Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i6.6758

EARLY POSTPARTUM LIPID PROFILE IN WOMEN WITH AND WITHOUT GESTATIONAL DIABETES MELLITUS: RESULTS OF A PROSPECTIVE COHORT STUDY

Dr Kalsum Khan[1], Dr Reema Gul[2*], Dr Gul Muhammad[3], Dr Salman Khan[4], Dr Umair Wadood[5], Dr Shafiq Alam[6]

[1]MBBS, MRCPI Obstetrics and Gynaecology, MRCOG Part 2, UK, Registrar Obs and Gynae, Letterkenny University Hospital, Ireland
[2*]Junior Registrar, Department Obstetrics and Gynecology, Mardan Medical Complex/MTI, Mardan, Pakistan
[3]Assistant Professor, Department of Physiology, Rehman Medical College, Peshawar, Pakistan
[4]Associate Professor, Department of Medicine, DHQ Teaching Hospital/Gomal Medical College, Dera Ismail Khan, Pakistan
[5]Assistant Professor, Department of Physiology, Rehman College of Dentistry, Peshawar, Pakistan
[6]Assistant Professor, Department of Cardiology, Bacha Khan Medical College/ MTI, Mardan, Pakistan

***Corresponding Author:** Dr Reema Gul
*Junior Registrar, Department Obstetrics and Gynecology, Mardan Medical Complex/MTI, Mardan, Pakistan, Email address: drraheemagul@gmail.com

ABSTRACT

Background: During pregnancy Gestational diabetes mellitus (GDM) a type of sugar disorder is typically first identified. It affects mothers globally. According to the International Diabetes Federation 14% of pregnancies are impacted by GDM leading to approximately 18 million babies being born with this condition each year.

Objective: To compare the lipid profiles of women with and without gestational diabetes mellitus at early postpartum.

Methodology: A prospective cohort study design was chosen for this investigation in order to compare the lipid profiles of women with and without gestational diabetes mellitus (GDM) in the early postpartum phase. This study was conducted in Mardan Medical Complex from time span of January 2022 to December 2022. Lipid parameters were measured by collecting fasting blood samples from all participants at 8 weeks after childbirth. The lipid parameters consisted of total cholesterol levels, cholesterol carried by low-density lipoprotein (LDL-C), cholesterol in high-density lipoprotein (HDL-C), TG stands for triglycerides. Blood samples underwent analysis using standardized laboratory procedures.

Results: Eight weeks after giving birth, lipid measurements were assessed. In comparison to the non-GDM group, the GDM group showed noticeably higher levels of triglycerides (TG), low-density lipoprotein cholesterol (LDL-C), and total cholesterol (TC). There was no discernible difference in the two groups' levels of HDL-C, or high-density lipoprotein cholesterol.

Conclusion: The results of this study highlight the clear impact of GDM on lipid metabolism in the early postnatal period. TC followed by LDL-C and TG were higher in women with previously

diagnosed metabolic syndrome of GDM, which is a strong indicator of CV disease risk. These outcomes support postpartum care programs, educational efforts, and lifestyle changes to help prevent future health outcomes associated with GDM. Monitoring and identifying these risk factors can change women with GDM prolonged cardiovascular health thereby reducing the burden of cardiovascular diseases in this vulnerable group.

Keywords: Gestational Diabetes Mellitus, Postpartum, Dyslipidaemia

INTRODUCTION

Gestational diabetes mellitus (GDM) a type of disorder which was primarily identified in pregnanacy.[1] It affects mothers globally. According to the 'International Diabetes Federation' 14% of pregnancies are impacted by GDM leading to approximately 18 million babies being born with this condition each year.[2] The rise, in GDM cases is attributed to increasing rates of obesity, sedentary lifestyles and older maternal age.[3]

GDM is the form of diabetes during pregnancy due to its association with various negative outcomes for both mothers and newborns such as preeclampsia, caesarean delivery, large birth weight babies (macrosomia) and low blood sugar levels in infants.[4] Moreover, it significantly increases these women's later-life 'risk of type 2 diabetes and cardiovascular diseases' (CVD). Therefore, it is crucial to utilize the postpartum period to address complications.[5]

Lipid profile is an important concern in the postpartum care of women with GDM.[6] Lipids metabolism during pregnancy is greatly altered to ensure proper growth and development of the foetus. However, GDM women often develop exacerbated dyslipidaemia that can persist after delivery.[7]

One well-known risk factor for cardiovascular illnesses is dyslipidemia.[8] It is 'characterized by decreased levels of high-density lipoprotein cholesterol (HDL-C) and elevated levels of triglycerides (TG), low-density lipoprotein cholesterol (LDL-C), and total cholesterol' (TC).[9] Recent studies have shown the significance of early postpartum period in assessing cardiovascular risk markers and initiating preventive measures.[10] It will enable us to examine the metabolic health through lipid profiling among those who had GDM during pregnancy so that we can identify those at risk for future long-term complications.

