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Research Article

The Effect of Parity on Atherogenic Indices in Normotensive Pregnant Women at 2nd Trimester

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Abstract: A physiological increase in plasma lipids occurs during normal pregnancy. However, this occurrence is not atherogenic because it is regulated by hormones. Although the majority of the changes that occur during pregnancy are transient, theydo coincide with established cardiovascular disease (CVD) risk factors when it comes to parity. The focus on the study was to compare atherogenic indices among various groups of parity. Fifty normotensive pregnant female subjects were chosen at random from Rivers State University and the Rivers State University Teaching Hospital (RSUTH) for this study in their second trimester. They were divided into three groups; 20 nulliparous women, 13 primiparous women and 17 multiparous women. Blood was drawn for the analysis of atherogenic indices; atherogenic index of plasma (AIP), atherogenic coefficient (AC), Castelli Risk Index I and II (CRI1, CRI-2) and Apo B/Apo A1. The comparison was done and it was revealed that atherogenic indices showed no notable difference ($p>0.05$) in the parity groups. As a result, the study has reported that parity does not have any effect on the level of atherogenic markers in pregnant with normal blood pressure in RSUTH.

Keywords: parity, atherogenic indices, cvd, normotensive.

1. Introduction

During pregnancy, a woman's body goes through a lot of changes. In addition to weight gain and the accumulation of abdominal fat, pregnancy is accompanied by a number of physiological changes, such as increased insulin resistance, higher cholesterol levels, and structural heart defects like an enlarged left ventricular mass and end-systolic volume. The majority of changes brought on by pregnancy are merely transient, but because they overlap with recognized risk factors for cardiovascular disease, they may have long-term consequences [5]. Improved CVD risk prediction can be achieved by acknowledging the increased cardiovascular demand during pregnancy. A physiological response in the second trimester causes mothers' energy metabolism to shift towards lipolysis, ensuring the infant has a consistent source offuel [6, 7].

Early pregnancy has been linked to somewhat raised lipidemia, with trimesters two and three showing the largest increases [7, 8, 9]. It is still challenging to determine ifan increase in lipids is risky or normal.

Although it is normal for plasma lipid levels to rise during pregnancy, this rise is not atherogenic [10] because hormones [11] regulate it. The system that typically regulates physiologic hyperlipidemia may not function properly in challenging pregnancies. The development of pregnancy-induced hypertension is thought to be influenced by aberrant lipid metabolism [10].

There is proof that increases in lipid and lipoprotein metabolism during the second trimester exceed the amount of risk for cardiovascular disease that is deemed safe [9].

Hyperphagia and increased lipogenesis are linked to pregnancy-related weight gain. Maternal hypertriglyceridemia is essential in late pregnancy, notably, as a source of triglycerides for milk production just before birth [9]. To meet the metabolic demands of both the mother and the baby, a larger amount of lipid must be produced throughout pregnancy.

It has been claimed that specific lipoprotein ratios, frequently referred to as "atherogenic indices," have been devised to improve the predictive usefulness of the lipid profile. A few of the several atherogenic indicators are the atherogenic index of plasma (AIP), the Castelli Risk Index I and II (CRI), the atherogenic coefficient (AC), and apolipoprotein B/A1. AIP is calculated using serum HDLc and triglyceride values. Because it reveals several connections between various lipoprotein metabolisms, this ratio of triglycerides to HDLc can be used as a predictor of plasma atherogenicity.CRI-I and CRI-II are more accurate predictors of vascular events in the future compared to lipid measurements used alone. The maximum number of full-term (20- week) pregnancies that a woman can carry is known as parity (length varies by area, 20–28 weeks depending on viability age). The length of the pregnancy before delivery, not the condition of the child after birth, determines parity [12]. Even if a mother bears a child to viable age but the child is stillborn, this is true. Women who have never carried a pregnancy to term are referred to as "nulliparous" or "para 0"[13]. A primipara or primip is a woman who has only ever given birth once. A lady is saidto as multipara if she has given birth twice, three times, or more. A woman who has given birth five times or more is known as a "great multipara" in medical jargon [14].

