Section: General Medicine

Original Research Article

A CROSS-SECTIONAL STUDY ON ABNORMALITIES OF LIPID PROFILE AMONG GESTATIONAL DIABETES MELLITUS PATIENTS IN TERTIARY CARE HOSPITAL

Gauthaman C S[1], Geetha S[2], Haridoss Sripriya V[3], Elanthirayan G[4], Subhashini K[5]

[1]Associate Professor, Department of General Medicine, Government Kilpauk Medical College Hospital, Tamilnadu, India.
[2]Professor, Department of General Medicine, Government Kilpauk Medical College Hospital, Tamilnadu, India.
[3]Associate Professor, Department of General Medicine, Government Stanley Medical College Hospital, Tamilnadu, India.
[4]Senior Resident, Department of General Medicine, Government Medical College Hospital, Namakkal, Tamilnadu, India.
Postgraduate, Department of General Medicine, Government Kilpauk Medical College Hospital, Tamilnadu, India.

Received : *XX/XX/2023*
Received in revised form : *XX/XX/2023*
Accepted : *XX/XX/2023*

Keywords:
Gestational diabetes mellitus, Dyslipidemia, Triglycerides.

Corresponding Author:
Dr. Haridoss Sripriya V
Email: sripriyaharidoss@yahoo.co.in

DOI: 10.47009/jamp.2023.5.2.33

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (2); 156-160

Abstract

Background: Worldwide, 21.3 million or 16.2% of live births had some form of hyperglycemia in pregnancy. An estimated 85.1% were due to gestational diabetes. 1 in 7 births was affected by gestational diabetes. The study aims to find out underlying dyslipidemia in GDM patients and study the abnormalities in various types of lipids in GDM patients. **Materials and Methods:** This cross-sectional study was conducted at the Department of General Medicine, Chengalpattu Medical College, Chengalpattu, for 12 months (March 2019 - February 2020). Two hundred seventy-six pregnant women with gestational diabetes mellitus were included. Patients with diabetes mellitus, a patient who didn't give consent for testing lipid profile, and patients with hypothyroidism were excluded. **Result:** The levels of serum cholesterol, Triglycerides, VLDL, and LDL increase with maternal age among GDM mothers. LDL levels were significantly increased as the number of gravida increased. Total cholesterol and VLDL levels were significantly increased as the trimester advances. Total cholesterol, triglycerides, and VLDL were significantly increased in obese mothers. **Conclusion:** Dyslipidemia in gestational diabetes mellitus may be temporary, but these patients are more prone to dyslipidemia and type 2 diabetes mellitus in the future. Thus, they are important candidates for lifestyle modifications as this dyslipidemia may contribute to insulin resistance. Treating this non-physiological dyslipidemia in pregnancy can prevent the development of gestational diabetes mellitus or help them achieve better control of their blood sugars even if they become a GDM patient.

INTRODUCTION

Gestational diabetes mellitus (GDM) is any glucose intolerance with onset or first recognition during pregnancy. Worldwide 21.3 million or 16.2% of live births had some form of hyperglycemia in pregnancy. An estimated 85.1% were due to GDM, and 1 in 7 births was affected by GDM. In India, the prevalence rates are between 4.6% and 14% in urban areas and 1.7% and 13.2% in rural areas. In Tamilnadu prevalence of GDM was found to be 15.7%.[1,2]

GDM is the most common metabolic complication of pregnancy. Although asymptomatic, GDM is associated with increased risk of pregnancy and childbirth complications risk. In the long term, the risk of developing type 2 DM significantly increases in women with GDM.[3,4] Many GDM patients have abnormal lipid profiles, and this dyslipidemia may contribute to insulin resistance in patients with GDM. Thus, identifying dyslipidemia will help in the better management of GDM. This dyslipidemia is temporary and may get corrected after delivery. Mothers with temporary dyslipidemia and GDM during pregnancy are more prone to develop type 2 DM and dyslipidemia in the future.[5-7] Thus, they are important candidates for lifestyle modification. Therefore, this study aimed to find underlying dyslipidemia in GDM patients and to study the abnormalities in various lipids in GDM patients.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Department of General Medicine, Chengalpattu Medical College, Chengalpattu, for 12 months (March 2019 - February 2020). Two hundred seventy-six pregnant women with gestational diabetes mellitus were included. Patients with diabetes mellitus, patients who didn't give consent for testing lipid profile, and patients with hypothyroidism were excluded.

