Original Article

Lipid Profile Patterns in Women with Uterine Fibroids: A Case-Control Study in Northwestern Nigeria

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ABSTRACT

Uterine fibroids (leiomyomas) are benign uterine smooth-muscle tumors with high prevalence among women of African descent. Emerging evidence suggests lipid metabolic dysregulation may play a role in fibroid development and growth. This study aimed to evaluate the lipid profile pattern of women diagnosed with uterine fibroid. We conducted a hospital-based case-control study from April, 2022 to February, 2023 at a tertiary health care facility, Northwest Nigeria. Women aged 18–50 years with ultrasound-confirmed uterine fibroids (cases; 115) were compared to age and parity-matched controls without fibroids (115). Fasting serum lipid profile (total cholesterol [TC], triglycerides [TG], high-density lipoprotein cholesterol [HDL-C], low-density lipoprotein cholesterol [LDL-C]) were measured colorimetrically. Statistical analyses included t-tests adjusted for age, body mass index and parity. Patients had significantly higher mean HDL-C ($p = 0.000$), Triglyceride ($p = 0.001$) with lower TC: HDL-C ($p = 0.000$) when compared with the controls. Higher insignificant mean Cholesterol in patients was observed compared to the controls ($p = 0.050$). There was no statistically significant difference in LDL-C between patients and controls ($p = 0.296$). Our findings in this Nigerian population align with the notion that lipid metabolism may contribute to fibroid pathophysiology.

Running title: Lipid Profile in Uterine Fibroid
Keywords: Uterine fibroid, Dyslipidemia, Lipid profile, Total Cholesterol, LDL, HDL, Nigeria

INTRODUCTION

Uterine fibroids (leiomyomas) are benign smooth muscle tumors of the uterus that affect a large proportion of women of reproductive age worldwide. Epidemiologic studies suggest that women of African ancestry have a disproportionately high incidence and prevalence of fibroids compared to other racial/ethnic groups[1]. In Nigeria and across sub-Saharan Africa, fibroids constitute one of the most common gynaecologic conditions encountered in clinical practice[2]. Clinical manifestations such as menorrhagia, pelvic pain, infertility, and bulk symptoms contribute substantially to morbidity and health care burden.

The aetiopathogenesis of fibroids is multifactorial, involving hormonal, genetic, growth factor, and extracellular matrix pathways. One hypothesis that has gained attention is that lipid metabolism (and more broadly, metabolic dysregulation) may influence fibroid growth and recurrence. Estrogens, which are implicated in fibroid biology, also modulate lipid metabolism; thus, dyslipidaemia may reflect or contribute to fibroid-related pathophysiology.[2]

Some studies in non-African settings have observed altered lipid profiles (changes in total cholesterol, LDL, HDL, triglycerides) in women with fibroids or associations with fibroid size[2]. However, data are scarce for African populations such as Nigeria.

Better characterization of lipid profile patterns among women with fibroids in Nigeria may help with the following; elucidate possible metabolic correlates or risk factors, suggest prognostic biomarkers, and identify potential intervention pathways (e.g. through lipid-lowering therapy). Therefore, in this study we aimed to compare serum lipid profiles between women with ultrasonographically confirmed uterine fibroid and matched controls without fibroids. We hypothesized that women with fibroids will exhibit more atherogenic lipid patterns (for example, higher LDL or lower HDL) relative to controls, and that more adverse lipid levels will correlate with greater fibroid burden.

MATERIALS AND METHODS

Study design and setting

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This was a hospital-based case–control study carried out between April 2022 and February 2023 at the Department of Obstetrics and Gynecology in collaboration with the Department of Chemical Pathology, in Barau Dikko teaching hospital, Kaduna, Northwestern Nigeria. The hospital is a tertiary referral center serving urban and peri-urban populations with a dedicated obstetrics & gynecology outpatient clinic, service laboratories and imaging facilities.

