

## Evaluation of Lipid Profile between Gestational Diabetes Mellitus and Normal Pregnant Women

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**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 3<sup>rd</sup> 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 3<sup>rd</sup> 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.

**Key Words:** Gestational diabetes mellitus, Carbohydrate, LDL- cholesterol, HDL cholesterol, Triglyceride levels

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### I. Introduction

Gestational diabetes (or gestational diabetes mellitus, GDM) is a condition in which women without previously diagnosed diabetes exhibit high blood glucose levels during pregnancy. Gestational diabetes generally has few symptoms and it is most commonly diagnosed by screening during pregnancy. Diagnostic tests detect inappropriately high levels of glucose in blood samples [16]. Gestational diabetes is formally defined as "any degree of glucose intolerance with onset or first recognition during pregnancy [1]. The precise mechanisms underlying gestational diabetes remain unknown. The hallmark of GDM is increased insulin resistance. Insulin resistance is a normal phenomenon emerging in the second trimester of pregnancy, which progresses thereafter to levels seen in non-pregnant patients with type 2 diabetes [7].

Development of DM during pregnancy may alter the metabolism of lipoprotein characteristics of uncomplicated pregnancy. The aetiology of GDM is very heterogeneous, 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 [2]. The changes in lipoprotein metabolism found in normal pregnancy results from the effects of sex hormone. Of special importance is the elevation of chorionic Gonadotrophin and cortisol as well as oestrogens and progesterone, which augment insulin resistance and hyperinsulinism. Cholesterol is the substrate for steroid hormones produced by placenta and the changes in cholesterol concentration affected the levels of the various lipoprotein fractions. Changes in the concentration of the individual types of lipoprotein in subsequent trimester of pregnancy have been decreased elsewhere [17], [18], [19]. Some authors says, pregnant women with GDM were older and had higher BMI values before pregnancy but were slower to gain weight during pregnancy compared to healthy control, which is most likely due to dietary restriction [18]. GDM is associated with a high frequency of maternal and fetal morbidity [3]. GDM is not associated with modification in the maternal lipid profile but it increases the concentration of inflammatory cytokines. The study suggests that in placenta, expressions of key proteins involved in de novo lipid synthesis are affected by changes in maternal metabolism (HC and GDM) that may subsequently affect fetal development. 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. In Bangladesh especially in urban area cardiovascular disease risk is increasing day by day. In our country no such study to determine the altered lipid profile in GDM patients were done. In our country no such study to determine the altered lipid profile in GDM patients were done. Therefore this 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 constitutes 90% of all pregnancies complicated by diabetes [14]. According to American Diabetic Association, GDM affects 7% of all pregnancies, resulting in > 2,00,000 cases per year. The prevalence may range from 1-14% depending on the population sample and diagnostic criteria [1]. 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]. The prevalence of GDM among rural Bangladeshi women was between 4.8-7.5% using fasting blood glucose only [20].

## II. Objectives

### General objective:

- Evaluation of lipid profile between gestational diabetes mellitus and normal pregnant women.

### Specific Objective:

- 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.

## III. Methods

- **Study design:** This study is a cross sectional comparative study.
- **Location of study:** Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka Bangladesh Institute of Research & Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM). Indoor and outdoor patients of Obstetrics and Gynaecology Department of BSMMU, BIRDEM and Department of Biochemistry, BSMMU. were study area and involved centers/institutions. Study Period was July 2009 to June 2010.
- **Study population:** Case (Group- A): Pregnant women at 3<sup>rd</sup> trimesters with GDM. Control (Group- B): Pregnant women at 3<sup>rd</sup> trimesters without GDM.
- **Sample size:** A total 60 pregnant women of 3<sup>rd</sup> 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 3<sup>rd</sup> 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 3<sup>rd</sup> 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.

**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 patients 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 aseptic precaution. 5 cc venous blood was taken with disposable plastic syringe from the antecubital

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.

**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<sub>1c</sub> 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 aliquoted 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.

