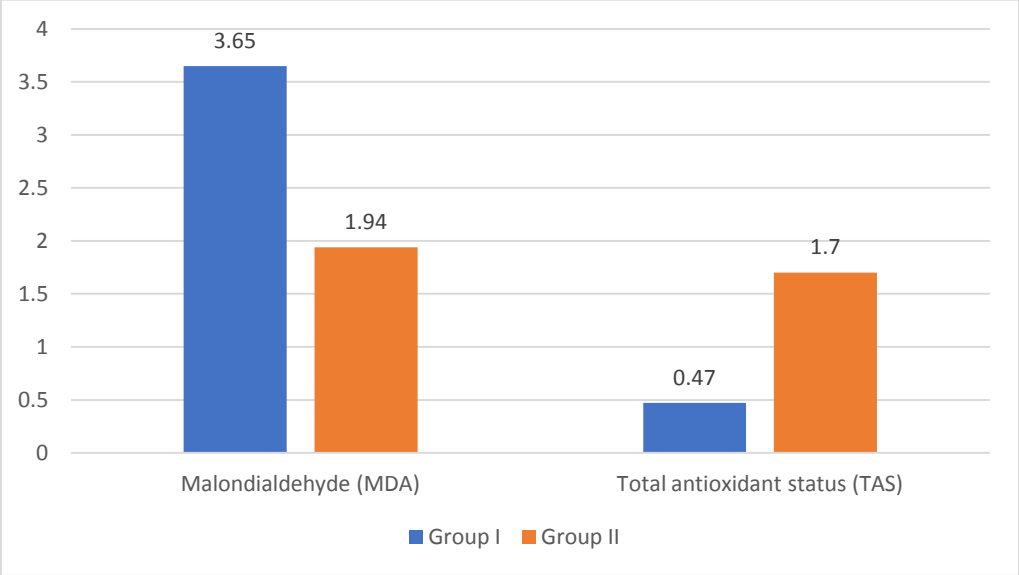
Table I shows that group I had 52 males and 30 females and group II had 42 males and 40 females.

Table II Assessment of parameters

Parameters	Group I	Group II	P value
Malondialdehyde (MDA)	3.65	1.94	0.02
Total antioxidant status (TAS)	0.47	1.70	0.01

Table II, graph I shows that mean malondialdehyde (MDA) level in group I was 3.65 µM and in group II was 1.94 µM. The mean total antioxidant status (TAS) in group I was 0.47 mM and in group II was 1.70 mM in group II. The difference was significant (P< 0.05).

Graph I Assessment of parameters



DISCUSSION

It is now well recognized that diabetes is an epidemic disease in most countries that are undergoing socio-economic transitions.[6] World- wide, an estimated 150 million people are affected by diabetes, and this number is likely to reach 300 million by the year 2025 if successful strategies are not implemented for its prevention and control. Diabetes mellitus is a syndrome characterized by chronic hyperglycemia and the most common complications such as atherosclerosis, nerve damage, renal failure, male impotence and infection.[7] Recently, some evidences suggest that oxidative stress may play an important role in the etiology of diabetes and diabetic complications.[8] In healthy individuals, oxidative damage to tissue is prevented by a system of defences which includes antioxidant enzymes and small molecules with scavenging ability such as antioxidant vitamins. In diabetic patients an altered balance between reactive oxygen species production and antioxidant levels has been reported but there is still lack of data regarding the actual status of antioxidant enzymes in diabetic patients.[9] The present study was conducted to assess total antioxidant status in relation to oxidative stress in type II diabetes.

In present study, group I had 52 males and 30 females and group II had 42 males and 40 females. Rani et al[10] conducted a study on healthy volunteers and type 2 diabetic patients. Malondialdehyde levels and total antioxidant status of the case and controls was assessed. A significant decrease in the total antioxidant status among diabetic patients and significant increase in their malondialdehyde levels in comparison to healthy controls was observed.

We found that mean malondialdehyde (MDA) level in group I was 3.65 µM and in group II was 1.94 µM. The mean total antioxidant status (TAS) in group I was 0.47 mM and in group II was 1.70 mM in group II. Kharroubi et al[11] compared the level of total antioxidant status (TAS) in type 2 diabetic and normal Palestinian subjects as well as the major factors influencing TAS levels. A sample of convenience composed of 212 type 2 diabetic and 208 normal subjects above the age of 40 were recruited. Only 9.8% of the subjects had normal body mass index (BMI) levels (< 6.5%). Multivariate analysis revealed that only diabetic status (P = 0.032) and the level of education (P = 0.036) were significantly associated with TAS.

Rahbani-Nobar et al[12] determined the plasma total antioxidant capacity (TAC) and changes in the activities of two antioxidant enzymes; superoxide dismutase (SOD) and glutathion peroxidase (GPX) in diabetic patients and to estimate their relationship to levels of glycated hemoglobin, fasting blood sugar and duration of diabetes. The changes in the status of antioxidant enzymes were evaluated in erythrocyte samples obtained from 125 diabetic patients (types I and II) and 120 apparently healthy sex and age matched subjects as control group. Serum glucose and GHb levels were high in two types of diabetic patients versus the control group. Compared with the control, the total antioxidant capacity was depleted in two diabetic groups, but depletion was more severe in second type. The activities of SOD and GPX were significantly low in two types of diabetic patients. Marked differences in the activities of the enzymes in good, fair and poor controlled patients were noticed. The enzyme activities in first type were higher than that of type II, but the differences were not significant. In diabetic patients, significant correlation between the total antioxidant capacity and levels of GHb, fasting blood sugar and duration of diabetes was observed, but in the case of SOD and GPX it was not marked. In view of low activities of the enzymes in both types of diabetic patients and lack of correlation between their enzymes activities, levels of glycated hemoglobin, fasting blood sugar and duration of disease it may be concluded that reduction in the activities of the enzymes are partially involved in depletion of the total antioxidant capacity. It seems that the reduction in levels of other antioxidant enzymes and substances are involved in the decreased antioxidant capacity in diabetic patients. In view of low activities of SOD and GPX in patients supplementary trace elements such as Selenium, Copper, Zinc and Manganese, the essential components of the enzymes structures may be useful in prevention of oxidative stress. The meaningful correlation between depletion of total antioxidant capacity and poor glycemic control suggests that measurement of total antioxidant capacity in diabetic patients can be used as an index of glycemic control and development of diabetic complications in both types of diabetes.

CONCLUSION

Authors found that decreased TAS status and increased MDA levels can be considered as an early marker of the pathogenesis of complications in type 2 diabetes mellitus.

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