It is unclear whether hyperlipidemia in the second half of pregnancy in some women is a common reaction to pregnancy, a sign of an illness, or something else different. It is crucial to determine whether hyperlipidemia is related to parity and whether it responds differently to pregnancy. In order to evaluate the advantages of early detection in the diagnosis and management of cardiovascular disease, further study must be conducted.

2. Materials and Methods

2.1. Study Location

In Port Harcourt, the state capital of Rivers State, where both Rivers State University Teaching Hospital and Rivers State University (formerly known as Braithwaite Memorial Specialist Hospital) are located, this study was conducted.

2.2. Characteristics of Subjects that Participated in the Study

Upon verification that each participant met the inclusion and exclusion requirements for the questionnaire, participants were chosen at random from Rivers State University and the teaching hospital there are two examples. The study included 50 normotensive women of various parity phases, all of which were pregnant.

Inclusion Criteria

All pregnant women who satisfied the inclusion requirements for the study and had normal blood pressure were included, regardless of whether they were taking any drugs or getting routine prenatal care were included.

Exclusion Criteria

Participants who were excluded from participating in the study were those who displayed symptoms of illness, had a history of infectious diseases or an underlying chronic condition (such stomach and intestinal conditions, bleeding during pregnancy, cancer, tuberculosis, diabetes diagnosed, heart disease, a history of blood transfusions, surgery, or the inability to give informed permission).

2.3. Ethical Consideration and Informed Consent

The study's protocol was approved by the research ethics committee of the Rivers State Ministry of Health in Port Harcourt, Nigeria. When the ladies were counselled regarding the hospital's policy of screening all pregnant women for HIV and the benefits of attendance for those who may be negative, verbal informed consent was acquired for this study. The study's details were also given to women who weren't expecting a baby. Every datum was handled with appropriate sensitivity and confidentiality. The required demographic data were requested of and submitted by the participants. The parity of the mother and the timing of her last period were among the information the attending physician recorded regarding the pregnancy.

2.4. Experimental Design

50 women from Rivers State University Teaching Hospital and Rivers State University participated in the study in Port Harcourt, Rivers State, Nigeria. The 50 pregnant women in their second trimester with normal blood pressure had three groups based on parity. Detailed categories are shown in Table 1 below.

Table 1. Groupings of Subjects

Groups	Conditions
Group 1	20 Nulliparous women
Group 2	13 Primiparous women
Group 3	17 Multiparous
TOTAL	100 PARTICIPANTS

2.5. Blood Sample Collection

Blood samples taken while fasting were taken via venipuncture [15,16]. The bloodwas drawn centrifuged for ten minutes after pouring into plain vacutainer tubes at1500 rpm [17–19]. The serum was combined and maintained at a low temperature of 4°C prior to analysis for apoA1, apoB, High-density lipoprotein cholesterol (HDL-c), triglycerides, and total cholesterol.

2.6. Biochemical Determinations

Biochemical analysis of apo A1 and apo B, triglycerides, HDL-c, and total cholesterol in fasting blood samples was performed. To separate the serum, blood samples were taken into regular bottles and centrifuged. The medical laboratory science lab at Rivers State University in Port Harcourt is where the laboratory tests were performed.

Determination of Apo Lipoprotein A1 in Human Serum

The turbidimetric approach was used to quantitatively assess apolipoprotein A1 [17].

Reference Range

For Women = (108 - 225 mg/dl).

Apolipoprotein B Levels in Human Serum Determination

The turbidimetric approach was used to quantify apolipoprotein B [17].

Reference Range

For Women = (60 -117 mg/dl).

Total Cholesterol in Serum Measurement

By using an enzymatic technique, total cholesterol was quantitatively quantified [18].

Reference Range

< 5.17mmol/l= Desirable

5.17 – 6.18mmol/l =Borderline

>6.20 mmol/l =High

High-Density Lipoprotein (HDL) Cholesterol Levels in Serum Analysis

By using an enzymatic technique, HDL-C was quantitatively quantified [19].

1.04 mmol/l is the reference range.

Triglyceride Measurement in Serum

Triglycerides are determined quantitatively by enzymatic method [20].

