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STUDY OF GENDER DIFFERENCES IN LIPIDS PROFILE AND APO B-100 IN APPARENTLY HEALTHY INDIVIDUALS AND DIABETIC/HYPERTENSIVE PATIENT IN KEBBI STATE

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ABSTRACT

This study was carried out to assess gender differences in lipid Profile and Apo B-100levels in apparently healthy individuals and Diabetic/hypertensive patients. The investigation was done at Department of chemical pathology Sir Yahaya Memorial Hospital Birnin Kebbi, Kebbi State, Nigeria. One hundred and fifty diabetic/hypertensive patients and one hundred and fifty apparently healthy individuals were studied. The subjects were further divided into apparently healthy females, apparently healthy males, Diabetic/hypertensive females and Diabetic/Hypertensive males groups respectively. Fasting blood samples were analyzed for Apo B-100, total cholesterol (TC), triglycerides (TG), low density lipoprotein cholesterol (LDL-C), high density lipoprotein cholesterol (HDL-C) and glucose. The lipid profile of apparently healthy females was compared with the lipid profile of apparently healthy males and was observed that HDL-C levels were significantly higher in apparently healthy females compared with the apparently healthy males ($p < 0.05$). The serum triglycerides were significantly raised in apparently healthy males compared with apparently healthy females ($p < 0.05$). Diabetic/hypertensive females had significantly higher levels of LDL-C, TG and Apo B-100 levels as compared with apparently healthy female ($p < 0.05$). Diabetic/hypertensive males had significantly higher levels of TC, LDL-C and Apo B-100 levels than the apparently healthy males ($p < 0.05$). The difference in lipid profile and Apo B-100 profile was no significant between diabetic/Hypertensive females and males. The results revealed that there were gender differences in lipid profile in Diabetic/Hypertensive patient as well as in apparently healthy individuals. Diabetic/Hypertensive individuals have high levels of Apo B-100 as compared with apparently healthy persons in the case of both females and males. However in diabetic females and diabetic males there was no difference in lipid profile and Apo B-100concentrations.

KEYWORDS: *Apolipoprotein B-100, CHD, CAD, HDL-C , LDL-C, Lipids, T*

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INTRODUCTION

Cardiovascular disease is among the number one cause of death in women, as it is obtained in men. Cardiovascular risk factors include; high cholesterol, high triglycerides, low HDLC, diabetes, hypertension, gender as well as cigarette smoking[1]. The lipid profile of a woman undergoes continuous changes during her lifetime due to the effects of endogenous hormones during pregnancy, the use of oral contraceptives, and use of estrogen replacement therapy at menopause[1]. Endogenous estrogen reduces the risk of heart disease in women same as ripple effect of estrogen replacement therapy in the menopause[1].

An increase in the incidence of coronary heart disease risk has commonly been reported in postmenopausal women.[1]The incidence of coronary heart disease (CHD) had been reported to be of much decrease in younger women than in age-matched men, and this gave rise to the popular misconception that cardiovascular disease is a disease of men, and hence relatively rare in women[2]. The incidence of CHD may be much lower in young women than in men of the same age, until the age of 65 is attained[2]. At a later age however, beyond the age65, there tends to be equal risk for both sexes[2].

Cardiovascular diseases rate had been reported to pose greater risk for women than for men. For instance, the risk factors, testing modalities, presenting symptoms and the therapeutic choices made for women with coronary artery disease differ significantly from those for men[2]. Decrease in levels of High-Density Llipoprote in cholesterol (HDL-C), < 1.94mmol/l in men and< 2.5mmol/l in women, is associated with a greater risk of coronary artery disease [3]. While increasing HDL-C has more cardio protective effect in the female than in the male population[4].Cardiovasculardiseases in women are reported to be under represented, with the majority of trials being conducted in middle-aged men[4].

Cardiovascular disease prevalence, incidence and mortality rates tend to be higher for men than for women[5]. Oestrogen has a protective effect on the development of CVD risk factor and consequently is the reason most often cited for these gender differences[6]. Oestrogen is thought to contribute to the premenopausal women's tendency to have lower systolic blood pressure (B.P), higher level of HDL-C and low Triglycerides (TG) level than men[5, 7]. This protective effect of oestrogen fades away after menopause and this relation further strengthens the evidence of protective role of oestrogen and by age 75, women tends to have higher rate of hypertension and CVD than men[8].

