Scholars Journal of Applied Medical Sciences (SJAMS)
Abbreviated Key Title: Sch. J. App. Med. Sci.
ISSN 2320-6691 (Online)
ISSN 2347-954X (Print)

A Unit of Scholars Academic and Scientific Society, India
www.saspublisher.com

Obstetrics & Gynaecology

A Cross Sectional Study on Lipid Profile and Gestational Diabetes Mellitus

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Original Research Article

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Article History
Received: 10.06.2018
Accepted: 18.06.2018
Published: 30.07.2018

DOI:
10.21276/sjams.2018.6.7.14

Abstract: Gestational diabetes mellitus is a syndrome of disturbed carbohydrate tolerance diagnosed during pregnancy. However there is possibility of alteration of lipid profile as well. In the present study lipid profile parameters of gestational diabetes mellitus patient (GDM) were evaluated in a cross-sectional study conducted at the Department of Obstetrics & Gynecology of BSMMU and BIRDEM. A total of 60 pregnant women of 3rd trimester were recruited for the study in which 30 were with GDM and 30 were normoglycemic**.** Along with basic characteristics and parameters like total cholesterol, LDL- cholesterol, HDL cholesterol and triglyceride levels were evaluated at 3rd trimester of pregnancy. The lipid profile in gestational diabetes mellitus is found to be altered compared to healthy pregnant women. The altered parameter of lipid profile (Triglycerides, Total cholesterol) was found to be evident in our study. However, altered lipid profile in the GDM might also be due to altered diet in pregnancy.
Keywords: Gestational diabetes mellitus, Pregnant women, Lipid profile.

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy [14]. Sign and symptoms: Gestational diabetes generally has few symptoms and it is most commonly diagnosed by screening during pregnancy.No specific cause has been identified, but it is believed that the hormones produced during pregnancy increase a woman's resistance to insulin, resulting in impaired glucose tolerance [15].

Gestational diabetes is a treatable condition, in which, women who have adequate control of glucose levels can effectively decrease these risks. Women with gestational diabetes are at increased risk of developing type 2 diabetes mellitus after pregnancy, while their offspring are prone to develop childhood obesity, with type 2 diabetes later in life. Babies born to mothers with gestational diabetes are at increased risk of problems typically such as being large for gestational age (which may lead to delivery complications), low blood sugar, and jaundice [5].GDM constitutes 90% of all pregnancies complicated by diabetes [13]. It has been documented that there is marked variation in GDM prevalence among different racial/ethnic groups with higher prevalence in Native American, Asian, African, American and hispanic population [8, 9]. The prevalence of GDM among rural Bangladeshi women was between 4.8-7.5% using fasting blood glucose only [17].A number of studies in abroad have already done to explore altered lipid profile in pregnancy complicated by gestational diabetes mellitus compared to normal pregnancy and its impact on GDM related complications. The cross sectional study was designed to achieve this goal in Bangladesh to see if, during pregnancy, women with GDM have an exaggerated lipid response compared to normal pregnancy. GDM is accompanied by alterations in fasting, postprandial, and integrated 24-h plasma concentrations of amino acids, glucose, and lipids. These changes include a 3-fold increase in plasma triacylglycerol concentrations during the third trimester of pregnancy, elevation of plasma fatty acids, delayed postprandial clearance of fatty acids, and elevation of the branched-chain amino acids [16]. Development of DM during pregnancy may alter the metabolism of lipoprotein characteristics of uncomplicated pregnancy. The aetiology of GDM is very heterogenous, which may be the reason for the variety of data on the changes in lipid metabolism

observed in the course of this disorder. The most commonly reported one include elevated triglyceride levels and reduced total and LDL-cholesterol levels. There have also been reports of a lack of differences between healthy pregnant women and women with GDM [1-3,10]. The changes in lipoprotein metabolism found in normal pregnancy results from the effects of sex hormone. Approximately 7% of all pregnancies are complicated by GDM, resulting in more than 200,000 cases annually. The frequency of gestational diabetes varies widely by study depending on the population studied and the study design. It occurs in between 5 and 10% of all pregnancies (between 1-14% in various studies).

