Comparative study of glycosylated hemoglobin and lipid profile in gestational diabetic women and normal pregnant women

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Abstract

Aim: Lipid profile and glycosylated hemoglobin level changes in gestational diabetes. The extent to which this alteration takes place is still not clearly documented. Materials and Methods: To add a clear answer to this question, lipid profile parameters, and glycosylated hemoglobin status were determined in patients with gestational diabetes mellitus and compared to healthy pregnant women (controls). Results: Fasting plasma glucose levels, plasma glucose levels 1 hour, and plasma glucose levels 2 hours after 75 gm oral glucose administration (oral glucose tolerance test) were significantly higher in patients with gestational diabetes as compared to controls. Glycosylated hemoglobin was significantly higher in gestational diabetes than in controls. It was observed that there was a significant increase in serum cholesterol and serum triglyceride level in cases with gestational diabetes when compared to healthy pregnant women. Conclusion: The results of our study suggest that abnormal glucose levels, glycosylated hemoglobin, serum cholesterol, and serum triglycerides play an important role in pathophysiology of gestational diabetes, and therefore, extensive studies are required. Early diagnosis of gestational diabetes will decrease adverse neonatal and maternal outcomes

Keywords: Gestational diabetes, glycosylated hemoglobin, high density lipoprotein cholesterol, low density lipoprotein cholesterol, oral glucose tolerance test, serum cholesterol, serum triglycerides.

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INTRODUCTION

Gestational diabetes mellitus is defined as “carbohydrate intolerance of variable severity with onset or first recognition during pregnancies.”¹,² About 6% of all pregnant women have gestational diabetes.³ Gestational diabetes resolves when the pregnancy ends important risk factors of gestational diabetes include marked obesity (BMI ≥30 kg/m²), high maternal age, ethnicity, personal history of Gestational diabetes mellitus, and family history of Type 2 diabetes⁴. The prevalence of Gestational diabetes mellitus increases with age, becoming more common over the age of 30. However, women under the age of 30 are also at the risk of developing Gestational diabetes mellitus⁵. Gestational diabetes is associated with adverse maternal and neonatal outcomes⁶. These adverse outcomes include increased likelihood of birth defects, preterm birth, cesarean delivery, macrosomia, congenital abnormalities, preeclampsia, and hypertension⁷,⁸,⁹. In infants of diabetic mothers, the frequency of congenital malformation is 6-10%. Alteration in lipid profile is known to occur in gestational diabetes⁰. Women with gestational diabetes have a significant risk of long-term morbidity and mortality due to cardiovascular disease (CVD), with heart disease being the leading cause of death¹¹,¹2,¹3,¹4. Metabolic and cardiovascular alterations that increase the risk of type 2 diabetes and CVD cluster together in the metabolic syndrome, which is characterized by central body adiposity, dyslipidemia,
hypertension, and elevated fasting glucose levels. Traditionally, gestational diabetes is considered as a disorder of carbohydrate metabolism; thus, blood glucose levels have become the main "key player" for monitoring and directing treatment during pregnancy. This focus on glycemic metabolism ignores the important role of other potential fetal fuels such as proteins and lipids in the pathophysiology of GDM. In the present study, serum lipid profile parameters, blood glucose levels in oral glucose tolerance test, and glycosylated hemoglobin levels were estimated in patients with gestational diabetes and compared with healthy pregnant women (HPW) in the present study, the following parameters were assessed in the serum to elucidate the biochemical profile status in patients with gestational diabetes. Serum lipid profile parameters, blood glucose levels in oral glucose tolerance test and glycosylated hemoglobin levels were estimated in patients with gestational diabetes and compared to controls.

MATERIAL AND METHODS
The present Comparative study was carried out in the Department of Biochemistry at PES institute of Medical Science and Research Centre, Kuppam, Andhra Pradesh from 2007 to 2009 after approval of institutional ethical committee. 30 pregnant women with established diagnosis of gestational diabetes were taken as cases. These patients do not have any other complications during pregnancy such as Hypertension, Jaundice and Urinary Tract Infections. All the 30 antenatal women are in 3rd trimester of pregnancy. 50 pregnant women without gestational diabetes in 3rd trimester and without any other complication during pregnancy are taken as controls. All the cases and controls are selected randomly in the age group of 20-40 years. All the cases and controls are in 3rd trimester only. Detailed history, clinical examination and obstetric examination of cases and controls enrolled in this study are carried out regarding any current or past history of Diabetes, Hypertension, Systemic diseases, any other chronic physical disability and any other obstetrical complications. Informed consent from the cases and controls were taken.