For the study, 3 ml of venous blood sample was collected from all the study participants, and serum was separated after centrifugation at 3000 rpm for 15 minutes. The serum was analysed using a semi-auto analyser. The analyte was estimated as follows: total serum cholesterol by CHOD-PAP method, serum triglyceride by Glycerol 3 Phosphate oxidase method, and Serum HDL by Phosphotungstic Acid method. LDL was calculated using Friedwald's equation, and VLDL was calculated using the formula VLDL = Triglycerides/5.

Data were entered into Microsoft excel and analyzed by SPSS. The categorical variables were expressed by percentage, and the chi-squared test was used to compare groups. The statistics with a p-value less than 0.05 was considered statistically significant.

RESULTS

Table 1: Demographic data of the study

		Frequency	Percentage
Age	20- 25 years	33	12.0
	26- 30 years	183	66.3
	> 30 years	60	21.7
Gravida	First	67	24.2
	Second	160	58.0
	Third	49	17.8
Trimester	First	0	0.0
	Second	81	29.3
	Third	195	70.7
Co-morbidities	PIH	16	5.8
	Obesity	17	6.2
	COPD	6	2.2
	Bronchial Asthma	3	1.1
Family history	Present	118	42.8
	Absent	158	57.2
Treatment history	Only Insulin	276	100.0
	Insulin + Metformin	16	5.8
Height (cm)	< 155 cm	102	37.0
	155- 160 cm	115	41.7
	> 160 cm	59	21.4
Weight (kg)	< 50 kg	102	37.0
	51 - 55 kg	115	41.7
	56 - 60 kg	59	21.4
Cholesterol levels	< 200 mg/dl	180	65.2
	> 200 mg/dl	96	34.8
Triglyceride levels	< 150 mg/dl	144	52.2
	151-200 mg/dl	86	31.2
	> 200 mg/dl	46	16.7
VLDL levels	< 30 mg/dl	149	54.0
	> 30 mg/dl	127	46.0
LDL levels	< 100 mg/dl	243	88.0
	> 100 mg/dl	33	12.0
HDL levels	40-60 mg/dl	263	95.3
	> 60 mg/dl	13	4.7

In our study, out of the 276 patients, the majority of 183 belong to the age group of 26-30 years, accounting for 66.3%. The remaining 33 belong to the age group of 20-25 years, the least contribution being 12%.

One hundred sixty antenatal mothers were second gravida, accounting for a majority of 58%, 67 were primi gravida, contributing to 24.2%, and the remaining 49 were the third gravida, contributing to 17.8%. One hundred ninety-five were in the third trimester of pregnancy, which is about 70.7%, 81 were in the second trimester contributing to the remaining 29.3% and none in the first trimester, which may be because the antenatal mothers develop GDM in the second or third trimester.

One hundred eighteen participants have a family history of dyslipidemia which is about 42.8%, and 158 participants were without any family history, which amounts to 57.2%. All 276 mothers were in treatment with 100%, whereas 16 also received Metformin in addition to insulin, which is only 5.8%. This may be because insulin is the drug of choice for GDM. Most 115 participants were in the height range of 155- 160cm, contributing to 41.7%. The majority of 115 participants were 51-55kg, contributing to 41.7%.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

One hundred eighty mothers have serum cholesterol levels below 200mg/dl, about 65.2%, and the remaining 96 mothers above 200mg/dl, which accounts for 34.8%. One hundred forty-four have serum triglyceride levels below 150mg/dl constituting 52.2%, 86 mothers have serum triglyceride levels between 151-200mg/dl which contributes to 31.2%, and the remaining 46 mothers have serum triglyceride levels of above 200mg/dl which forms the remaining 16.7%.