OBJECTIVES

General objective

- Evaluation of lipid profile in gestational diabetes mellitus.

Specific Objectives

- To measure serum level of lipid profile in GDM.
- To measure lipid profile in normal pregnant women.
- To compare of lipid profile between GDM and normal pregnant women.

MATERIALS AND METHODS

Study design: This study is a cross sectional comparative study.

Place and period of study: Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka

Bangladesh Institute of Research & Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM). Duration of this study period- July 2009 to June 2010

- Study population: Case (Group- A): Pregnant women at 3rd trimesters with GDM.Control (Group- B): Pregnant women at 3rd trimesters without GDM.
- Sample size: A total 60 pregnant women of 3rd trimester (30 cases and 30 control group) were included consecutively for the study.
- Sampling technique: Study participants were recruited based on convenience of the researcher from BSMMU and BIRDEM Hospital.
- Inclusion criteria:

For study group

- Pregnant women of all age groups at 3rd trimester diagnosed as GDM on the basis of fasting and 2 hours after 75 gm by Oral Glucose Tolerance Test
- Subject should be free from other co-morbid condition.

For control group

- Pregnant women of all age groups at 3rd trimester who are normoglycemic (Screened by Oral Glucose Tolerance Test)

Exclusion criteria

For both study and non GDM group

- Known case of diabetes mellitus (DM or impaired glucose tolerance)
- Pregnancy with co morbidity like hypertension, renal disease, liver disease, endocrine disorders
- Patients who didn't give consent for participation.
- Research Instrument: A structured questionnaire was prepared which included all the variables of interest, like demographic and socio-economic data such as age, educational status, occupational status and the obstetric history like parity, gravida, and previous obsetric history.

Data collection

Data were collected by interview, observations, clinical examination and necessary investigations.

Procedure

Patients were selected from BSMMU and BIRDEM hospital. After selecting patients a written informed consent was obtained from each patient or from person authorized by patient before patient's participation in the study. Each patient was interviewed and examined and data were recorded in a structured questionnaire form.

Lipid profile which includes serum triglyceride, total cholesterol, HDL, LDL was done under asceptic precaution. 5 cc venous blood was taken with disposable plastic syringe from the antecubetal vein and then blood was transferred to a test tube for determination of lipid profile. The investigation was done by the department of biochemistry BSMMU. Multi system automatic analyzer was used as analyzer.

Method of calculation of Body Mass Index (BMI)

Body mass index was calculated from the body weight and height of the subjects using the following the formula: weight in kg divided by height in meter square.

$$\text{BMI} = \frac{\text{Weight in kg}}{(\text{Height in meter})^2}$$

Collection of Blood Sample

Subjects were requested to fast over night (8-10 hours) and not to smoke or take any kind of medicine on the previous day. They were then requested to attend the Biomedical Research Group of BIRDEM on the next morning. 10ml of fasting blood and 2ml two hours after (75gm glucose) were collected following all aseptic precautions from the ante-cubital vein using disposable plastic syringe. Anti coagulant

was added to the eppendrop for HbA_1c and ESR fluid was added to the test tube for ESR. Serum was separated by centrifugation (10 minutes) at a rate of 2000 rpm at room temperature immediately after the blood was allowed to clot 30 minutes. Separated serum was alliquoted in different eppendrop and preserved immediately at -27°C for the subsequent analysis. Before analysis sample was allowed to thaw and then analyzed for fasting glucose, 2 hours after glucose load, triglyceride, total cholesterol, HDL, LDL.

Data processing and statistical analysis

Data were processed with the help of software SPSS (Statistical Package for Social Sciences) version 11 and analyzed. Descriptive analysis was done to see the basic clinical and obstetric profile.

OBSERVATION AND RESULTS

A total of 60 participants were recruited for the studies among them 30 were diagnosed to have GDM and 30 of them were healthy pregnant women.

