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ALTERED LIPID PROFILE AND ANTIOXIDANT STATUS OF GESTATIONAL DIABETES MELLITUS

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ABSTRACT

The present study aimed at investigating the lipid profile in GDM subjects. Methods: Blood samples were obtained from 20 GDM pregnant women and 20 control subjects in Chennai. The TG and Cholesterol were measured in all the samples by GC – FID analysis. Results: Significant increase in the levels of total cholesterol which is a risk factor for the development of GDM in our study. Results of the present study indicate that increase in total cholesterol, lipid concentration is indicators for the risk of Cardiovascular Disease in GDM subjects with multiple pregnancies as compared to control subjects. Diabetic pregnant subjects had significant lower activity of SOD and GST when compare to control ($P<0.0001$). GDM subjects showed significant increase in catalase activity ($P<0.0001$). No significant difference was found in GPx in both the studied groups. The changes in serum vitamin C were found to be decreased in GDM. The vitamin E level were found to be increased in GDM subjects. The oxiant status of MA, NO, LHP were also significantly decreased ($P<0.0001$) in GDM. There was a significant increased in reduced glutathione levels.

KEYWORDS

Gestational diabetes mellitus, Triglyceride, Cardiovascular risk, Oxidative stress, Enzymic and Non-enzymic.

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INTRODUCTION

Gestational Diabetes Mellitus (GDM), defined as carbohydrate intolerance of any degree first recognised during pregnancy complicates 4% of all pregnancies in the U.S with a prevalence of 1to14%and an annual incidence of more than 1,35,000 cases. There are several factors that can increase the risk of developing GDM, including obesity2, family history of type 2 diabetes mellitus and race/ethnicity. The increase in the risk of

developing GDM is associated with an increase in the risk of developing cardio vascular disease[1]. Diabetes mellitus is known to induce dys lipoproteinaemia[2, 3]. Hyper triglyceridaemia in GDM was reported in previous studied[4]. Very few investigations were demonstrated the changes in lipid metabolism during pregnancy complicated by Gestational Diabetes Mellitus[5]. Obesity is the most prominent risk factor for GDM patients and is linked to increasing cardiovascular risk[6]. Free radical mediated oxidative stress has been implicated in the pathogenesis of diabetes mellitus and its complications[7, 8]. Elevated glucose levels can induce oxidative stress in gestational diabetic mothers[9, 10].

Low insulin sensitivity has been suggested to be the cause of oxidative stress in diabetes which eventually leads to free radical generation[11]. Several studies found associations among diabetes in pregnancy and different markers of oxidative stress[12, 13]. Scavenging enzyme activities reflect antioxidant defence status. Glutathione is the most abundant intracellular antioxidant.

Oxidative stress is associated with a pro – oxidative shift of the GSH redox state in the blood [14]. GST would act as a biomarker of oxidative stress upon sudden increase in oxygenation. During pregnancy, the synthesis rate of lipoperoxides appears to exceed their decomposition rate, causing oxidative stress. Lipoperoxides are also increased in the fetus as it develops, but to lesser extent than that of mother. Diabetes induced oxidative stress might result from the underlying metabolic abnormalities rather than the direct causes of the disease itself.

MATERIAL AND METHODS

Human blood was collected from a total of 20 GDM subjects which was based on oral Glucose tolerance test. The control group consist a total of 20 women who were presented for screening for GDM and were studied simultaneously. The two groups were matched for age and race. Venous blood was drawn for the study of total cholesterol and triglycerides.

All subjects gave fully informed consent and the study was approved by the Ethical and Research Committee of Billroth Hospital Chennai. Fasting venous blood was collected from all subjects between 6-8AM.

The Lipid profiles were determined by using serum sample.

Serum sample was added to dissolve the organic phase of chloroform/methanol (1:1) mixture. To the mixture of 10% methanol was added and incubated at 80^{o} c for 90 minutes and cooled for 5-10 minutes and then distilled water and hexane were added and vortex-mixed. Two layers were formed from which the organic upper layer was transferred into a 2ml GC vial avoiding any particulate matter and evaporate to dryness in the fume hood overnight. The aqueous lower layer was discarded and the solution was reconstituted in hexane prior to GC-FID analysis. After sample preparation the processed samples were subjected to lipid analysis at 300^{o}C, Triglycerides at 380^{o}C and cholesterol at 260^{o}C. Statistical analysis of the present data was performed by using ANOVA method.

The serum SOD[15, 16], GPx[17] and GST were analysed spectrophotometrically as enzymic antioxidants. The levels of non-enzymes antioxidants such as vitamin C[18]was measured spectrophotometrically and vitamin E was measure by bipyridyl metho[19]. Reduced glutathione was measured spectro photometrically[20, 21].