Serum VLDL levels of 149 mothers were below 30mg/dl contributing to 54%, and 127 mothers had serum VLDL levels above 30mg/dl, which accounts for 46%. Serum LDL levels of 243 mothers were below 100mg/dl contributing to 88%, and 33 mothers had serum LDL levels above 100mg/dl, which accounts for the remaining 12%. Serum HDL levels of 263 participants were between 40-60mg/dl, contributing to a majority of 95.3%, and 13 participants had serum HDL levels above 60mg/dl, which accounts for only 4.7% [Table 1].

Table 2: Comparison of lipid profile and age group

		Age group (Years)			p-value
		20-25	26-30	>30	
Total Cholesterol	< 200 mg/dl	28 (15.6%)	121 (67.2%)	31 (17.2%)	0.004
	> 200 mg/dl	5 (5.2%)	62 (64.6%)	29 (30.2%)	
Triglyceride	< 150 mg/dl	18 (12.5%)	102 (70.8%)	24 (16.7%)	0.09
	151-200 mg/dl	12 (14%)	48 (55.8%)	26 (30.2%)	
	> 200 mg/dl	3 (6.5%)	33 (71.7%)	10 (21.7%)	
VLDL	< 30 mg/dl	15 (11.8%)	79 (62.2%)	33 (26%)	0.28
	> 30 mg/dl	18 (12.1%)	104 (69.8%)	27 (18.1%)	
LDL	< 100 mg/dl	30 (12.3%)	160 (65.8%)	53 (21.8%)	0.96
	> 100 mg/dl	3 (9.1%)	23 (69.7%)	7 (21.2%)	
HDL	40-60 mg/dl	29 (11%)	180 (68.4%)	54 (20.5%)	0.002
	> 60 mg/dl	4 (30.8%)	3 (25.1%)	6 (46.2%)	

There is a significant difference in total cholesterol and HDL between the age group (p=0.004) and (p=0.002). But there is no significant difference in triglycerides, VLDL, and LDL between age groups [Table 2].

Table 3: Comparison of lipid profile and gravida

		Gravida			p-value
		First	Second	Third	
Total Cholesterol	< 200 mg/dl	48 (26.7%)	102 (56.7%)	30 (16.7%)	0.43
	> 200 mg/dl	19 (19.8%)	58 (60.4%)	19 (19.8%)	
Triglyceride	< 150 mg/dl	33 (22.9%)	80 (55.6%)	31 (21.5%)	0.54
	151-200 mg/dl	23 (26.7%)	52 (60.5%)	11 (12.8%)	
	> 200 mg/dl	11 (23.9%)	28 (60.9%)	7 (15.1%)	
VLDL	< 30 mg/dl	33 (26%)	76 (59.8%)	18 (14.2%)	0.35
	> 30 mg/dl	34 (22.8%)	84 (56.4%)	31 (20.8%)	
LDL	< 100 mg/dl	64 (26.3%)	143 (58.8%)	36 (14.8%)	0.002
	> 100 mg/dl	3 (9.1%)	17 (51.5%)	13 (39.4%)	
HDL	40-60 mg/dl	65 (24.7%)	152 (57.8%)	46 (17.5%)	0.74
	> 60 mg/dl	2 (15.4%)	8 (61.5%)	3 (23.1%)	

There is no significant difference in total cholesterol, triglyceride, VLDL, and HDL between gravida. But there is a significant difference in LDL between gravida (p=0.002) [Table 3].

Table 4: Comparison of lipid profile and trimester

		Trimester		p-value
		Second	Third	
Total Cholesterol	< 200 mg/dl	44 (24.4%)	136 (75.6%)	0.01
	> 200 mg/dl	37 (38.5%)	59 (61.5%)	
Triglyceride	< 150 mg/dl	35 (24.3%)	109 (75.7%)	0.11
	151-200 mg/dl	32 (37.2%)	54 (62.8%)	
	> 200 mg/dl	14 (30.4%)	32 (69.6%)	
VLDL	< 30 mg/dl	45 (35.4%)	82 (64.6%)	0.04
	> 30 mg/dl	36 (24.2%)	113 (75.8%)	
LDL	< 100 mg/dl	74 (30.5%)	168 (69.5%)	0.27
	> 100 mg/dl	7 (21.2%)	26 (78.8%)	
HDL	40-60 mg/dl	75 (28.5%)	118 (71.5%)	0.17
	> 60 mg/dl	6 (46.2%)	7 (53.8%)	

There is a significant difference in total cholesterol and VLDL between the trimester (p=0.01) and (p=0.04). But there is no significant difference in triglyceride, LDL, and HDL between trimesters [Table 4].