Age and Gestational age

Table-1 shows the comparison of baseline characteristics of the study participants. Age of the two comparing group was similar; mean age was 29.70±3.93 and 27.76±5.45 in GDM and NGDM respectively (p> 0.05). Similarly mean gestational age (p>0.05) and mean parity (p>0.05) were also similar in the two groups.

Blood Pressure

The distribution of systolic and diastolic blood pressure was similar in two groups. Mean±SD SBP in GDM was 117.25±11.90 and in NGDM was 115.17±20.5. Mean±SD DBP in GDM was 75.16±4.81 and in NGDM was 73.83±6.10. None of the systolic and diastolic blood pressure was found to be different in two groups.

Table-1: Baseline characteristics of the study participants

Variables	GDM	Non GDM	P value	Remark
Age (Years)	29.70±3.93	27.76±5.45	**0.12**	Not significant
Gestational age (weeks)	34.33±1.67	32.20±3.12	**0.08**	Not significant
Para	3.80±1.75	2.333±1.10	**0.15**	Not significant
SBP (mmHg)	117.25±11.90	115.17±20.5	**0.670**	Not significant
DBP (mmHg)	76.16±4.81	74.83±6.10	**0.35**	Not significant

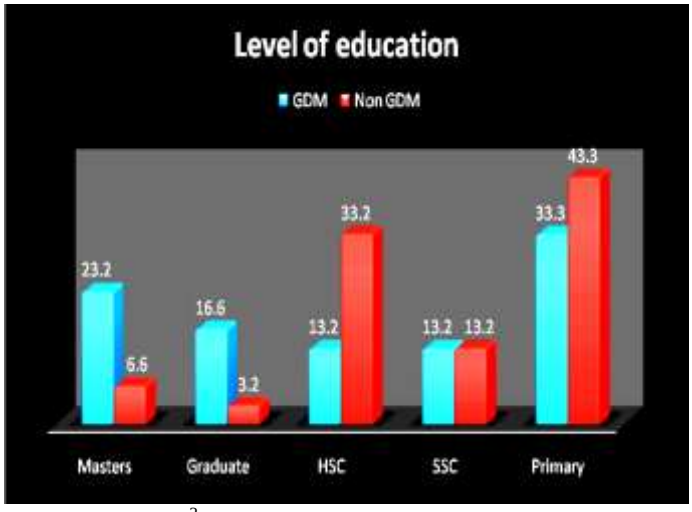
Results are expressed as mean ± SD. P value was obtained from independent t test.

Table 2 shows the distribution of the study subjects by family history of Diabetes mellitus and Hypertension. Among the 21 subjects had history of DM in the family 16(71.3%) were with GDM and 7(28.5%) without GDM. Among the 17 subjects had history of hypertension in the family 13 (70.5%) were with GDM and 6 (29.3%) without GDM. Family history of DM and HTN were not found to be statistically different in the two groups (p = > 0.05).

Figure-1 shows the distribution of the study subjects by level of education. In both the groups' level of education was rather high. In GDM 23.2% had Masters, 16.6% were graduates and 13.2% had higher secondary level of education. In NGDM 6.6% had Masters, 3.2% had graduate and 33.2% had higher secondary level of education. No statistically significant difference was found in level of education in two groups (p > 0.05).

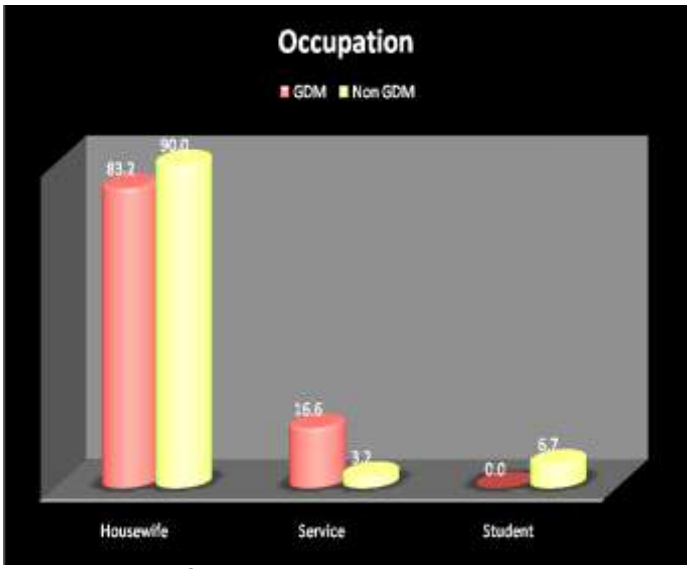
Table-2: Family history of Diabetes mellitus and Hypertension among the study participants