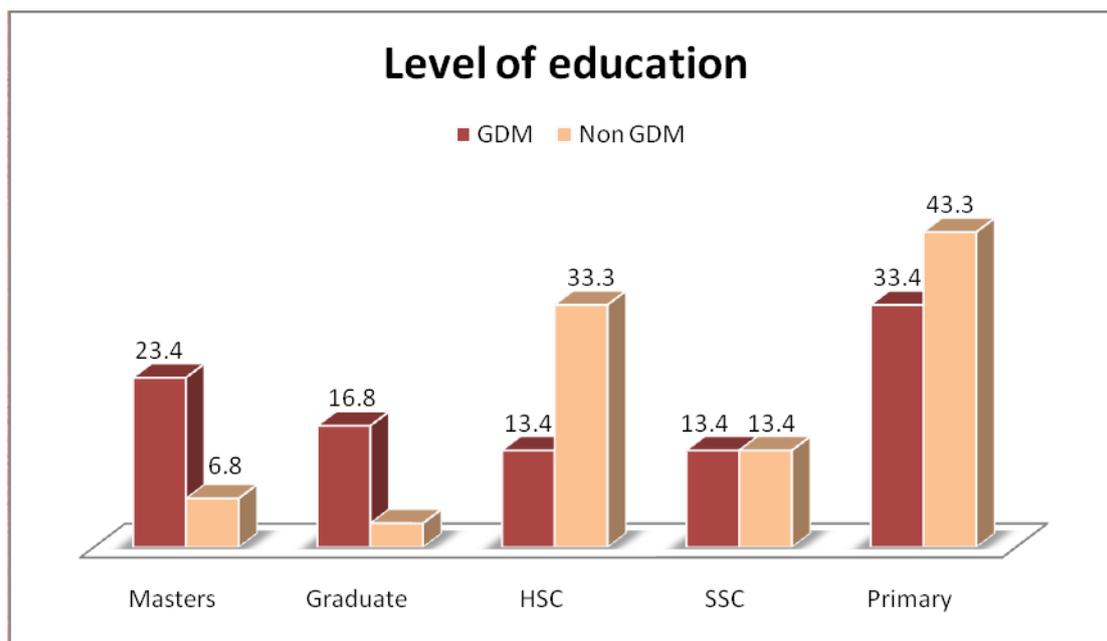
**Data processing and Statistical analysis:** Data were processed with the help of software SPSS (Statistical Package for Social Sciences) version 11 and analyzed. Descriptive analysis was done to see the basic clinical and obstetric profile. After performing descriptive assessment, analytic statistics were performed to see any relationship of the related variables and outcome. Suitable tables and diagram were used to present the observations and results of the study. The data were expressed as mean with standard deviation ( $\pm$  SD). (P value < .05 was taken as statistically significant).

**Ethical consideration:**

It is a cross sectional study. All the subjects selected for the study were informed orally and in writing about the study design, objectives and right for the participants, to withdraw from the project at any time for any reason what so ever. Written consent was obtained from each subject. However approval from the Ethical Review Board, BSMMU was sought. Then, approval from the Ethical Review Board, BSMMU was taken.