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 5: Comparison of lipid profile and obesity

		Obesity		p-value
		Present	Absent	
Total Cholesterol	< 200 mg/dl	6 (3.3%)	174 (96.7%)	0.007
	> 200 mg/dl	11 (11.5%)	85 (88.5%)	
Triglyceride	< 150 mg/dl	2 (1.4%)	142 (98.6%)	0.001
	151-200 mg/dl	13 (15.1%)	73 (84.9%)	
	> 200 mg/dl	2 (4.3%)	44 (95.7%)	
VLDL	< 30 mg/dl	15 (11.8%)	112 (88.2%)	<0.001
	> 30 mg/dl	2 (1.3%)	147 (98.7%)	
LDL	< 100 mg/dl	17 (7%)	226 (93%)	0.12
	> 100 mg/dl	0	33 (100%)	
HDL	40-60 mg/dl	17 (6.5%)	246 (93.5%)	0.34
	> 60 mg/dl	0	13 (100%)	

There is a significant difference in total cholesterol, triglyceride, and VLDL between obesity (p=0.007), (p=0.001), and (p=<0.001). But there is no significant difference in LDL and HDL between obesity [Table 5].

Table 6: Comparison of lipid profile and family history

		Family history		p-value
		Present	Absent	
Total Cholesterol	< 200 mg/dl	73 (40.6%)	107 (59.4%)	0.31
	> 200 mg/dl	45 (46.9%)	51 (53.1%)	
Triglyceride	< 150 mg/dl	53 (36.8%)	91 (63.2%)	0.11
	151-200 mg/dl	42 (48.8%)	44 (51.2%)	
	> 200 mg/dl	23 (50%)	23 (50%)	
VLDL	< 30 mg/dl	62 (48.8%)	65 (51.2%)	0.06
	> 30 mg/dl	56 (37.6%)	93 (62.4%)	
LDL	< 100 mg/dl	116 (47.7%)	127 (52.3%)	<0.001
	> 100 mg/dl	2 (6.1%)	31 (93.9%)	
HDL	40-60 mg/dl	108 (41.1%)	155 (58.9%)	0.01
	> 60 mg/dl	10 (76.9%)	3 (23.1%)	

There is no significant difference in total cholesterol, triglyceride, and VLDL between family histories. But there is a significant difference in LDL and HDL between family history (p=<0.001) and (p=0.01) [Table 6].

DISCUSSION

This study's main aim was to find underlying dyslipidemia in GDM patients and to study the abnormalities in various lipids in GDM patients. We have observed that serum cholesterol, Triglycerides, VLDL, and LDL levels increased with maternal age among GDM mothers. LDL levels were significantly increased as the number of gravida increased, whereas total cholesterol and VLDL levels were significantly increased as the trimester advances. However, we have seen that total cholesterol, triglycerides, and VLDL levels were significantly increased in obese mothers.

In our study, most GDM mothers are 26-30 years old, accounting for 66.3%. The remaining 33 belong to the age group of 20-25 years, the least contribution being 12%. Previously, it was found that the probabilities of acquiring GDM are higher among pregnant women aged 35 years. Followed by the age group 30-34 years, compared to women aged 18-24 years, indicating that the risks of having GDM rise with age for pregnant women aged 30 years and older. This could be because it is considered that the chance of having chronic illnesses such as diabetes increases with age. And if a person develops one chronic illness, the risk of having another chronic illness rises, raising the risk to a higher level.[1,3,8,9]

In addition, in previous studies, it has been found that BMI is a significant factor influencing the prevalence of GDM. Pregnant women with a BMI of 25 kg/m2 had 2.233 times the risk of having GDM than those with a BMI of 25 kg/m2. This is because obesity is a well-known risk factor for various chronic diseases, including diabetes mellitus, particularly as part of metabolic syndrome. As a result, as a pregnant woman's weight increases, so does her risk of insulin resistance, which increases her risk of developing GDM.[1,3,11]