Family history	GDM	Non GDM	P value	Remark
DM (n=21)	16 (71.3%)	7(28.5%)	0.147	Not Significant
Hypertension (n=17)	13 (70.5%)	6(29.3%)	0.225	Not significant



χ^2= 8.407; df = 4; p < .078 (NS)

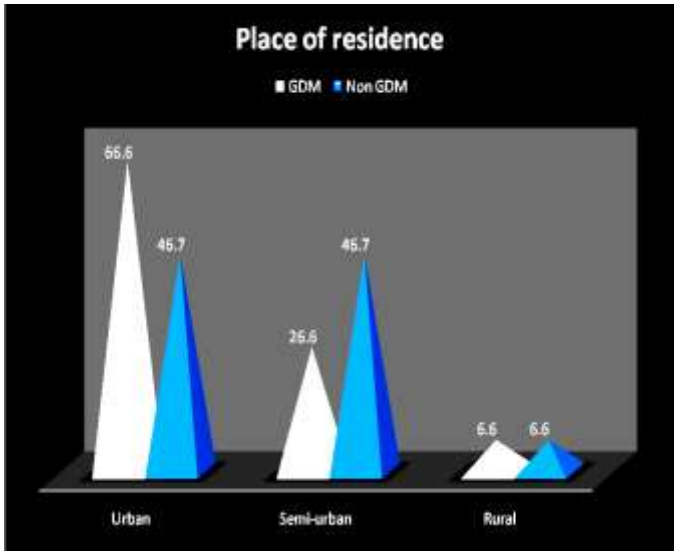
Fig-1: Distribution of the respondents by level of education



χ^2= 4.744; df = 2; p < .093 (NS)

Fig-2: Distribution of the respondents by occupation

Figure-2 shows the distribution of the respondents by occupation. In both the groups majority were housewives. In GDM 83.2% and in NGDM 90.0% were housewives, service holder were 16.6% in GDM and 3.2% in NGDM.



χ^2= 2.695; df = 2; p < .260 (NS)

Fig-3: Distribution of place of residence

Figure-3 shows the distribution of the respondents by place of residence. In GDM group 66.6% were from urban, 26.6% were from semiurban and 6.6% were from rural areas. In NGDM group 46.7% were from urban, 46.7% from semiurban and 6.6% were from rural background. The two groups are not statistically different in terms of place of residence (p>0.05).

Table-3 shows the comparison of lipid parameters (S triglyceride, total cholesterol, HDL-C, LDL-C) among the two groups.

Mean S triglyceride in GDM was (277.96±56.32) and in NGDM (242.86±58.41) the difference was found to be statistically significant in two groups (P < 0.05). Mean total cholesterol was (219.53±34.666) in GDM and was (240.43±45.258) in NGDM. It was also found to be significantly different in comparing groups (p < 0.05). Mean HDL-C was found to be (56.63±34.261) in GDM and (54.00±6.816) in NGDM. HDL-c was found to be similar in two comparing groups (p > 0.05). Mean LDL-C was found to be (129.86±31.54) in GDM and was found to be (120.20±24.77) in NGDM. The difference was found to be statistically insignificant in two groups.

Table-3: Distribution of lipid profile of the study subjects

Variables	GDM	Non GDM	P value	Remark
S triglyceride (mg/dl)	277.96±56.32	242.86±58.41	0.02	Significant
Total cholesterol (mg/dl)	219.53±34.666	240.43±45.258	0.04	Significant
HDL-C (mg/dl)	56.63±34.261	54.00±6.816	0.68	Not significant
LDL-C (mg/dl)	129.86±31.54	120.20±24.77	0.19	Not significant

HDL-C= HDL cholesterol LDL-C= LDL cholesterol

Results are expressed as mean±SD. P value was obtained from Independent't' test. P < .05 is considered statistically significant.