Sample Collection and Storage
Antecubital vein, peripheral vein of front of forearm was selected for venous blood collection. The arm was extended, and a tourniquet was applied a few centimeters above the elbow to obstruct the venous return. The skin was sterilized over the vein with a cotton swab. A disposable sterile needle fixed to a disposable syringe of 10 ml capacity into the vein was inserted, which was held steady by thumb. The plunger was withdrawn and as the desired amount of blood was collected, the tourniquet was withdrawn. A swab was placed over the puncture site, and the needle was withdrawn. The swab was pressed to arrest the bleeding. The needle was removed carefully avoiding contamination of fingers, and slowly blood was transferred to an appropriate container. For separation of serum, blood taken into a plain vial is first allowed to clot and then centrifuged at 3000 rpm for 5 minutes.

This separated plasma was used to determine:
- Total cholesterol
- Triglycerides
- HDL cholesterol
- LDL cholesterol

All specimens were clearly labeled with names of cases and controls along with date and time of collection. The following biochemical parameters were estimated in patients with gestational diabetes and compared with healthy pregnant women. Oral glucose tolerance test was performed by the standard method described by Harold varley. Glucose was determined using Chemwell fully auto analyzer by the standard kit based on the glucose oxidase and peroxides method. Glycosylated hemoglobin was determined by the method described by Little and Goldstein DE. Total cholesterol and triglycerides were estimated by enzymatic methods. HDL-Cholesterol (HDL-C) was estimated by phosphotungstic acid precipitation followed by enzymatic analysis in supernatant fraction and LDL-Cholesterol (LDL-C) was determined by using Friedewald's equation. The data was statistically analyzed using the SPSS software (version 12.0) and by applying Student’s t-test.

RESULTS
Table no.1 Shows that lipid profile parameters of cases and controls. Serum Triglycerides and serum cholesterol in cases was significantly higher compare to controls. There was no significant difference in their HDL and LDL Cholesterol. Table no. 2 shows that Fasting plasma glucose level, plasma glucose level 1hr and 2hr after 75grams oral glucose administration are significantly higher in cases than in controls. Table no 3 shows that HbA1C in cases was significantly higher as compare to controls.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Cases(30) Mean ±SD</th>
<th>Controls(50) Mean ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum Triglycerides</td>
<td>192.83±11.18</td>
<td>153.46±7.31</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Serum Total Cholesterol</td>
<td>210.56±15.06</td>
<td>170.76±22.63</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Serum HDL Cholesterol</td>
<td>58.56±6.19</td>
<td>54.76±7.15</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Serum LDL Cholesterol</td>
<td>91.62±16.58</td>
<td>83.09±11.25</td>
<td>&gt;0.05</td>
</tr>
</tbody>
</table>
Table 2: Mean comparison of Oral Glucose Tolerance Test in cases and Control groups

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Cases(30) Mean ±SD</th>
<th>Controls(50) Mean ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting blood Glucose</td>
<td>115±8.70</td>
<td>90±6.90</td>
<td>&lt;0.001</td>
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<tr>
<td>Blood Glucose – 1hr</td>
<td>197.26±11.67</td>
<td>160.94±10.62</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Blood Glucose – 2hr</td>
<td>175.63±14.03</td>
<td>141.14±8.0</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Table 3: Mean comparison of HbA1c in case and Control groups

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Cases(30) Mean ±SD</th>
<th>Controls(50) Mean ±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycosylated Hemoglobin</td>
<td>8.85±1.48</td>
<td>6.05±0.45</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

DISCUSSION

We have made an effort to find out the biochemical profile of gestational diabetes. For this, we studied plasma glucose levels by oral glucose tolerance test, glycosylated hemoglobin, serum total cholesterol, serum triglycerides, serum HDL cholesterol, and serum LDL cholesterol. We have done the comparative study of all these parameters with healthy pregnant women. Similar reports of elevated triglyceride levels in gestational diabetes have been reported earlier by Kjos et al. In contrast to our findings Sobki SH et al reported lower levels of triglycerides in patients with gestational diabetes when compared to controls. Fasting plasma glucose levels, Plasma glucose levels 1st hr and 2nd hrs after 75 gm oral glucose administration (ORAL GLUCOSE TOLERANCE TEST) are significantly higher in case than in controls. If the plasma glucose levels are higher, it results in increased morbidity to the fetus and also mother. By estimating this parameter, we can predict the severity of the disease process and can plan to provide better antenatal care by institutional treatment to save the mother and the child from all the grave complications of gestational diabetes. Similar reports of elevated blood glucose levels in gestational diabetes have been reported earlier by Taricco E et al. Glycosylated hemoglobin is significantly higher in cases than in controls. This parameter provides the level of blood glucose 8-12 week period prior to determination. Therefore by estimating this parameter, we can avoid further deterioration of the disease process by early detection and prompt treatment.

CONCLUSION

Finally, our study shows that abnormal glucose levels, glycosylated hemoglobin, serum cholesterol, and serum triglycerides play an important role in gestational diabetic patients, and therefore, extensive studies are required. An early diagnosis of gestational diabetes provides safe baby and motherhood, and in particular, it will reduce the severity of complications and mainly fetal and maternal morbidity and mortality.

REFERENCES


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