EFFECT OF BISPHENOL-A ON HORMONE AND LIPID LEVELS AMONG FIBROID PATIENTS IN LAGOS STATE, NIGERIA

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE, (M.Sc.) IN BIOCHEMISTRY IN THE DEPARTMENT OF BIOCHEMISTRY, COLLEGE OF SCIENCE AND TECHNOLOGY, COVENANT UNIVERSITY, OTA, NIGERIA

MARCH, 2024

ACCEPTANCE

This is to attest that this dissertation is accepted in partial fulfillment of the requirements for the award of a Master of Science (M.Sc.) in Biochemistry in the Department of Biochemistry, College of Science and Technology, Covenant University, Ota, Nigeria.

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DECLARATION

I, **SALAMI, ESTHER ABISOLA**, hereby declare that this research work was carried out by me under the supervision of Dr. Oluwakemi A. Rotimi of the Department of Biochemistry, College of Science and Technology, Covenant University, Ota, Ogun State. I attest that the dissertation has not been presented either wholly or partially for the award of any degree elsewhere. All sources of data and scholarly information used in this dissertation were duly acknowledged.

SALAMI, ESTHER ABISOLA

Signature and Date

CERTIFICATION

We hereby, certify that this dissertation titled "**EFFECT OF BISPHENOL-A ON HORMONE AND LIPID LEVELS AMONG FIBROID PATIENTS IN LAGOS STATE, NIGERIA**" is an original research work carried out by **SALAMI, ESTHER ABISOLA** with matriculation number **(16CP021237)** from the Department of Biochemistry, College of Science and Technology, Covenant University, Ota, Ogun State, Nigeria, under the supervision of Dr. OLUWAKEMI A. ROTIMI. We reviewed the work and determined that it meets the requirements for the award of the degree of Master of Science (M.Sc.) in Biochemistry.

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DEDICATION

This dissertation is dedicated to God Almighty from whom all good and perfect gift comes. God, the Master Orchestrator, ensures everything falls into place, and through His divine orchestration, this project was successfully completed.

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LIST OF ABBREVIATIONS

ART: Assisted Reproductive Technology

BPA: Bisphenol-A

BPA-HRP: Bisphenol-A Horseradish Peroxidase

BMI: Body Mass Index

COMT: CatecholO-methyltransferase

CD68: Cluster of Differentiation 68

COL4A6: Collagen alpha-6 (IV) Chain

ECM: Extracellular Matrix

ELISA: Enzyme-linked immunosorbent assay

EE: Environmental estrogens

EDCs: Endocrine-disrupting Chemicals

FAS: Fatty Acid Synthase

FH: Fumarate Hydratase

FIGO: The International Federation of Gynaecology and Obstetrics

HAART: Highly Active Antiretroviral Therapy

HDL: High Density Lipoprotein

HMGA-2: High-Mobility Group AT-Hook 2

IRS4: Insulin Receptor Substrate-4

LASUTH: Lagos State University Teaching Hospital

MED12: Mediator Subunit 12

mTOR: Mechanistic Target of Rapamycin

PPARα: Peroxisome Proliferator-activated Receptors alpha signaling pathway

PCOS: Polycystic Ovarian Syndrome

SCD: Stearoyl-coenzyme A Desaturase

SCAP: SREBP Cleavage Activating Protein

SHGB: Sex Hormone Binding Globulin

SREBP1: Sterol Regulatory Element-Binding Protein 1

MMSC: Single Myometrial Stem Cell

TMB: 3, 3',5,5' Tetra Methyl Benzadine

TG: Triglycerides

TICs: Tumor-initiating Stem Cells

TGF-β3: Transforming Growth Factor Beta-3

UL: Uterine leiomyoma

VDBP: Vitamin D-binding protein

WNT: Wingless-related Integration Site

25(OH)D: 25-hydroxyvitamin D

1,25(OH)D: 1,25-dihydroxyvitamin D

ABSTRACT

Leiomyomas are benign smooth muscle tumors that develop on the myometrium of the uterus. Research has shown that over 70% of women will have fibroids by the time they reach the age of 50. In recent times, there has been a growing concern regarding pollution of the environment, with reports indicating that synthetic chemicals possess the potential to disrupt the reproductive system by their endocrine-disrupting properties. Bisphenol-A (BPA) is one of the most produced endocrine disrupting chemicals in the world and this is as a result of industrialization and the increasing demand for plastics. The growth and development of uterine fibroids is regulated, in part, by hormone levels in the body. BPA has close structural similarity with estrogen; therefore it can act as both an estrogen mimic as well as an agonist of estrogen receptors. This study aimed to determine the levels of Bisphenol-A, hormones, and lipids and their relationship among fibroid patients in Lagos, Nigeria. The study was a cross-sectional study and involved 69 fibroid patients from the Gynaecology clinic at Lagos State University Teaching Hospital (LASUTH). Urinary BPA levels and plasma levels of vitamin D and estrogen in the patients were measured using an enzyme-linked immunosorbent assay (ELISA) technique. The plasma levels of high-density lipoprotein, triglycerides and cholesterol were measured spectrophotometrically. The mean concentration of BPA in the patients was 696.65 ng/ml and the median concentration was 39.67 ng/ml. The mean concentration of HDL-Triglycerides and HDL-Cholesterol were 14.35 mg/dl and 10.35 mg/dl respectively. The range of BPA concentrations (0.10 -15357.39 ng/ml) indicates that there is an exposure to BPA among Nigerian fibroid patients. Results of our study showed that patients in the high BPA group had a significantly higher level of HDL-Triglycerides (HDL-T) compared to those in the low BPA group ($P<0.05$). A statistically significant inverse relationship ($\beta= -0.26$; $P<0.05$) between Bisphenol-A and HDL-Cholesterol (HDL-C) was also detected. This study is the first to investigate the association between BPA, hormones, and lipids levels in Nigerian fibroid patients. Overall, this study provides suggestive evidence that exposure to BPA may alter the levels of plasma HDL-C and HDL-T in Nigerian fibroid patients.

Keywords: Bisphenol-A, fibroids, lipids, estrogen, vitamin D