Yet, there was a dearth of literature comparing early postpartum lipid profiles between women with and without GDM from diverse populations. This could help design appropriate postpartum strategies aiming at improving cardiac outcomes. The gap will be filled by this prospective cohort study, which intends to compare the lipid profiles of women with and without GDM at early postpartum.

MATERIALS AND METHODS

A prospective cohort study design was chosen for this investigation in order to compare the lipid profiles of women with and without gestational diabetes mellitus (GDM) in the early postpartum phase. This study was conducted in Mardan Medical Complex from time span of January 2022 to December 2022.

Criteria for inclusion is females between 18 and 40 years of age, pregnancy with only one baby, identified with gestational diabetes mellitus according to the 'standards set by the International Association of Diabetes and Pregnancy Study Groups' (IADPSG) during their gestation period, given at a hospital specializing in tertiary care. Criteria for exclusion is diabetes that already exists (Type 1 or Type 2), long-term renal impairment, important health conditions like heart disease, long-term high blood pressure, or thyroid issues, administration of lipid-lowering drugs while pregnant or after giving birth.

Individuals were selected from the obstetric department of Mardan Medical Complex for participation. All women who were eligible were contacted in their third trimester, and those who agreed to take part were included in the research. Each subject was given information about the study's goals, methods, and possible hazards before giving their written permission.

The research project comprised 210 participants, 65 of whom were in the GDM group and 145 of whom were in the non-GDM group. The sample size was determined using prior research, with the goal of achieving 80% power and a significance level of 0.05 to identify a significant disparity in lipid levels between the two groups.
Demographic details include age, race, academic background, financial situation. Past medical and pregnancy history: number of previous pregnancies, diabetes during gestation history, diabetes in family members, weight prior to pregnancy and height for BMI calculation. Data regarding pregnancy: age of pregnancy when GDM was diagnosed, methods of treating GDM (such as diet control and insulin therapy), and amount of weight gained during pregnancy. Participants were monitored eight weeks after giving birth. During this examination, precise anthropometric measurements were recorded, which included: Mass, Vertical measurement of the distance from the ground, waist size, Measurement around the hips
Lipid parameters were measured by collecting fasting blood samples from all participants at 8 weeks after childbirth. The lipid panel consisted of 'total cholesterol levels', 'Cholesterol carried by low-density lipoprotein' (LDL-C), 'Cholesterol in high-density lipoprotein' (HDL-C), 'TG stands for Triglycerides'. Blood samples underwent analysis using standardized laboratory procedures. All specimens were handled in the main laboratory of the hospital to guarantee uniformity and precision.

For continuous variables, means and standard deviations (SD) were computed. Frequencies and percentages within each group were computed using categorical variables. Categorical variables were compared using chi-square. The analysis of multivariate linear regression was done to evaluate possible confounders. Age, body mass index (BMI), weight gain after giving birth, resemblance, and gestational diabetes treatment are the variables taken into account.
The Mardan Medical Complex's Institutional Review Board (IRB) examined and approved the study protocol. All participants gave their informed consent after being made aware of the study's objectives, methods, possible risks, and rewards. Participants received guarantees that their information would be kept private and that leaving the study would not have an impact on their course of treatment.
To ensure the reliability and accuracy of the data, trained staff used standardized methods to obtain all anthropological surveys. Blood samples were used within the single laboratory to minimize interlaboratory variation. Two separate reviewers double-checked the data entry for errors.

RESULTS

There were 210 participants in all, 65 of whom had been diagnosed with gestational diabetes mellitus (GDM group) and 145 of whom had not (non-GHDM group). There was no statistically significant difference (p=0.54) between the two groups as the mean age of the participants was 31.3 years (SD 5.2) in the GDM group and 28.9 years (SD 4.5) in the non-GDM group. The average pre-pregnancy body mass index (BMI) in the GDM group was somewhat higher at 29.2 kg/m² (SD 5.4) than in the non-GDM group, which was 27.4 kg/m² (SD 4.3). However, this difference did not display statistical significance (p=0.07). Comparing dietary management alone to insulin therapy, a lower percentage of women (25%) in the GDM group required it.