Population and sampling

Cases: Women aged 18–50 years presenting for gynecologic evaluation who were found to have uterine fibroids on transvaginal and/or transabdominal ultrasound, confirmed by a trained radiologist according to standard criteria (presence of well-defined hypoechoic nodules in the myometrium) were recruited. Exclusion criteria included: (i) prior use of hormonal therapy (e.g. contraceptives, GnRH analogues) in preceding 3 months, (ii) known dyslipidaemia under treatment, (iii) chronic liver disease, (iv) renal disease, (v) current pregnancy, (vi) history of malignancy, (vii) other uterine pathologies (e.g. adenomyosis) interfering with ultrasound interpretation.

Controls: Age and parity-matched women attending the same hospital for non-gynecologic or benign gynecologic complaints (e.g. routine screening, infertility evaluation) who, on ultrasound, had no evidence of uterine fibroid nor other uterine masses. Controls had the same exclusion criteria as in the cases.

Data collection and measurements

Clinical and demographic data: We collected via structured questionnaire and review of medical records: age, parity, weight, height, body mass index, blood pressure, smoking status, alcohol intake, comorbidities (hypertension, diabetes), family history of fibroid or dyslipidaemia.

Ultrasound assessment of fibroids: All participants underwent pelvic ultrasound (transvaginal if feasible, otherwise transabdominal) by an experienced sonographer blinded to lipid results. For each fibroid, we recorded maximum diameter (cm) in three orthogonal planes, number of fibroids, estimated volume or simpler approximations. The sum of volumes (total burden) was computed for women with multiple fibroids.

Blood sampling and lipid assays: After an overnight fast (8 -12 hours), 5 mL of venous blood was drawn into plain tubes. Samples were centrifuged at ~3000 rpm × 10 minutes, and sera aliquoted. Lipid assays included:

- Total cholesterol (TC) measured by enzymatic (cholesterol oxidase) method
- Triglycerides (TG) by enzymatic glycerol phosphate oxidase
- HDL-C via precipitation of apoB-containing lipoproteins
- LDL-C via direct LDL-C assay[3]

Quality control: Each assay run included internal controls and calibrators according to the manufacturer's instructions. The laboratory technician was blinded to case/control status.

Statistical analysis

The data was analysed using SPSS version 25. Age, BMI and concentrations of serum TC, HDL, LDL & TG obtained from patients and control were compared using student t-tests and expressed as mean +SEM. A p value of ≤ 0.05 was considered statistically significant. Furthermore, cardiovascular disease risk was calculated (TC: HDL)

Ethical considerations

The research protocol was approved by the Institutional Ethics & Research Committee of Barau Dikko teaching hospital, reference number (HREC. No. 20-0072). All participants provided written informed consent. Confidentiality was maintained by anonymizing data. Participants found to have dyslipidaemia or other pathology were referred for further management.

RESULTS

A total of 230 subjects were recruited, 115 patients (labelled 1) and 115 controls (labelled 2), aged 18 years and above. The mean age of the patients and controls were 37.1 ± 0.7 and 34.7 ± 0.9 years respectively (p = 0.034). The mean Body mass index in patients and controls were 25.9 ± 1.1 and 26.7 ± 0.8 kg/m^2 respectively (Figure 1).

Table 1 shows pattern of Total Cholesterol, HDL-C, LDL-C, Triglyceride and TC: HDL-C ratio of patients and controls. Patients had significantly higher mean HDL-C (p = 0.000), Triglyceride (p = 0.001), TC: HDL-C (p = 0.000) when compared with the controls. Higher insignificant mean Total Cholesterol in patients was observed compared to the controls (p = 0.050). There was no statistically significant difference in LDL-C between patients and controls (p = 0.296).