DISCUSSION

Gestational diabetes mellitus (GDM), defined as carbohydrate intolerance first recognized during pregnancy, continues to be a common medical complication of pregnancy in United States and Worldwide. It is also a burning problem for pregnant women of developing countries like Bangladesh. Different studies show that diabetes in pregnancy is accompanied by increased plasma levels of triglyceride and cholesterol as well as an increased susceptibility of low density lipoprotein (LDL) cholesterol to oxidation. In GDM, especially during 3rd trimester there has been a reported increase in triglyceride and decrease in HDL concentration [11]. It has also been demonstrated that GDM women have an increased in total triglyceride but lower LDL cholesterol [10].Most of the studies on the evaluation of lipid parameter in patient with GDM have been done in developed countries and results of those studies do not reflect the situation of developing countries like Bangladesh, where most of the pregnant women are not in regular antenatal check-up and not screened regularly for GDM.In the present study both age, gestational age, parity, all are same in two different groups. Among the base line parameters like blood pressure both the comparing groups were also statistically insignificant. Our investigations also encompassed a few related factors like family history of diabetes mellitus (DM) and hypertension, although pre-

pregnant DM patients were excluded. Of the 30 GDM patients 21 had at least one parent with DM and 12 had least one parent with hypertension. There was no significant difference of family history of DM and HTM were revealed two groups. Socio-demographic status and occupation in two groups showed no significant difference.Gestational diabetes mellitus is a syndrome of disturbed carbohydrate tolerance diagnosed during pregnancy. It is a heterogeneous group of abnormalities which may encompass cases of type 1, type 2 or other forms of diabetes mellitus diagnosed in this period of a woman's life. Typical GDM develops in the second half of pregnancy as a result of gradually increasing insulin resistance. Some authors consider it an early marker of metabolic syndrome [12]. In type 2 diabetes mellitus, the increasing insulin resistance must be accompanied by a factor that impairs insulin secretion by pancreatic beta cells, which is consistent with the fact that only several percentages of pregnant women do develop GDM despite insulin resistance present in all of them [4]. The abnormalities of carbohydrate metabolism in GDM may lead to lipid abnormalities. In the present study, change in the lipid profile was observed in GDM group. Mean serum triglyceride in GDM was 277.96±56.32 and in NGDM 242.86±58.41. Serum triglyceride was found to be higher in GDM group (P<.05). Increase of glucose levels might be associated with higher TG values, which explains the elevated TG values in GDM groups. It should be kept in mind that elevated TG level during pregnancy may result in foetal macrosomia irrespective of glucose levels[7].Serum total cholesterol was found to be statistically different in two comparing groups ($P < 0.05$), which was similar to other researchers. They reported that serum total cholesterol levels in the GDM group were significantly lower than those observed in healthy controls. In addition to reduced TC, other researchers reported reduced LDL-C as well in GDM patients, which was most likely a result of insulin therapy which inhibits lipolysis in the adipose tissue [6]. In our present study both HDL-C and LDL-C were found to be similar in two groups. The altered parameter of lipid profile (Triglycerides, Total cholesterol) was found to be evident in our study. However it should be kept in mind, before extrapolating the results, lipid profile in the GDM group might have also been affected by the diet during pregnancy.

CONCLUSION

The lipid profile in gestational diabetes mellitus was found to be altered than the healthy pregnant women.Triglyceride level was found to be higher in GDM patients than in healthy pregnant women ($p < 0.05$).Total cholesterol level was found to be lower in GDM than in healthy pregnant women ($p < 0.05$).

Limitation of the study

This study was crossing sectional, so causal relationship could not be evaluated properly. The sample size was small and as such the result should be interpreted with caution.The duration of study was limited.

RECOMMENDATION

More studies with large number of sample need to be conducted in this area to explore the relationship of lipedemic status and its impact on feto maternal health.

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