

ORIGINAL RESEARCH

Total antioxidant status in relation to oxidative stress in type II diabetes patients

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ABSTRACT

Background: 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. The present study was conducted to assess total antioxidant status in relation to oxidative stress in type II diabetes.

Materials & Methods: 90 type II diabetes patients and healthy subjects of both genders were subjected to assessment of malondialdehyde levels and total antioxidant status.

Results: Group I had 50 males and 40 females and group II had 45 males and 45 females. The mean malondialdehyde (MDA) level in group I was 3.68 μM and in group II was 1.90 μM . The mean total antioxidant status (TAS) in group I was 0.48 mM and in group II was 1.68 mM in group II. The difference was significant ($P < 0.05$).

Conclusion: Type II diabetes mellitus patients exhibited decreased TAS status and increased MDA levels. It may be considered as an early marker of the pathogenesis of complications in type 2 diabetes mellitus.

Key words: Diabetes mellitus, Malondialdehyde, TAS

INTRODUCTION

It is now well recognized that diabetes is an epidemic disease in most countries that are undergoing socio-economic transitions. Worldwide, 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.¹ Recently, some evidences suggest that oxidative stress may play an important role in the etiology of diabetes and diabetic complications. 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.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.³ Excess generation of ROS in oxidative stress has pathological consequences including damage to proteins, lipids and DNA.⁴ 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.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 90 type II diabetes patients of both genders. All gave their written consent for the participation in the study.

Data such as name, age, gender etc. was recorded. A thorough clinical examination was carried out. 2 groups were made. Group I had DM and group II had healthy subjects. All underwent fasting and random blood glucose evaluation. 5ml 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	50:40	45:45

Table I, graph I shows that group I had 50 males and 40 females and group II had 45 males and 45 females.

Graph I Distribution of subjects

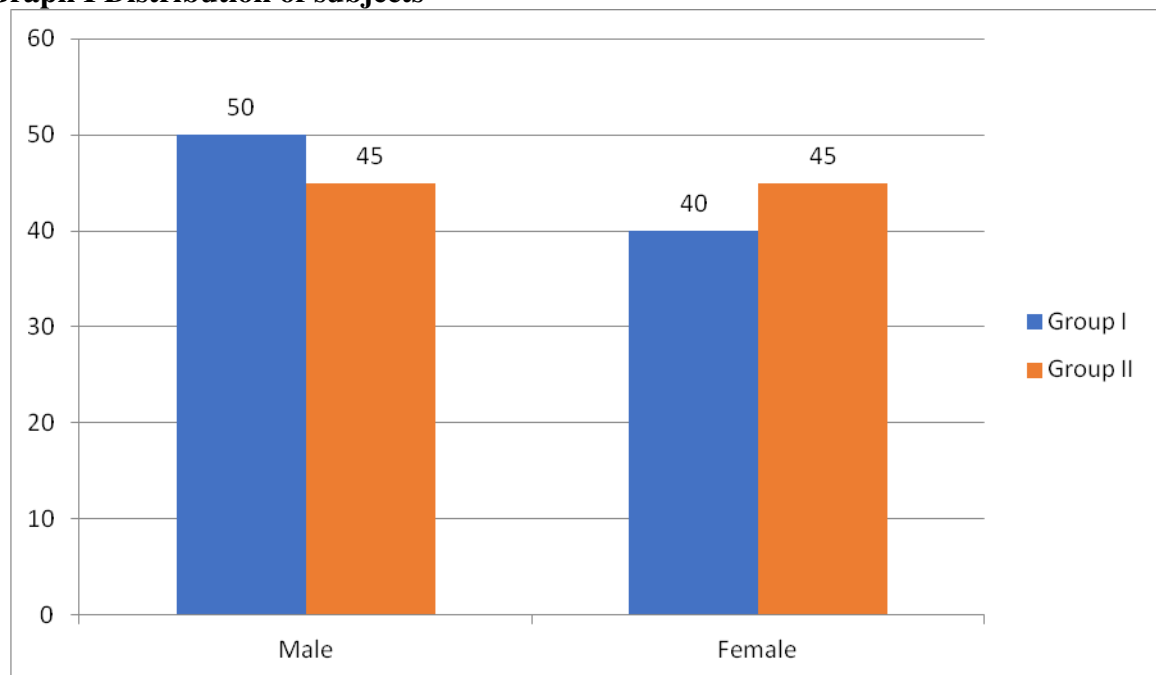
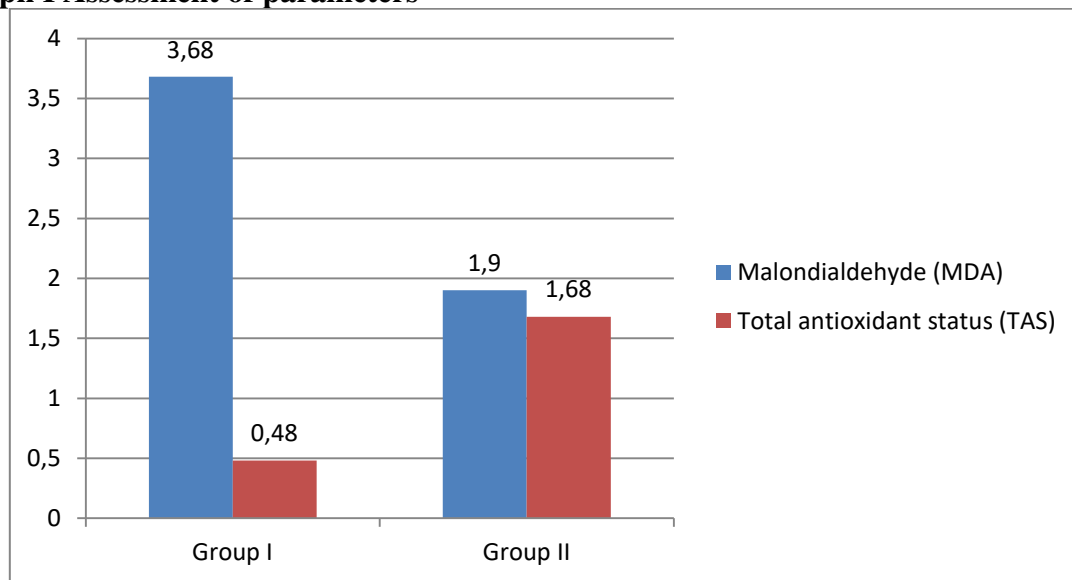