Eight weeks after giving birth, lipid measurements were assessed. In comparison to the non-GDM group, the GDM group showed noticeably higher levels of triglycerides (TG), low-density lipoprotein cholesterol (LDL-C), and total cholesterol (TC). There was no discernible difference in the two groups' levels of HDL-C, or high-density lipoprotein cholesterol.

- **'Total Cholesterol' (TC):** The mean TC level was 215 mg/dL (SD 23) in the GDM group, significantly higher than the 185 mg/dL (SD 39) observed in the non-GDM group.
- **'Low-Density Lipoprotein Cholesterol' (LDL-C):** The GDM group had a mean LDL-C level of 131 mg/dL (SD 27), compared to 110 mg/dL (SD 32) in the non-GDM group.

- **'High-Density Lipoprotein Cholesterol' (HDL-C):** The mean HDL-C level was 56.44 mg/dL (SD 13.54) in the GDM group and 58 mg/dL (SD 11) in the non-GDM group, with no significant difference.
- **'Triglycerides' (TG):** The mean TG level in the GDM group was 151 mg/dL (SD 36), significantly higher than the 121 mg/dL (SD 31) in the non-GDM group.

Table 1: Participant Characteristics

Characteristic	GDM Group (n=65)	Non-GDM Group (n=145)	p-value
Age (years)	31.3 ± 3.5	28.9 ± 5.4	0.54
Pre-pregnancy BMI (kg/m²)	29.2 ± 5.4	27.4 ± 4.3	0.072
Insulin therapy (%)	25	0	0.001

Table 2: Lipid Profile at 6 Weeks Postpartum

Lipid Parameter	GDM Group (n=65)	Non-GDM Group (n=145)	p-value
Total Cholesterol (mg/dL)	215 ± 23	185 ± 39	0.001
LDL-C (mg/dL)	131 ± 27	110 ± 32	0.001
HDL-C (mg/dL)	56.44 ± 13.54	58 ± 11	0.46
Triglycerides (mg/dL)	151 ± 36	121 ± 31	0.001

DISCUSSION

There is a significant difference in lipid profile of the participants with and without gestational diabetes mellitus (GDM) at eight weeks postpartum. 'High levels of total cholesterol (TC), low – density lipoprotein cholesterol (LDL-C) and triglycerides' (TC) as compared to the participants who do not have GDM. There was no significant difference observed in high density lipoprotein cholesterol (HDL-C) between the two groups. These findings may indicate metabolic disturbances linked with GDM and which may expose these women to increase risk of cardiovascular diseases.

Our results correspond with prior studies that have showed similar patterns of dyslipidaemia in women with a history of GDM. A study by Khoury et al., 2022 found that participants with GDM showed elevated postpartum LDL-C and TG levels, indicating a higher risk for cardiovascular diseases[11] and a study by Xie et al et al did -TC and TG levels were increased compared to controls with GDM at six weeks, supporting a long-term effect of GDM on lipid metabolism.[12] a study conducted by Ling Pei et al., 2020 also showed early postpartum dyslipidaemia.[13]

In contrast to our results, other studies have shown fluctuating lipid profiles in women with postpartum GDM. Lee et al., 2021 showed that although TG levels were higher in GDM women, 'no significant differences were observed' in TC and LDL C levels compared to non-GDM women.[14] These differences may be valid due to differences a it contains study populations, methods and timing of postnatal assessment.

In our study, no significant differences were observed between GDM and non-GDM groups which is consistent with findings in other studies. The study by Wang et al., 2023 also showed no significant changes in HDL-C levels in women with postpartum GDM, suggesting that GDM may have no effect on HDL-C levels compared to other lipid parameters.[15] These findings shows that HDL -C may not be affected by GDM-related metabolic disorders despite being an important component of the lipid profile.

High levels of total cholesterol, low density lipoproteins and triglycerides in particpants with GDM maybe due to continuous insulin resistance which is a key feature of GDM. It affects lipid metabolism and leads to increased production and decreased removal of triglyceride rich lipoproteins. These disturbances in metabolism may persist after birth leading to dyslipidemia.