Reference Range

Up to 1.71 mmol/l, Increased from 2.29 mmol/l

Low-Density Cholesterol Measurement (LDL-C)

LDL cholesterol was calculated using Friedewald's formula [21].

Calculation

LDL cholesterol levels in the serum sample were derived by subtracting the total cholesterol, triglyceride, and high-density lipoprotein (HDL) values from the total cholesterol value.

LDL – Cholesterol = Total Cholesterol – (TG/2.2) – HDL

Reference Range

(3.8 - 4.9) mmol/l

Assessment of Lipids, Atherogenic Index, and Lipid Ratio

Raised TG levels of 1.7 mmol/L, decreased HDL-C levels of 1.03 mmol/L in malesand 1.30 mmol/L in females, and TC levels of 5.2 mmol/L (200 mg/dl) were all considered to be lipid abnormalities [22]. The atherogenic index and lipid ratios were calculated using the following common formulas:

AIP = Log (TG/ HDL-C)

Reference Range = Low risk (-0.3 – 0.1), Moderate risk (0.1 – 0.24), High risk (>0.24).

CRI-1 = TC/HDL-C

Reference Range = Low risk (< 1-3), Moderate risk (3-5), High risk (>5).

CRI-II = LDL-C /HDL-C

Reference Range =Low risk (< 1-3), Moderate risk (3- 5), High risk (> 5).

AC = TC – HDL-C/ HDL-C (Reference >3.0).

Apo B/ Apo A1

Reference range = (low risk 0.30, moderate risk 0.6 and high risk 0.8).

2.7. Statistical Analysis

The investigation's findings were evaluated using GraphPad Prism version 8.0.2.263. The mean and standard deviation of the data were displayed. To evaluate mean differences, a one-way analysis of variance (ANOVA) was used, and then Tukey's test. The significance threshold was set at 0.05.

3. Results

The effects of parity on atherogenic indices (AIP, CRI1, CRI2, AC, Apo B/ApoA1) in normotensive pregnant women during the second trimester are shown in Tables 2 and 3. In normotensive pregnant women in the second trimester, parity did not significantly affect any of the atherogenic indices ($p<0.05$).

Table 2. Effect of Parity on Atherogenic Indices in Normotensive 2nd Trimester

Parameters	Normotensive women			P-value	F-value
	Nulliparous n=20	Primiparous(>1) n=13	Multiparous (≥ 5) n = 17		
AIP	0.18 ± 0.04	0.21 ± 0.06	0.17 ± 0.06	0.1715	1.8310
CRI 1	5.47 ± 0.94	5.27 ± 0.26	5.15 ± 1.28	0.6915	0.3718
CRI 2	3.81 ± 0.92	3.55 ± 1.20	3.53 ± 1.22	0.6858	0.3802
AC	4.47 ± 0.94	4.27 ± 1.26	4.15 ± 1,28	0.6915	0.3718
APoB/APoA1	0.38 ± 0.03	0.38 ± 0.06	0.37 ± 0.05	0.6216	0.4802

Table 3. The ANOVA Post – Hoc Findings Using Turkey Multiple Comparison Test for Effect of Parity on Atherogenic Indices (Normotensive 2nd Trimester)

Parameters	Nulliparous vs Primiparous	Nulliparous vs Multiparous	Primiparous vs Multiparous
AIP	0.4211	0.7294	0.1486
CRI 1	0.8744	0.6743	0.9569
CRI 2	0.7786	0.7133	0.9986
AC	0.8744	0.6743	0.9569
APoB/APoA1	0.9838	0.6141	0.7756

4. Discussion

Few studies have examined a variety of cardiovascular outcomes, and the conclusions of those that have regarding the connection between parity and CVD, are inconclusive. Nobody can say for sure if there is a connection between parity and CVD that goes beyond chance. Each year, more than 200 million women give birth around the world, and the majority of them deliver healthy children. As a result of changes in hormonal status during pregnancy, sex hormones activate adaptive mechanisms. One of these is the claimed shift in metabolism from lipids to energy. In other words, the physiological dyslipidaemia [23] that develops in pregnant women can be assessedusing lipid indices.