Table II Assessment of parameters

Parameters	Group I	Group II	P value
Malondialdehyde (MDA)	3.68	1.90	0.02
Total antioxidant status (TAS)	0.48	1.68	0.04

Table II, graph II shows that mean malondialdehyde (MDA) level in group I was 3.68 μM and in group II was 1.90 μM . The mean total antioxidant status (TAS) in group I was 0.48 mM and in group II was 1.68 mM in group II. The difference was significant ($P < 0.05$).

Graph I Assessment of parameters

DISCUSSION

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.⁶ 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.⁷ 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.^{8,9} The effect of diabetes on total antioxidant levels seems to be complicated by the effect of diabetes on individual antioxidant systems.¹⁰ The present study was conducted to assess total antioxidant status in relation to oxidative stress in type II diabetes.

We found that group I had 50 males and 40 females and group II had 45 males and 45 females. Najafi et al¹¹ ninety individuals including fifty patients diagnosed with T2DM and MS, but without overt diabetes complications, and forty individuals without T2DM or MS as control group participated in this study. Plasma malondialdehyde (MDA), catalase (CAT), superoxide dismutase (SOD), glutathione peroxidase (GPx) activities, total antioxidant capacity (TAC), and Na⁺-K⁺ ATPase activity were assessed by standard laboratory methods. Plasma MDA in patients group was statistically significantly higher than that of controls ($P \leq 0.05$). Whereas, Na⁺-K⁺ ATPase activity was statistically significantly lower in patient group ($P \leq 0.05$). TAC, CAT, SOD, and GPx enzyme activities were not statistically significantly different between two groups ($P > 0.05$). Results from the patient group showed positive

correlations between CAT activity and triglyceride and positive correlations between GPx activity and weight, body mass index (BMI), and waist circumference. In addition, there was a positive correlation between MDA results with high-density lipoprotein-cholesterol (HDL-C) and total cholesterol and a negative correlation with TAC, BMI, and weight ($P \leq 0.05$) in controls.

We found that mean malondialdehyde (MDA) level in group I was $3.68 \mu\text{M}$ and in group II was $1.90 \mu\text{M}$. The mean total antioxidant status (TAS) in group I was 0.48 mM and in group II was 1.68 mM in group II. Rani et al¹² 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. Kharroubi et al¹³ 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.

CONCLUSION

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

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