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Lipid peroxidation and superoxide dismutase levels variation in type 2 diabetes mellitus

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ABSTRACT

The long-term disorder which is characterised by the high blood sugar and insulin resistance is known as type 2 diabetes, and it is also known as diabetes mellitus type 2. Increased thirst, frequent urination, and unexplained weight loss are their common symptoms. Increased hunger, feeling tired, and sores that do not heal are also their symptoms. These symptoms occur slowly. 40 subjects were selected from the outpatient department of Saveetha Dental College and Hospitals. They were divided into two groups. Group I (Control group) – Normal healthy individuals – 20 in numbers Group II (Study group) – Type 2 Diabetes mellitus patients – 20 in numbers. 5ml of blood will be collected for the separation of serum. The serum was separated and analysed for Malanaldehyde and Superoxide dismutase by TBARS method and Pyrogallol Autoxidation method using ERBA CHEM 5 plus analyser. There is an increasing (MDA) which is very high in lipid peroxidation ($p < 0.001$) as well as there is a significant decrease in (SOD) superoxide dismutase ($p < 0.005$) in Hypothyroidism patients. In our findings its clearly understood that the Oxidative stress would get an increase in the diabetic people, this may lead to metabolic disease like dyslipidemia, Cardiac problems and renal failure etc.



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INTRODUCTION

Oxidative stress is caused due to the imbalance level of oxidant is in favor of the former and is potentially leading to the macromolecules and cell dysfunction (Nehru. B *et al.*, 2004, King. G. L *et al.*, 2004). Increase in oxidative stress might cause an impairment of glucose-stimulated insulin secretion, which destroys pancreatic β -cells. There is a lack in the number of β -cell will result in the pathogenesis of Diabetes Mellitus (Gorogawa. S *et al.*,

2002). In Diabetes Mellitus, antioxidant balance can be harmful to the cellular macromolecules and leads to lipid peroxidation and which may even cause a modification in protein. This will result in the generation of Malondialdehyde (MDA) (Horton. A.A *et al.*, 1987, Pasaoglu.H 1987). Serum MDA is seen as a biomarker for the lipid peroxidation and damage in free radical can be identified by this. Increase in lipid peroxidation in diabetes mellitus is one of the causative agent of hyperlipidemia (Dhalla.N. S *et al.*, 2000) Superoxide Dismutase (SOD) and Glutathione Peroxidase (GPx) in blood is recognised as a symbol for vascular injury in type 2 Diabetes Mellitus (Kalaivanam. K. N *et al.*, 2006, King.G.L 2008). For the patients who are having type 2 Diabetes Mellitus, increased oxidative stress and lower concentrations of antioxidants are recognised, but results have been unstable (Saxane A 1993, Martin Gallen C. M *et al.*, 2003). MDA levels were found to be notably low in Diabetic subjects with complexities (Griesmacher A *et al.*, 1995, Sundaram. R. K *et al.*, 1996, kedziora

kornatowska *et al.*, 1998) and without complications (Dincer Y *et al.*, 2002, Ceriello. A *et al.*, 1997, Giugliano. D *et al.* 1996). Others have reported that there is no change in oxidative stress (Nurooz Zadeh. J *et al.*, 1996, Van der jagt *et al.*, 2001, Wright. E *et al.*, 2006). Thus, this study aimed to scrutinise the association between lipid peroxidation and antioxidant status in type 2 Diabetes mellitus.

METHOD AND MATERIALS

40 subjects were selected from the outpatient department of Saveetha Dental College and Hospitals. They were divided into two groups.

