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Assessment of serum lipid profile changes in pregnant women with proteinuria attending antenatal care in Nnewi, Anambra state, Nigeria

Chidiadi M. Njoku [1,*], Samuel C. Meludu [2], Jude A. Onuegbu [1], Charles C. Onyenekwe [3], Nosakhare O. Osakue [3], Ugochinyere J. Chilaka [4] and Emmanuel C. Okwara [5]

[1] *Department of Chemical Pathology, faculty of basic clinical Sciences, Nnamdi Azikiwe University, Awka, Nigeria.*
[2] *Department of Human Biochemistry, faculty of basic medical Sciences, Nnamdi Azikiwe University, Awka, Nigeria.*
[3] *Department of Clinical Chemistry, faculty of Medical Laboratory Science, Nnamdi Azikiwe University, Awka, Nigeria.*
[4] *Department of Heamatology, faculty of basic clinical Sciences, Nnamdi Azikiwe University, Awka, Nigeria.*
[5] *Department of Chemical Pathology, faculty of Clinical Sciences, Imo State University, Owerri. Nigeria.*

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Abstract

This study assessed the serum lipid profile changes in pregnant women with proteinuria. A cross-sectional comparative study was conducted among 168 pregnant women aged 25–40 years attending antenatal clinics at Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi. Participants were divided into proteinuric and non-proteinuric groups. Triglycerides (TG) and high-density lipoprotein cholesterol (HDL-C) were analyzed using spectrophotometric methods, and the TG/HDL ratio was calculated. Anthropometric indices (age, BMI, weight, and height) were also measured. Results showed significantly higher weight (p=0.012), BMI (p=0.002), and triglycerides (p=0.01) in the proteinuric group, whereas HDL-C showed no significant difference (p=0.837). The TG/HDL ratio was significantly elevated in the proteinuric group (p=0.038). These findings suggest that pregnancy complicated by proteinuria is associated with adverse lipid alterations which may predispose mothers to long-term cardiometabolic risks. Early screening and intervention strategies are recommended to improve maternal and fetal outcomes.

Keywords: Pregnancy; Proteinuria; Lipid profile; Triglycerides; HDL-C; TG/HDL ratio

1. Introduction

Pregnancy is characterized by extensive physiological, metabolic, and hormonal adaptations essential for fetal development and maternal survival. Lipid metabolism undergoes significant alterations during this period, with changes in triglycerides (TG), total cholesterol, and high-density lipoprotein cholesterol (HDL-C) concentrations reflecting the body's effort to meet the increasing energy and biosynthetic demands of the growing fetus [1]. As gestation progresses, the maternal metabolic state becomes increasingly insulin resistant, mimicking type 2 diabetes physiology [2]. This state enhances lipolysis and promotes hyperlipidemia, particularly during the second and third trimesters, ensuring a constant nutrient supply to the fetus. However, these physiological changes can become pathological when dysregulated, predisposing pregnant women to complications such as preeclampsia, gestational hypertension, and proteinuria.

Proteinuria, defined as urinary protein excretion exceeding 300 mg/day is a marker of renal and endothelial dysfunction. It commonly manifests in hypertensive disorders of pregnancy and has been associated with metabolic derangements, including dyslipidemia [3, 4]. In such cases, abnormal lipid accumulation in vascular endothelial cells contributes to oxidative stress and endothelial injury. Elevated TG and reduced HDL-C levels have been implicated in

* Corresponding author: Chidiadi M. Njoku

increased cardiovascular risk among women with proteinuria, both during pregnancy and later in life [5]. The triglyceride-to-HDL-C ratio (TG/HDL-C) is now recognized as a sensitive index of atherogenic risk and insulin resistance, providing valuable insight into maternal cardiometabolic health [6].

Several studies across diverse populations have demonstrated that dyslipidemia in pregnancy correlates with the severity of preeclampsia and adverse fetal outcomes [7–9]. Increased TG concentrations may exacerbate endothelial dysfunction, promoting hypertension and renal stress. Conversely, a reduction in HDL-C impairs cholesterol efflux and endothelial protection mechanisms [10]. Despite these established associations, there is limited information regarding lipid profile changes among Nigerian pregnant women with proteinuria. Given the variability in genetic, dietary, and environmental influences on lipid metabolism, region-specific research is critical for developing preventive strategies tailored to local populations.

The present study, therefore, sought to evaluate serum triglyceride and HDL-C concentrations, as well as the TG/HDL-C ratio, in pregnant women with and without proteinuria attending antenatal clinics at Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi, Anambra State, Nigeria. It also assessed anthropometric parameters, including body mass index (BMI), weight, and height, to identify potential associations between lipid alterations and physical indices. By clarifying these relationships, this study will enhance understanding of the biochemical basis of proteinuria and its implications for maternal and fetal health in the Nigerian context.

2. Material and methods

2.1. Study area and Population

The study was conducted at the antenatal clinics of Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi, Anambra State, Nigeria. One hundred and sixty eight (168) pregnant women between the ages of 25–40 years were recruited for this study. They were divided into proteinuric (test group) and non-proteinuric (control group) groups. The biochemical analysis was performed at the facilities of Chemical Pathology Laboratory of NAUTH, Nnewi, Anambra State, Nigeria.

2.2. Study design

This study was a cross sectional comparative study.

2.3. Sample Size and recruitment

Fisher's formula [11] for population >1000 with a 5.8% prevalence was used to calculate minimum sample size. The minimum sample size calculation gave 84 subjects per group. Participants were randomly selected, with written informed consent obtained.