However, despite the protective role of oestrogen on CVD development, oestrogen replacement therapy in postmenopausal women does not reduce CVD risk and is not recommended as primary or secondary prevention, evidence from clinical trials indicates that hormonal replacement therapy increases the risk of adverse CVD events especially, stroke[9]. The lower prevalence of smoking among women is another factor that could contribute to their decreased CVD incidence and mortality rate among women[5]. Around the world, prevalence of female smoking is lower than that of men[5]. These differences are particularly noted in lower and middle income countries[10].

Another important gender difference is seen in the increased prevalence of obesity among women. WHO data indicate that overweight (BMI≥ 25 kg/m²) is more common among men globally [11].This trend of increased obesity prevalence among women is consistent around the world, including sub-Saharan Africa[11].Further studies are needed to explore the differences in dyslipidemia of females and males. Therefore, this study aimed to study gender based differences in lipid profile and ApoB-100 in apparently healthy individuals and Diabetic/hypertensive patients in Kebbi State.

SAMPLING AND METHODS

The subjects were divided into four groups.

- Group 1 consisted of seventy five (75) apparently healthy female subjects
- Group 2 consisted of seventy five (75) apparently healthy male subjects
- Group 3 consisted seventy five (75) Diabetic/Hypertensive female subjects
- Group 4 consisted of seventy five (75) Diabetic/Hypertensive male subjects

Patients were selected on the basis that there were no significant differences in their clinical

Characteristics and glucose status. Their height was measured in metres and weight in kilograms. Body mass index (BMI) was calculated by the following formula;

BMI = Body Weight in Kilograms / Height (square meters).

All the patients were in stable condition and history was taken regarding any disease that could affect the metabolic status of the body and the parameters studied like nephrotic syndrome, acute or chronic renal failure, thyroid disorder and acute infections. The patients having any ofthe above mentioned disorders were excluded from the study. The history of medication was recorded and the patients taking lipid lowering agents, oral contraceptives, hormone replacement therapy and steroids were also excluded. Blood pressure (SBP/DBP) was also recorded.

Serum glucose level was estimated by glucose oxidase method[12]using the Randox Assay Kit. Cholesterol was estimated by enzymatic hydrolysis method[13] using fortress Assay kit. The HDL-Cholesterol was determined by precipitation method [14] using fortress Assay kit. Serum Low Density Lipoprotein Cholesterol (LDL-C) was calculated using Friedwald formula[15]:Serum Very LowDensity Lipoprotein Cholesterol was calculated using Friedwald formula[15] Triglycerides was estimated by fortress diagnostic assay kit[16]. Apolipoprotein B-100 was estimated by the turbidimetry assay method [17]with fortress diagnostic assay kit.

Data generated were expressed as mean ± S.D. Statistical difference between means of the subject groups were analysed with one-way analysis of variance (ANOVA) using SPSS 21. Value that gave $P < 0.05$ was considered statistically significant.

RESULTS

Cardiovascular risk index based on gender is presented in Table 1

Table 1: Cardiovascular Risk Index of Kebbi State Based On Gender

Gender		Body Mass Index (kg/m²)	Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)	Mean Arterial Blood Pressure (mmHg)	Glucose Level (mmol/l)
Male	AH	24.77 ± 6.46	123.95 ± 4.93	83.08 ± 4.74	96.62 ± 4.21	4.87 ± 0.85
	D/H	26.55 ± 6.07*	141.36 ± 7.66*	90.89 ± 5.71*	107.74 ± 5.69*	10.08 ± 2.09*
Female	AH	24.58 ± 6.47	122.56 ± 4.50	82.00 ± 4.37	95.43 ± 3.75	5.07 ± 0.62
	D/H	25.27 ± 6.88*	142.38 ± 9.72*	91.25 ± 5.44*	108.12 ± 6.33*	10.10 ± 2.00*
All subjects	AH	24.57 ± 6.22	123.25 ±4.76	82.54 ± 4.58	96.02 ± 4.02	4.87 ± 0.77
	D/H	26.02 ± 6.66*	141.88 ± 8.75*	91.07 ± 5.56*	109.93 ± 6.01*	10.69 ± 2.04*

AH-Apparently healthy. D/H- Diabetic/hypertensive. Values are expressed as mean ± S.D. (*P < 0.05) significantly different from apparently healthy subjects. (^P < 0.05) Significantly different from diabetic/Hypertensive

The Apo B-100 and lipid profile based on gender is presented in table 2 below.