In this study, second-trimester atherogenic indices in normotensive pregnant women were compared based on parity. There was no notable change in atherogenic indices among various parity groups in pregnant women with healthy blood pressure. This implies that parity had no impact on atherogenic indicators in pregnant women in the second trimester of pregnancy. This might be brought on to the fact that

physiologically-driven changes in plasma lipids that happens throughout a healthy pregnancy [10], which is hormonally controlled do not in actual fact cause atherogenic problems particularly when the women are apparently healthy. Studies with comparable design supported the conclusion of this study [24, 25, and 26]. However, another study that was similar contradicted the findings of this study. [27, 28, 29, 30, 31]. Whether parity causes changes in atherogenic indices would need further studies especially on subjects with condition like hypertension to determine with the coexistence of hypertension in pregnancy can spike atherogenicity.

5. Conclusion

The finding from this study has pointed that parity does not affect atherogenic markers in pregnant women with health blood pressure at their second trimester. Further studies are required to focus on other phases of pregnancies such as first and third trimester, and also in other coexisting metabolic disorders.

References

[1] Straughen JK, Trudeau S, Misra VK. Changes in adipose tissue distribution during pregnancy in overweight and obese compared with normal weight women. Nutr Diabetes 2013;3:e84. Crossref, Medline, Google Scholar

[2] Mankuta D, Elami-Suzin M, Elhayani A, Vinker S. Lipid profile in consecutive pregnancies. Lipids Health Dis 2010;9:58. Crossref, Medline, Google Scholar

[3] Sonagra AD, Biradar SM, Dattatreya K, Jayaprakash Murthy DS. Normal pregnancy- a state of insulin resistance. J Clin Diagn Res 2014;8:CC01–CC03. Medline, Google Scholar

[4] Parikh NI, Lloyd-Jones DM, Ning H, et al. Association of number of live births with left ventricular structure and function. The Multi-Ethnic Study of Atherosclerosis (MESA). Am Heart J 2012;163:470–476. Crossref, Medline, Google Scholar

[5] World Health Organisation. Cardiovascular diseases: Fact Sheet 317. Available at: www.who.int/mediacentre/factsheets/fs317/en Accessed August 24, 2015. Google Scholar

[6] Nasioudis D, Doulaveris G, Kanninen TT. Dyslipidemia in pregnancy and maternal-fetal outcome. Minerva Ginecol. 2019;71(2):155–62.

[7] Herrera E, Desoye G. Maternal and fetal lipid metabolism under normal and gestational diabetic conditions. Horm Mol Biol Clin Invest. 2016;26(2):109–27.

[8] Brizzi P, Tonolo G, Esposito F, Puddu L, Dessole S, Maioli M, et al. Lipoprotein metabolism during normal pregnancy. Am J Obstet Gynecol. 1999;181(2):430–4.

[9] Lippi G, Albiero A, Montagnana M, Salvagno GL, Scevarolli S, Franchi M, et al. Lipid and lipoprotein profile in physiological pregnancy. Clin Lab. 2007;53(3–4):173–7.

[10] Klhaliq F, Singhal U, Arshad Z, Hossain MM. Study of Serum lipid and Lipoprotein in pre-eclampsia with special reference to parity. Indian Journal of Physiology and Pharmacology. 2000;44(2):192-196.

[11] Winkler K, Wetzka B, Hoffmann MM, Friedrich I, Kinner M, Manfred WB,et al.Triglyceride-rich lipoproteins are associated with hypertension in pre-eclampsia. The J Clin Endocrinol Metabol. 2003;88:1162-6.

[12] F. Gary Cunningham, 2005. Williams Obstetrics, 22nd Edition, McGraw-Hill Companies.

[13] Deric M, Kojic-Damjanov S, Cabarkapa V, Eremic N. Biochemical Markers of Atherosclerosis. JMB. 2008;27(2):148–53. [Google Scholar

[14] "Definition of Grand multipara". medicinenet.com.

[15] WHO guidelines on drawing blood: best practices in phlebotomy. Geneva, World Health Organization, 2010.