Unmanaged GDM in pregnancy can have severe consequences for both the mother and the newborn, including an increased risk of preeclampsia, hydramnios, foetal macrosomia, foetal organomegaly, birth trauma, caesarean section, obstructed labour, perinatal mortality, neonatal respiratory problems and metabolic complications (hypoglycemia, hyperbilirubinemia, hypocalcemia), increased risks of miscarriage, and congenital anomalies.[3,12] Thus, the results obtained from the current study suggest that pregnant women aged 30 and higher should receive additional care if their BMI is over the usual range during antenatal care follow-up. Fasting blood sugar can be performed at least at the first antenatal care visit and between 24-28 weeks of pregnancy. Professional societies and the Ministry of Health must collaborate to create a protocol for screening mothers for GDM. Further research that

ISSN (O): 2687-5365; ISSN (P): 2753-6556

includes additional relevant personal (behavioural) elements related to GDM and obesity should be performed in a larger sample size

CONCLUSION

In our study, serum cholesterol, Triglycerides, VLDL, and LDL levels increase with maternal age among GDM mothers. When comparing these increased levels to normal pregnancy, serum cholesterol is significantly elevated. LDL levels were significantly increased as the number of gravida increased. Total cholesterol and VLDL levels were significantly increased as the trimester advances. Total cholesterol, triglycerides, and VLDL were significantly increased in obese mothers. This dyslipidemia in GDM may be temporary, but these patients are more prone to dyslipidemia and type 2 DM in the future. Thus, they are important candidates for lifestyle modifications as this dyslipidemia may contribute to insulin resistance. Treating this non-physiological dyslipidemia in pregnancy can prevent the development of gestational diabetes mellitus or help achieve better control of their blood sugars even if they become a GDM patient.

Limitations:

This is a hospital-based study, and although GDM is more common in antenatal mothers older than 30, in our study, the majority of the participants were with less than 30 years of age. It is a cross-sectional study, and testing is done only once during antenatal.

Acknowledgement: Thanks to the Department of General Medicine, Govt Chengalpattu Hospital.

REFERENCES

1. World Health Organization. Global Report on Diabetes. 2016. pp. 16–8.
2. Nigatu B, Workneh T, Mekuria T, Yifter H, Mamuye Y, Gize A. Prevalence of Gestational Diabetes Mellitus among pregnant women attending antenatal care clinic of St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia. Clin Diabetes Endocrinol 2022;8:2.
3. The American College of Obstetricians and Gynecologists. Clinical management guidelines for obstetrician-gynaecologists. ACOG Practice Bulletin. No. 180, 2017.
4. ADA. Standards of medical care in diabetes, glycaemic targets. 2017.
5. Vani K. Alterations in lipid profile in gestational diabetes mellitus (GDM) and type 2 DM women during pregnancy. Int J Med Res Rev 2015; 3:800-804.
6. Khan R, Ali K, Khan Z, Ahmad T. Lipid profile and glycosylated haemoglobin status of gestational diabetic patients and healthy pregnant women. Indian J Med Sci. 2012; 66:149-54.
7. Ghodke B, Pusukuru R, Mehta V. Association of lipid profile in pregnancy with preeclampsia, gestational diabetes mellitus, and preterm delivery. Cureus 2017;9:e1420.
8. International Diabetes Federation. IDF Diabetes Atlas. 2017. pp. 43–86.
9. Fauci A, Braunwald E, Kasper D. Harrison Principles of Internal Medicine. 18. New York NY: McGraw Hill Medical; 2015.
10. Muche AA, Olayemi OO, Gete YK. Prevalence and determinants of gestational diabetes mellitus in Africa based on the updated international diagnostic criteria: a systematic review and meta-analysis. Arch Public Health. 2019; 77:36.
11. Kumar P, Clark M. Kumar and Clark Clinical Medicine. 6. 2014. pp. 248–58.
12. Trujillo J, Vigo A, Duncan BB, Falavigna M, Wendland EM, Campos MA, et al. Impact of the International Association of Diabetes and Pregnancy Study Groups criteria for gestational diabetes. Diabetes Res Clin Pract. 2015; 108:288–95.

ISSN (O): 2687-5365; ISSN (P): 2753-6556