Group I (Control group) – Normal healthy individuals – 20 in numbers

Group II (Study group) – Type 2 Diabetes mellitus patients – 20 in numbers

Inclusion Criteria

1. A normal healthy individual with normal BMI (19.9-249)
2. Known type 2 Diabetes mellitus Patients

Exclusion Criteria

1. Subjects with systemic diseases like CVD, Hypertension and other endocrine disorders.
2. Immunocompromised persons

Sample collection and procedure

Venous blood in a quantity 5 ml was collected from the participants and blood was distributed in the plain collection tube and centrifuged in 2500 rpm for 10 minutes. The Serum was separated and analysed for Melanaldehyde and Superoxide dismutase by TBARS method and Pyrogallol Autoxidation method using ERBA CHEM 5 plus analyser.

RESULTS AND DISCUSSION

Diabetes mellitus is a term which is derived from the Greek word syphon which means passing through urine, and the word Mellitus means honey in Latin. Diabetes mellitus means honey sweet urine. The occurrence of type 2 Diabetes mellitus is varied from one region to another; as a result risk factor in human lifestyle and environment. There is a pre-dominantly rise of Type 2 diabetes mellitus (DM) is seen as an urban phenomenon where the large Indian cities show four times higher rates than the population in rural areas. The prevalence of reduced glucose tolerance and in fasting glycaemia is considered as pre-diabetic, which is common in both urban and rural areas. The number of people with Type 2 DM in developing countries is between the age of 45–64 years, and more than 65 years in developed countries. In a recent Indian survey, 56% of people who have

Type 2 DM were diagnosed between the age of 40 - 59 years and 25% of the people are between the age of 20-39 years.

Table 1: Mean, SD and p-value of Control and Study groups

PARAMETERS	Control			Type 2 DM	p-value
	Mean	SD	Mean	SD	
MDA (nmol/ml)	1.0	0.6	2.75	0.94	<0.001
SOD (U/ml)	193.7	27.3	119.6	25.5	<0.005



Figure 1: Mean MDA levels in both groups

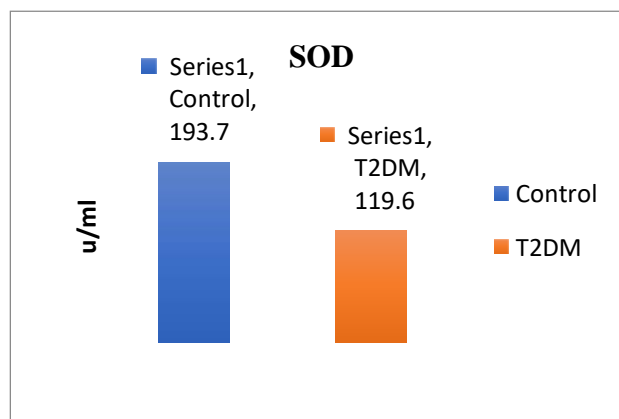


Figure 2: Mean SOD levels in both groups

The mean age of the patients in our study group consisting of patients with Type 2 diabetes with the oral sign of exposition was 47.91 years. Unusually high levels of lipid peroxidation and the same time the decline of antioxidant defence mechanisms can also be harmful to the cellular organelles, and this ends in the oxidative stress. The antioxidant level of patients may determine whether they develop microvascular or macrovascular complications. Medical researchers who had found that the reduction in the number of body chemicals is called antioxidants which may increase the risk of complication from diabetes mellitus. In order to address the correlation between the presence of secondary complications in diabetes and superoxide changes. The present study was undertaken. Diabetes mellitus is

connected with the increased free radical activity which may end at a higher level of incidence in atherosclerotic and cardiovascular diseases. Free radical forms the lipid peroxides which may also play an essential role in the growth of the atheromatous vascular disease. Some authors have described that an increase in the levels of lipid peroxides in diabetic patients, while a few could not find any sign of an increase in lipid peroxidation in the diabetics. The serum levels of TBARS were massively increased in all the type II diabetic patients when compared with controls.

CONCLUSION

In our findings its clearly understood that the Oxidative stress would get an increase in the diabetic people, this may lead to metabolic disease like dyslipidemia, Cardiac problems and renal failure etc.,

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