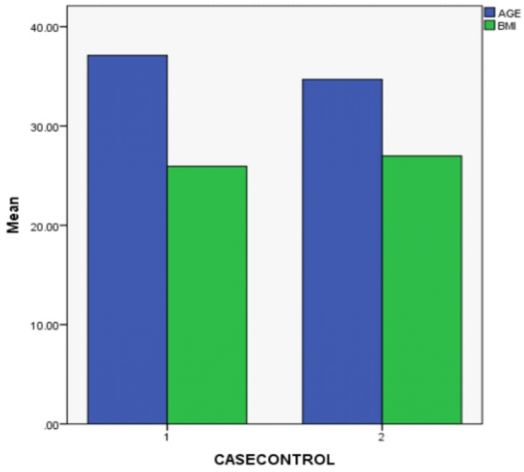

Figure 1: Clinical and Demographic Characteristics (mean ± SEM) of the Study Population

Table 1: Biochemical Parameters (mean ± SEM) for the Study Population

Parameter	Patients (n = 115)	Control (n = 115)	p-value
TC (mmol/L)	3.52 ± 0.08	3.31 ± 0.08	0.050
HDL-C (mmol/L)	0.93 ± 0.02	0.79 ± 0.03	0.000
LDL-C (mmol/L)	2.22 ± 0.07	5.06 ± 2.77	0.296
TG (mmol/L)	1.94 ± 0.16	1.36 ± 0.04	0.001
TC: HDL-C	3.86 ± 0.09	4.61 ± 0.17	0.000

SEM = standard error of mean, n = number, TC = total cholesterol, TG = triglyceride, mmol/L = millimole per litre, TC: HDL-C = atherogenic index.

DISCUSSION

In this study, we observed that individuals with uterine fibroid had significantly higher mean HDL-C and TG with lower TC/HDL ratio compared to controls. These findings align with the hypothesis that dyslipidaemia may interplay with fibroid pathophysiology, possibly via hormonal, inflammatory, or metabolic mechanisms. These findings are consistent with studies from other regions, such as Iraq which found similar associations between lipid fractions and fibroid size[2].

Comparatively, a study in Bangladesh (Afruza et al., 2020) similarly reported significantly higher TC and TG, and lower HDL-C in women with fibroids vs controls, with elevated atherogenic index in the fibroid group[4]. These parallels suggest that regardless of geography, fibroid presence is associated with lipid metabolic alterations. In the present study, measurement of total serum cholesterol was insignificantly higher in patients with fibroids compared with controls. This is quite similar to the findings reported by Sadlonova *et al*. [5] who found lower levels of total serum cholesterol in women with fibroids though with no significant difference between women with fibroids and their control group.

From our study, patients with uterine fibroids had insignificantly lower LDL-C levels than comparative control patients. This is also similar to the findings of Sadlonova *et al*.[5] who reported that LDL-C was not significantly increased in women without fibroids of all ages, but was significantly increased in the subgroup of women without fibroids aged 30-45 years. In relation to HDL-C, the results of our study confirmed significantly higher levels of serum HDL-C in women with fibroids compared with controls. This comes in agreement with findings reported by Sadlonova *et al*.[5] in 2008 and that by Binani et al in 2023.[2]

Regarding serum triglycerides, a significant difference was reported in our study between the two groups. This is similar to the work of (Afruza et al., that reported significantly higher TC and TG, and lower HDL-C in women with fibroids vs controls.[4] In this study atherogenic index was significantly lower in fibroid group compared with controls. This finding corresponds to the estrogenic effects on lipid profile. Our results agree with those observed by Binani et al. in 2023 who reported a lower atherogenic index with significant association in women with uterine fibroids.

CONCLUSION

Our findings support the existence of altered lipid metabolism among Nigerian women with uterine fibroids.

RECOMMENDATIONS

Future research should include prospective cohort studies in African populations to assess whether lipid abnormalities predict incident fibroid development or growth. Interventional trials of lipid-lowering agents in women with fibroids may shed light on causality and therapeutic potential. Integrating metabolic and gynecologic perspectives may enrich fibroid risk stratification and management.

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CONFLICTS OF INTEREST

There was no conflict of interest

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