**IV. Results**

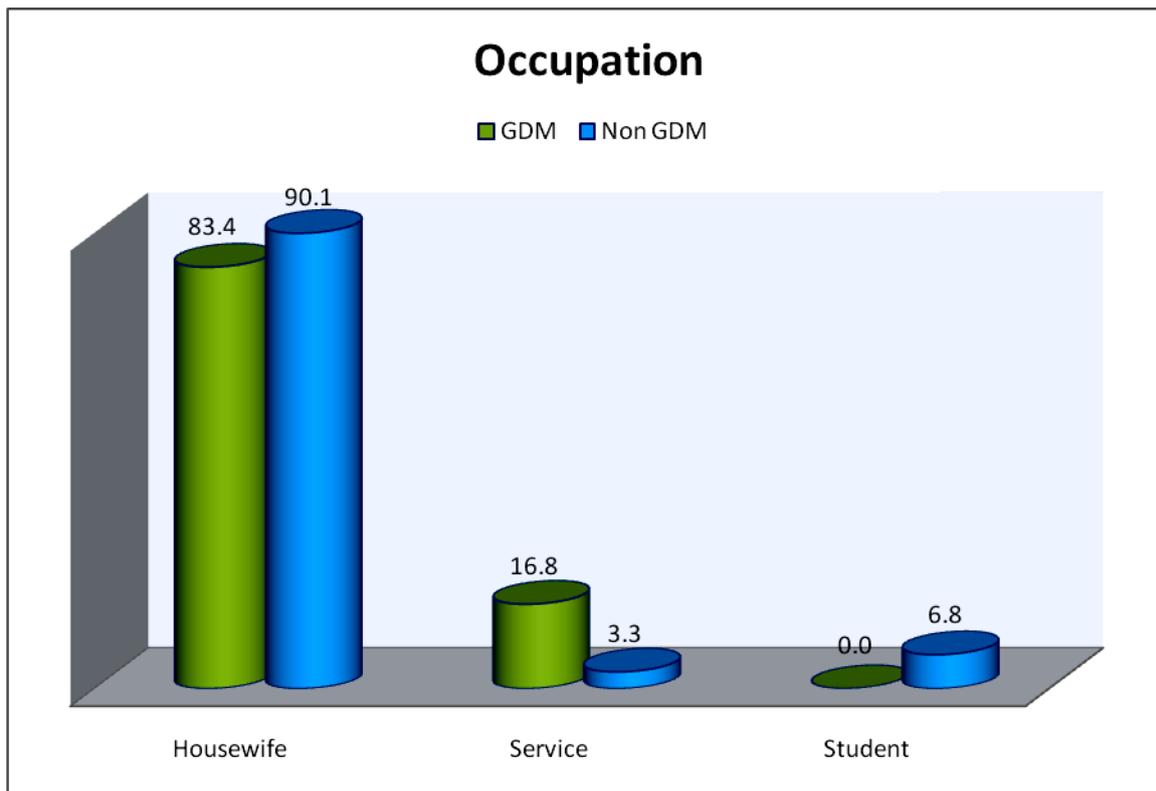
A total of 60 participants were recruited for the study among them 30 was diagnosed to have GDM and 30 of them were healthy pregnant women.



**Figure 1: Distribution of the respondents by level of education**

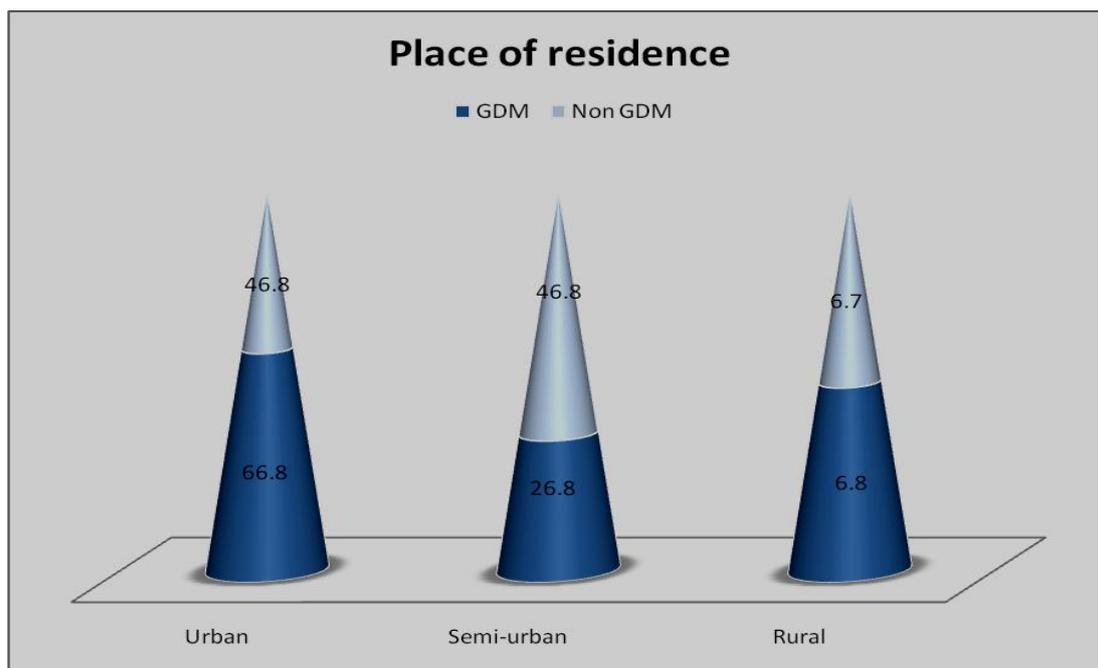
$\chi^2 = 8.407$ ;  $df = 4$ ;  $p < .078$  (NS)

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 23.4% had Masters, 16.8% were graduates and 13.4% had higher secondary level of education. In NGDM 6.8% had Masters, 3.4% had graduate and 33.4% had higher secondary level of education. No statistically significant difference was found in level of education in two groups ( $p > 0.05$ ).