Table 2: Apolipoprotein B100 and Lipid Profile Risk Index Based on Gender

Parameter		Male	Female	All Subjects
Apo B-100 (mg/dl)	AH	86.95 ± 13.65	89.00 ± 13.71	87.98 ± 13.67
	D/H	98.17 ± 10.09*	98.54 ± 9.75*	98.34 ± 9.88*
Total Cholesterol (mmol/l)	AH	4.57 ± 0.91	4.32 ± 0.80	4.45 ± 0.87
	D/H	7.27 ± 1.10*	6.94 ± 0.93*	7.10 ± 1.03*
High Density Lipoprotein Cholesterol (mmol/l)	AH	2.15 ± 0.68^	2.20 ± 0.66^	1.93 ± 0.68^
	D/H	0.82 ± 0.35	0.88 ± 0.24	0.79 ± 0.30
Low Density Lipoprotein Cholesterol (mmol/l)	AH	2.20 ± 0.54	1.96 ± 0.76	2.08 ± 1.87*
	D/H	5.07 ± 1.20*	4.85 ± 1.00*	4.96 ± 1.11
Very low Density Lipoprotein Cholesterol (mmol/l)	AH	0.57 ± 0.15	0.55 ± 0.14	0.56 ± 0.14
	D/H	1.38 ± 0.34*	1.33 ± 0.64*	1.36 ± 0.31*
Triglycerides (mmol/l)	AH	1.24 ± 0.33	1.20 ± 0.30	1.22 ± 0.31
	D/H	3.11 ± 0.75*	2.92 ± 0.58*	3.02 ± 0.67*

AH-Apparently healthy. D/H- Diabetic/hypertensive. Values are expressed as mean ± S.D. (*P < 0.05) significantly different from apparently healthy subjects. (^P < 0.05) Significantly different from diabetic/Hypertensiv

DISCUSSION OF RESULT

When the mean body mass index (BMI) of the apparently healthy female subjects was compared with apparently healthy male (Table 1.0) there was no significant difference (P > 0.05) observed. (24.58 ± 6.47 kg/m² and.24.55 ± 6.07 kg/m²). However, the BMI was significantly higher (P < 0.05) in the diabetic/hypertensive male subjects compared to the apparently healthy male subjects (26.55 ± 6.07 kg/m² and 24.77 ± 6.46 kg/m²). Comparing the BMI of diabetic/hypertensive female with that of diabetic/hypertensive male groups showed that the BMI of the diabetic/hypertensive male subjects was significantly higher (P<0.05) compared with that female.(26.55 ± 6.07 kg/m² and 25.27 ± 6.88 kg/m²).

The mean arterial blood pressure (MABP) was significantly higher (P < 0.05) in the diabetic/hypertensive male subjects (Table 1.0) compared to the apparently healthy males subjects (107.74 ± 5.69mm Hg and 96.62 ± 4.20 mmHg). The mean arterial blood pressure of the female diabetic/hypertensive subjects was significantly higher (P < 0.05) compared to the apparently healthy females subjects. (108.12 ± 6.33 mmHg and 95.43 ± 3.75 mmHg). The MABP was lower and there was no significant difference between the apparently healthy groups. (P > 0.05).The glucose level was significantly higher (P < 0.05) in diabetic/hypertensive male subjects compared to the apparently healthy male subjects. (10.08 ± 2.09 mmol/l and 4.67 ± 0.85 mmol/l). Likewise, the glucose level was significantly higher (P < 0.05) in the diabetic/hypertensive female subjects compared to the apparently healthy female subjects. (10.10 ± 2.00 mmol/l and 5.07.0.68 ± 2.00 mmol/l).