[16] James, P.A., Suzanne, O., Barry, L., William, C., Cheryl, D., Joel, H., Daniel, T., Michael, L., Thomas, D. Evidence-Based Guideline for the Management of High Blood Pressure in

Adults Report From the Panel Members Appointed to the Eighth Joint National Committee (JNC 8) JAMA. 2014; 311(5):507-520.
[17] Oladapo- Akinfolarin, T. T., Bartimeaus, E. S., Nwachukwu, E. O. and Nduka, N. (2017). Assessment of C-reactive protein levels in normotensive and hypertensive pregnant subjects in Port Harcourt, Nigeria. World Journal of Pharmaceutical and Medical Research, 3(10), 292-296
[18] Oladapo- Akinfolarin, T. T., Bartimeaus, E. S., Nwachukwu, E. O. and Nduka, N. (2018). Assessment lipoprotein levels in normotensive and hypertensive pregnant women in Port Harcourt, Nigeria. American Journal of Biomedical Sciences, 10(1), 18-27Patrizia, B., Giancarlo, T. & Franca, E. (1999), Lipoprotein metabolism during normal pregnancy. American Journal of Obstetrics and Gynecology, 181(2), 430-4.
[19] Oladapo- Akinfolarin, T. T. Akinfolarin, O. M., Maduagwu, M. C. and Amadi, C. F. (2022). Effect of gravidity on biomedical parameters in normotensive and hypertensive 3rd trimester pregnant women. Biotechnology Journal International, 26(2), 25-33
[20] Fraser, C.G., Hearne, C.R. Assessment of colorimetric enzymatic determination of triglyceride, by manual and centrifugal analyzer techniques, and comparison with a CDC standardized method. Clin Biochem. 1981 Feb;14(1):28-31. doi: 10.1016/0009-9120(81)90150-8. PMID: 6263517.
[21] Friedewald WT, Levy RT, Frederickson DS. 1972. Estimation of the concentration of low-density lipoprotein cholesterol in plasma without use of the preparative ultracentrifuge Clin. Chem., 18: 499-502.
[22] Wahab KW, Sani MU, Yusuf BO, Gbadamosi M, Gbadamosi A, Yandutse MI. Prevalence and determinants of obesity – A cross-sectional study of an adult Northern Nigerian population. Int Arch Med. 2011;4:10.
[23] Merabishvili V, Kambladze O, Sulaberidze T. Peculia - rities of lipid metabolism during pregnancy. Georgian Med News 2006; 138: 86–9.
[24] Njoku, TK. Evaluation of serum lipid profile in women with preeclampsia in Federal Medical Centre, Owerri: a case control study. National postgraduate medical college of nigeria, department of obstetrics and gynaecology, Federal Medical Centre, Owerri. 2017; 28-29.
[25] Elajami TK, Giuseffi J, Avila MD, et al.. Parity, coronary heart disease and mortality in the old order Amish. Atherosclerosis 2016;254:14–19.
[26] Jacobsen BK, Knutsen SF, Oda K, Fraser GE. Parity and total, ischemic heart disease and stroke mortality. The Adventist Health Study, 1976–1988. Eur J Epidemiol 2011;26:711–718.
[27] Sirikulchayanonta C Mail, Singsurapap W , Phuapradit W. The Effect of Parity on Lipid Profile in Normal Pregnant Women. J Med Assoc Thai. 2000; 83 (3):141.
[28] Kashope D.T., Oyebola GA, Norah OA, Uche O & Alexander T. Plasma triglyceride and cholesterol levels in normotensive and hypertensive pregnant women and parturient Nigerian women. Trop J Obstet Gynaecol 2003; 20(2); 120 -122.
[29] Ness RB, Harris T, Cobb J, et al.. Number of pregnancies and the subsequent risk of cardiovascular disease. N Engl J Med 1993;328:1528–1533.
[30] Gaudet MM, Carter BD, Hildebrand JS, et al. Associations of parity and age at first pregnancy with overall and cause-specific mortality in the Cancer Prevention Study II. Fertil Steril 2017;107:179–188.e6.
[31] Oliver-Williams, C., Vladutiu, C. J., Loehr, L. R., Rosamond, W. D., & Stuebe, A. M. (2019). The Association Between Parity and Subsequent Cardiovascular Disease in Women: The Atherosclerosis Risk in Communities Study. Journal of women's health (2002), 28(5), 721–727.