**Figure 2: Distribution of the respondents by occupation**  
 $\chi^2 = 4.744$ ;  $df = 2$ ;  $p < .093$  (NS)

Figure-2 shows the distribution of the respondents by occupation. In both the groups majority were housewives. In GDM 83.4% and in NGDM 90.1% were housewives, service holder were 16.8% in GDM and 3.3% in NGDM.



**Figure 3: Distribution of place of residence**  
 $\chi^2 = 2.695$ ;  $df = 2$ ;  $p < .260$  (NS)

Figure-3 shows the distribution of the respondents by place of residence. In GDM group 66.8% were from urban, 26.8% were from semiurban and 6.8% were from rural areas. In NGDM group 46.8% were from

urban, 46.8% from semiurban and 6.7% were from rural background. The two groups are not statistically different in terms of place of residence ( $p > 0.05$ ).

**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  $28.70 \pm 3.95$  and  $28.76 \pm 5.47$  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  $\pm$  SD SBP in GDM was  $116.25 \pm 11.92$  and in NGDM was  $116.17 \pm 20.7$ . Mean  $\pm$  SD DBP in GDM was  $75.16 \pm 4.83$  and in NGDM was  $75.83 \pm 6.12$ . 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)	$28.70 \pm 3.95$	$28.76 \pm 5.47$	0.12	Not significant
Gestational age (weeks)	$32.33 \pm 1.69$	$33.20 \pm 3.14$	0.08	Not significant
Para	$2.80 \pm 1.77$	$2.235 \pm 1.19$	0.15	Not significant
SBP (mmHg)	$116.25 \pm 11.92$	$116.17 \pm 20.7$	0.670	Not significant
DBP (mmHg)	$75.16 \pm 4.83$	$75.83 \pm 6.12$	0.35	Not significant

Results are expressed as mean  $\pm$  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 15(71.5%) were with GDM and 8(28.7%) without GDM. Among the 17 subjects had history of hypertension in the family 12 (70.7%) were with GDM and 7 (29.5%) without GDM. Family history of DM and HTN were not found to be statistically different in the 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)	15 (71.5%)	8(28.7%)	0.147	Not Significant
Hypertension (n=17)	12 (70.7%)	7 (29.5%)	0.225	Not significant

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 ( $267.96 \pm 56.34$ ) and in NGDM ( $232.88 \pm 58.43$ ) the difference was found to be statistically significant in two groups ( $P < 0.05$ ). Mean total cholesterol was ( $209.53 \pm 34.668$ ) in GDM and was ( $230.45 \pm 45.259$ ) in NGDM. It was also found to be significantly different in comparing groups ( $p < 0.05$ ). Mean HDL-C was found to be ( $55.63 \pm 34.263$ ) in GDM and ( $53.02 \pm 6.818$ ) in NGDM. HDL-c was found to be similar in two comparing groups ( $p > 0.05$ ). Mean LDL-C was found to be ( $119.86 \pm 31.56$ ) in GDM and was found to be ( $110.22 \pm 24.79$ ) 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)	$267.96 \pm 56.34$	$232.88 \pm 58.43$	0.02	Significant
Total cholesterol (mg/dl)	$209.53 \pm 34.668$	$230.45 \pm 45.259$	0.04	Significant
HDL-C (mg/dl)	$55.63 \pm 34.263$	$53.02 \pm 6.818$	0.68	Not significant
LDL-C (mg/dl)	$119.86 \pm 31.56$	$110.22 \pm 24.79$	0.19	Not significant

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

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

## V. 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 3<sup>rd</sup> 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 [12]. 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 at 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 [13]. 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  $267.96 \pm 56.34$  and in NGDM  $232.88 \pm 58.43$ . 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 [6]. 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 [5]. 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.