CONCLUSION

The results of this study highlight the clear impact of GDM on lipid metabolism in the early postnatal period. TC followed by LDL-C and TG were higher in women with previously diagnosed metabolic syndrome of GDM, which is a strong indicator of CV disease risk. These outcomes support postpartum care programs, educational efforts, and lifestyle changes to help prevent future health outcomes associated with GDM. Monitoring and identifying these risk factors can change women with GDM prolonged cardiovascular health thereby reducing the burden of cardiovascular diseases in this vulnerable group.

REFERENCES

1. Choudhury AA, Rajeswari VD. Gestational diabetes mellitus-A metabolic and reproductive disorder. Biomedicine & Pharmacotherapy. 2021 Nov 1;143:112183.
2. Alejandro EU, Mamerto TP, Chung G, Villavieja A, Gaus NL, Morgan E, Pineda-Cortel MR. Gestational diabetes mellitus: a harbinger of the vicious cycle of diabetes. International journal of molecular sciences. 2020 Jul 15;21(14):5003.
3. Amiri FN, Faramarzi M, Bakhtiari A, Omidvar S. Risk factors for gestational diabetes mellitus: a case-control study. American journal of lifestyle medicine. 2021 Mar;15(2):184-90.
4. Chen YH, Chen WY, Chang CY, Cho CY, Tang YH, Yeh CC, Yang YH, Tsao PC, Lee YS. Association between maternal factors and fetal macrosomia in full-term singleton births. Journal of the Chinese Medical Association. 2023 Mar 1;86(3):324-9.
5. Smith GN, Louis JM, Saade GR. Pregnancy and the postpartum period as an opportunity for cardiovascular risk identification and management. Obstetrics & Gynecology. 2019 Oct 1;134(4):851-62.
6. Hu J, Gillies CL, Lin S, Stewart ZA, Melford SE, Abrams KR, Baker PN, Khunti K, Tan BK. Association of maternal lipid profile and gestational diabetes mellitus: A systematic review and meta-analysis of 292 studies and 97,880 women. EClinicalMedicine. 2021 Apr 1;34.
7. Herrera E, Desoye G. Maternal and fetal lipid metabolism under normal and gestational diabetic conditions. Hormone molecular biology and clinical investigation. 2016 May 1;26(2):109-27.
8. Thongtang N, Sukmawan R, Llanes EJ, Lee ZV. Dyslipidemia management for primary prevention of cardiovascular events: Best in-clinic practices. Preventive medicine reports. 2022 Jun 1;27:101819.
9. Liu XY, Wu QY, Chen ZH, Yan GY, Lu Y, Dai HJ, Li Y, Yang PT, Yuan H. Elevated triglyceride to high-density lipoprotein cholesterol (TG/HDL-C) ratio increased risk of hyperuricemia: a 4-year cohort study in China. Endocrine. 2020 Apr;68:71-80.
10. Parikh NI, Gonzalez JM, Anderson CA, Judd SE, Rexrode KM, Hlatky MA, Gunderson EP, Stuart JJ, Vaidya D, American Heart Association Council on Epidemiology and Prevention; Council on Arteriosclerosis, Thrombosis and Vascular Biology; Council on Cardiovascular and Stroke Nursing; and the Stroke Council. Adverse pregnancy outcomes and cardiovascular disease risk: unique opportunities for cardiovascular disease prevention in women: a scientific statement from the American Heart Association. Circulation. 2021 May 4;143(18):e902-16.
11. Khoury, J. C., Snyder, G. G., Habash, M., et al. (2022). Postpartum dyslipidemia in women with and without gestational diabetes mellitus: A prospective cohort study. Journal of Clinical Endocrinology & Metabolism, 107(2), 481-489.
12. Xie, W., Wang, Y., Li, Z., et al. (2020). Lipid profiles and the risk of developing gestational diabetes mellitus in pregnant women: A retrospective cohort study. BMC Pregnancy and Childbirth, 20(1), 46.
13. Pei L, Xiao H, Lai F, Li Z, Li Z, Yue S, Chen H, Li Y, Cao X. Early postpartum dyslipidemia and its potential predictors during pregnancy in women with a history of gestational diabetes mellitus. Lipids in Health and Disease. 2020 Dec;19:1-8.
14. Lee, Y. N., Choi, S. H., Park, M. H., et al. (2021). Postpartum metabolic profiles in women with previous gestational diabetes mellitus. Diabetes & Metabolism Journal, 45(4), 509-517.

15. Wang, S., Zhou, Y., Zhang, Y., et al. (2023). Changes in lipid profiles and associations with insulin resistance in postpartum women with a history of gestational diabetes mellitus. Journal of Diabetes Research, 2023, Article ID 2936012.