The lipid profile and Apo B-100 based on gender is presented in Table 1.2. The mean serum Apo B-100 level of the diabetic/hypertensive male subjects was significantly higher ($P < 0.05$) in diabetic/hypertensive male subjects (98.17 ± 10.09 mg/dl) compared to the apparently healthy male subjects (86.95 ± 13.65 mg/dl). The mean serum Apo B-100 of the diabetic/hypertensive female subjects (98.54 ± 9.75 mg/dl) was significantly higher ($P < 0.05$) compared to the apparently healthy female subjects (89.00 ± 13.71 mg/dl). The mean serum Apo B-100 level was within the normal range (< 90 mg/dl) in both the male and female apparently healthy subjects (86.95 ± 13.65 mg/dl and 89.00 ± 13.71 mg/dl) and no significant difference ($P> 0.05$) was observed. The mean serum TC, LDL-C, VLDL-C and TG, was significantly higher ($P < 0.05$) in diabetic/hypertensive male and female subjects compared to the apparently healthy male and female subjects respectively. The mean serum HDL-C was significantly higher ($P < 0.05$) in female apparently healthy subjects compared the apparently healthy male subjects. The mean serum HDL-C was significantly higher ($P< 0.05$) in male and female apparently subjects compared to the diabetic/hypertensive male and female subjects respectively. .

It is evident from the above result that cardiovascular disease risk prevalence, incidence and mortality rates tend to be higher for men than for women[18]. Oestrogen has a protective effect on the development of CVD risk and consequently the reason most often responsible for these gender differences [19]. Oestrogen is thought to contribute to the premenopausal women's tendency to have lower systolic blood pressure (B.P), higher level of HDL-C and low Triglycerides (TG) level than men[5,7]. This protective effect of oestrogen fades away after menopause and this relation further strengthens the evidence of protective role of oestrogen. By the age of 75, women tend to have higher rate of hypertension and CVD than men [8]. However, despite the protective role of oestrogen on CVD development, oestrogen replacement therapy in postmenopausal women does not reduce CVD risk and is not recommended as primary or secondary prevention, evidence from clinical trials indicates that hormonal replacement therapy increases the risk of adverse CVD events especially, stroke[9]. The lower prevalence of smoking among women is another factor that could contribute to their decreased CVD incidence and mortality rate[5]. Around the world, prevalence of female smoking is lower than that of men.[5]. These differences are particularly noted in lower and middle income countries[10].

Another important contributory factor to gender difference in lipid profile and Apo B-100 is seen in the increased prevalence of obesity among women (Table 1.0). Data from WHO indicate that overweight (BMI≥ 25 kg/m²) is more common among women globally[11]. This trend of increased obesity prevalence among women is consistent around the world, including sub-Saharan Africa[20].

Gender affects lipid parameters and this effect is independent of age and menopausal status[18]. Studies have shown that LDL-C, Apo B -100 and TG are higher in males than premenopausal females. These parameters however, increase after menopause in females. Females at all ages have higher HDL-C level than men[18]. Elevated LDL-C and decreased HDL-C are clearly coronary heart disease risk factors [9]. The risk of coronary heart disease is therefore higher in males than females[19]and nd the risk increase in females after menopause. In this study, it[20] is evident that females have lower BMI, TG and TC but higher level of Apo B-100. This finding showed evident that gender affects lipid profile and Apo B - 100 and this effect is independent of age and menopause status as shown in table 1.2. There was significant increase ($P < 0.05$) in the mean serum level of Apo B-100 level (98.17 ± 10.09 mg/dl and 98.54 ± 9.75 mg/dl) in the male and female diabetic/hypertensive subjects compared to the apparently healthy male and female subjects (86.95 ± 13.65 mg/dl and 89.00 ± 13.71 mg/dl). There was also same trend in the mean serum levels of lipid profile (TC, HDL-C, LDL-C, VLDL-C, and TG). Presumably, these differences are due to the different level of circulating hormones especially oestrogen and androgen in females and males respectively, this result is similar to the result of Syed *et al*[21] who reported gender

differences in lipoproteins, lipid profile in healthy individuals and patients with type 2 diabetic mellitus subjects.

CONCLUSIONS

There are gender differences in lipid profile in Diabetic/hypertensive patients and as well as in apparently healthy individuals. Diabetic/hypertensive individuals have raised levels of Apo B-100 when compared to apparently healthy subjects in case of both females and males. However, in both the diabetic/hypertensive females and males there were no observed differences in lipid profiles and ApoB-100concentrations. Further studies are needed to confirm these findings.

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