2.4. Inclusion/Exclusion Criteria

Apparently healthy pregnant women and pregnant women with proteinuria, aged 25–40 years who were confirmed not to have diabetes, hypertension, renal, hepatic or haematological diseases and any other chronic metabolic diseases were enrolled into the study.

2.5. Ethical Approval and Consent

Ethical approval was obtained from Nnamdi Azikiwe University Teaching Hospital (NAUTH) ethics committee. Informed consent was obtained from all the subjects.

2.6. Sample Collection, Preservation, and Analysis:

Five (5) ml of blood was collected from the subjects using vacutainer needles into EDTA tube. The samples were processed and stored at -20^{o}C before analysis. Basic anthropometric measurements of height and weight were measured, BMI was calculated.

2.7. Methods of determination of Triglyceride and HDL-C.

Triglyceride and HDL-C were analyzed using spectrophotometric methods.

2.8. Statistical Evaluation

Data generated from this study were analysed using IBM SPSS Statistics for Windows version 23.0 (IBM Corp, Armonk, NY, USA). Variables were normally distributed and were expressed as mean ± standard deviation (M±SD). The independent Student's t-test was used to assess group differences, with $p<0.05$ considered significant.

3. Results

Table 1 Anthropometric parameters of pregnant women with proteinuria (Test group) and pregnant women without proteinuria (control group)

Variables	Control	Test	t-value	P-value
Age(years)	27.00±5.36	33.83±1.72	2.970	0.14
Weight(kg)	71.66±6.12	81.83±5.38	3.055	0.012*
Height(M)	1.70±0.04	1.64±0.04	2.395	0.038*
BMI(kg/m2)	24.64±1.82	30.37±2.72	4.274	0.002*

Table 1 shows anthropometric parameters of the control and test groups. Pregnant women with proteinuria had significantly higher weight and BMI compared to controls. Height was significantly lower in the test group, while age showed no significant difference.

Table 2 TG, HDL and TG/HDL in Pregnant Women with proteinuria (Test group) and Pregnant Women without proteinuria (control group)

Variables	Control group	Test group	t-value	P-value
Triglyceride (mmol/l)	1.23±0.40	1.92±0.42	2.868	0.01*
HDL(mmol/l)	1.39±0.36	1.35±0.17	0.212	0.837
TG/HDL(mmol/l)	0.92±0.31	1.45±0.42	2.426	0.038*

Table 2 shows changes in lipid profile. Triglycerides and TG/HDL ratio were significantly elevated in Pregnant Women with proteinuria (test group) whereas the mean HDL-C levels did not significantly differ from the control group.

4. Discussion

The findings of this study demonstrate that proteinuria during pregnancy is associated with significant alterations in lipid metabolism, particularly elevated triglycerides and TG/HDL-C ratios. These findings are consistent with previous reports indicating that dyslipidemia accompanies hypertensive and renal complications of pregnancy [6–9]. The observed hypertriglyceridemia may result from enhanced hepatic very-low-density lipoprotein (VLDL) synthesis and decreased lipoprotein lipase activity due to hormonal changes and insulin resistance. This pathophysiological pattern mirrors the metabolic disturbances seen in preeclampsia and gestational hypertension, where lipid accumulation and endothelial dysfunction coexist.

An elevated TG/HDL-C ratio is recognized as a marker of atherogenic dyslipidemia and insulin resistance, both of which have prognostic implications for maternal cardiovascular health [12]. The absence of a significant difference in HDL-C concentration between groups may not exclude impaired HDL functionality, as qualitative changes in HDL structure during pregnancy can reduce its antioxidative and anti-inflammatory properties [13]. These subclinical changes contribute to endothelial damage, oxidative stress, and renal impairment. Our findings underscore the need for functional as well as quantitative lipid assessments in pregnant populations.

Increased adipose tissue serves as a reservoir for free fatty acids, which enhance hepatic triglyceride synthesis and VLDL secretion. This mechanism, combined with gestational insulin resistance, predisposes obese or overweight women to proteinuria, hypertension, and adverse obstetric outcomes [14]. These findings align with global evidence linking maternal obesity to heightened cardiometabolic risks during and after pregnancy.

Clinically, these results highlight the importance of routine lipid profile screening among pregnant women, particularly those presenting with proteinuria or elevated BMI. Early detection of lipid abnormalities could guide timely dietary and lifestyle interventions to mitigate cardiometabolic risks. Furthermore, antenatal counseling focused on nutrition and physical activity may reduce the incidence of gestational dyslipidemia and its complications. Future research should investigate longitudinal lipid changes postpartum to determine whether dyslipidemia persists and contributes to long-term cardiovascular disease in affected women.

In summary, pregnancy complicated by proteinuria is characterized by elevated triglycerides and an increased TG/HDL-C ratio, indicating a heightened cardiometabolic risk profile. Integrating lipid profile assessment into routine antenatal care could enhance early diagnosis, prevention, and management of metabolic complications, ultimately improving maternal and neonatal outcomes.

5. Conclusion

This study shows that pregnant women with proteinuria exhibit significant alterations in lipid metabolism, including elevated triglycerides and TG/HDL ratios. These preliminary data suggest that proteinuria in pregnancy is associated with adverse lipid alterations with far-reaching cardiometabolic consequences. Early screening and intervention strategies are recommended to improve maternal and fetal outcomes.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of ethical approval

Ethical approval for this study was obtained from the Ethics Committee of NAUTH.

Statement of informed consent

Informed consent was obtained from all participants.

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