## VI. 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 ( $p < 0.05$ ).

## VII. 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 fetomaternal health.

## References

- [1]. American Diabetes Association, 2004, Gestational diabetes mellitus (position statement), *Diabetes care*, vol. 27, pp. 88-90.
- [2]. Arcos F, Castelo-Branco C, Casals E, et al. 1998, Normal and gestational diabetic pregnancies, lipids, lipoproteins and apolipoproteins, *Reprod Med*, vol. 43, pp. 144-148.
- [3]. American Diabetes Association, 1999, Gestational diabetes mellitus, *Diabetes care*, vol. 22, pp. 74-76.
- [4]. Boder G. 1996, Fuel Metabolism in pregnancy and gestational diabetes mellitus *ObstetGynecol Clin North America*, vol. 23, no. 1, pp. 1-10.
- [5]. Couch S, Philipson EH, Bendel RB. et al. 1998, Elevated lipoprotein lipids and gestational hormones in women with diet-treated gestational diabetes mellitus compared to healthy pregnancy controls *J Diab Comp*, 12: 1-9.
- [6]. Ersanil OE, Damci T, Sen C et al. 1997, Lipid metabolism alterations in patients with gestational diabetes mellitus associated fetal macrosomia *Ann 1<sup>st</sup> super sanita*, vol. 33, no. 3, pp. 411-415.
- [7]. Gabbe SG, Gregory RP, Power ML, Williams SB, Schulkin J. 2004, Management of diabetes mellitus by obstetrician-gynecologists. *ObstetGynecol*, vol. 103, no. 6, pp. 1229-34.
- [8]. Green JR, Pawson IG, Schunacher LB, Perry J, Kretchmer N 1990, Glucose intolerance in pregnancy; ethnic variation and influence of body habits, *Am J ObstetGynecol*, vol. 163, pp. 86-92.
- [9]. Knoop RH, Chapmar N, Bergelin R et al. 1980, Relationships of lipoprotein lipids to mild fasting hyperglycemia and diabetes in pregnancy, *Diabetic care*, vol. 3, pp. 416-420.
- [10]. Koukkou E, Watts GF, Lowy C 1996, Serum Lipid lipoprotein apolipoprotein changes in gestational diabetes mellitus: a cross sectional and prospective study, *J clin pathol*, vol. 49, pp. 634-637.
- [11]. Kerenyi Z, Stella P, Tabak AG, et al. 2002, Gestational diabetes mellitus: early manifestation or predictor of metabolic syndrome *Diabetologia Hungarica*, vol. 10, pp. 32-36.
- [12]. Landon MB, 2000, Diabetes Mellitus and other endocrine disease, In: Gabbe SG, Langer L, Conway DL, Berkus MD, Xenakis EM-J, Gonzales O: A comparison of glyburide and insulin in women with gestational diabetes mellitus, *N Engl J Med*, vol. 343, pp. 1134-1138.

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- [13]. Moore TR, et al. 2005, Diabetes Mellitus and Pregnancy, [med/2349](#) .eMedicine
- [14]. Metzger BE, Phelps RL, Freinkel N, Navickas IA. 1980, Effects of gestational diabetes on diurnal profiles of plasma glucose, lipids, and individual amino acids, *Diabetes Care*, vol. 3, pp. 402-9.
- [15]. Mazurkiewicz JC, Watts GF, Warburton FG, et al. 1994, Serum lipids, lipoproteins and apolipoproteins in pregnant non-diabetic patients, *J Clin Pathol*, vol. 47, pp. 728-731.
- [16]. Peterson CM, Koenig RJ, Jones RL, et al. 1997, Correlation of serum triglyceride levels and HbA<sub>1c</sub> concentration diabetes mellitus *Diabetes care*, vol. 26, pp. 507-509.
- [17]. Priore G, Chatertor RT, Chandarana A, et al. 1993, Comparison of maternal serum lipids before and during parturition, *Obstet and Gynecol*, vol. 82, pp. 837-840.
- [18]. Sayeed MA, Mahtab H, Khanam PA, Amin STE and Azad Khan AK 2001, Prevalence of gestational diabetes in a rural community of Bangladesh, *Diabetic Medicine*, vol. 22, pp. 1267-71.

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