The levels of prooxidants such as LHP were quantified using 1.8ml of Fox reagent and analyzed spectrophotometrically, MDA and NO method.

RESULTS

Results of the present investigation are shown in Table I. A significant increase in the levels of cholesterol, TG and FFA are observed in GDM subjects.

Enzymic antioxidants

The activity of SOD and GST were significantly decreased in GDM subjects compared to the control subjects. On the other hand, the activity of catalase was significantly increased in GDM subjects. No significant difference was observed in the activity of glutathione peroxides between the studied groups.

Non enzymic antioxidants

The serum vitamin C was found to be decreased in GDM subjects when compared to control. The level of vitamin E was found to be increased markedly in GDM subjects on comparison with control. The level of reduced glutathione was observed to be increased in GDM subjects.

Prooxidants

In the present study the levels of NO, LHP and MDA were found to be decreased in GDM subjects when compared to control group.

The level of reduced glutathione was observed to be increased in GDM patients.

DISCUSSION

There is a linear co-relation between the risk of GDM and increased plasma TG levels [22]. In women with GDM increased insulin resistance may account for a further rise in triglyceride concentrations described previously. Increased lipid concentrations may increase the risk of cardiovascular disease, especially with multiple pregnancies.

In the present study we demonstrated the important risk factor in GDM subjects i.e oxidative stress. The oxidative stress was evaluated by the determination of MDA, NO and LHP. The decreased level of MDA which was observed in the present study was not found to be correlating to the previous studies [23].

NO, LHP levels of GDM subjects were found to be decreased in GDM subjects of the present study which has not been reported earlier.

The antioxidant defense mechanism against the oxidative stress generated in GM subjects was evaluated through assay of enzymic and non – enzymic indicators of antioxidant system. A significant decrease in SOD activity was observed in the present study is in accordance with the previous study in which extracellular SOD levels were significantly decreased[24]. Plasma SOD activity was significantly lowers in GDM subjects. The decreased activity may be due to its role as an antioxidant enzyme for scavenging free radicals produced in this condition as reported earlier.

Increased activity of catalase was observed in the present study which is contradicting to the previous finings. Catalase is an enzyme which protects cells from accumulation of H2O2 and dismutating it to water and O2, a process in which it works as a peroxidase. Significant increase in serum total GST was observed in the previous study which is contradicting to the present study. It has been reported that RBC GST activity is sensitive indicator which would act as a biomarker of oxidative stress upon sudden increase in oxygenation during delivery period.

Table No.1: Lipid Profile Status in GDM Subjects

	Control	GDM	F Value	P-Value
Cholesterol	174.603 ± 4.8501	206.344 ± 7.4023	494.6	0.0001
Free Fatty Acids	0.328 ± 0.0487	0.392 ± 0.0759	19.11	0.0001
Triglycerides	106.373 ± 9.1598	115.95 ± 9.8520	17.40	0.0001

All values are expressed as mean ± SD

Table No.2: Antioxidant Status in GDM Subjects

CONTENT	CONTROL	GDM PATIENTS	F VALUE	P VALUE
Activity of Superoxide dismutase (unit).	78.542 ± 10.3892	34.958 ± 7.2121	354.6	0.0001
Activity of Catalase (unit).	202 ± 12.1792	245.75 ± 55.5176	28.32	0.0001
Activity of Glutathione peroxidase (unit).	0.046 ± 0.0505	0.031 ± 0.0194	2.002	0.1387
Activity of Glutathione s transferase (unit).	3.022 ± 0.6220	2.532 ± 0.7971	8.533	0.0003
Activity of Ascorbic acid (unit).	0.031 ± 0.0091	0.018 ± 0.0047	47.23	0.0001
Activity of Tocopherol (unit).	0.010 ± 0.0031	0.055 ± 0.0160	373.9	0.0001
Activity of Malon di aldehyde (unit).	0.022 ± 0.0122	0.011 ± 0.0102	14.03	0.0001
Activity of Nitric oxide (unit).	0.068 ± 0.0157	0.052 ± 0.0142	18.95	0.0001
Activity of Lipid hydro peroxide (unit).	98.942 ± 51.8240	28.384 ± 2.9274	46.27	0.0001
Activity of Reduced glutathione (unit)	0.062 ± 0.0289	0.065 ± 0.0086	0.4381	0.6461

CONCLUSION

No significant change in GPx activity which is in contrary to the previous study of circulating biomarkers of oxidative stress. The serum antioxidant vitamin, alpha tocopherol exhibit a significant increase of GDM on comparison with control of the present study. This effect seems to represent an adaptive response to increase oxidative stress such as increase in GDM has also been reported [25].

On the contrary present investigation shows the decreased levels of ascorbic acid which is in correlation with the study of serum uric acid and ascorbic acid levels.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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