

Gender and susceptibility to the risk of cardiovascular diseases in young semi-vegetarians

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Abstract.

BACKGROUND: Cardiovascular diseases are leading cause of death worldwide. It affects both genders, but premenopausal females are said to be better protected against this disease than males. There are few information on gender susceptibility to cardiovascular diseases in some parts of the world none is available for young, native African, semi-vegetarians.

OBJECTIVES: The intent of this study is to report gender susceptibility to cardiovascular diseases in young semi-vegetarians living in Africa.

DESIGN: Anthropometric, Hematological and Hemostatic indexes known to be related to cardiovascular disease risk factors were studied in 108 semi-vegetarians (55 males and 53 females).

RESULT: Height, weight, and systolic blood pressure are significantly raised in males than females ($P < 0.05$) while BMI, waist circumference, hip circumference, waist to hip ratio, and diastolic blood pressure show no significant difference in both genders ($P > 0.05$). Hematocrit, hemoglobin concentration and platelet count are significantly higher in males than females, erythrocyte sedimentation rate is significantly lower in male, total white cell count, prothrombin time, activated partial thromboplastin time and plasma fibrinogen concentration show no significant difference in both genders ($P > 0.05$).

CONCLUSION: We concluded that male semi vegetarians are more susceptible to cardiovascular diseases than females.

Keywords: Genders, cardiovascular, vegetarians, Africa, anthropometry

1. Introduction

Cardiovascular diseases are known to be the leading cause of death worldwide and Africans are highly susceptible to the disease being people from low and middle income countries [1]. The choice of diet is believed to influence the onset of this disease. Healthy vegetarian diet is presumed to have more ability to reduce the risk of having cardiovascular diseases than non-vegetarian diet, this may be due to the fact that vegetarian meals contain phytochemicals that may help prevent early onset of certain diseases like cardiovascular diseases and other degenerative diseases [2], also vegetarian diets have positive impact on ischemic heart disease risk indexes such as blood lipids, lipoproteins, blood pressure and lipid peroxidation, as well as hemostatic parameters [3–7], following a vegetarian diet has been linked with less weight gain [8], and increased body leanness [9], compared with non-vegetarians.

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Cardiovascular disease affects both genders, but females have better protection due to reduced number of circulating red blood cells and higher oxygen delivery index. The increase in risk of morbidity and mortality from cardiovascular diseases among men and women may also be due to the difference in the mechanical properties of their blood [10]. Although, it has long been posited that vegetarian diets may be beneficial to general health and in particular cardiovascular diseases, does it have any gender biased protection against cardiovascular disease in vegetarians?

It is important to understand the effect of the diet on the disease risk factors as this will help in counselling these young vegetarians on how to balance their lifestyle with choice of diet, this may protect them against cardiovascular diseases on the long run. Therefore the intent of this study is to determine if vegetarian diets give equal protection against cardiovascular diseases in male and female vegetarians.

2. Subject and methodology

The study took place at Babcock University, Ilisan-Remo, Ogun State, Nigeria, the university is a co-educational school in the southwestern part of Nigeria, it was founded and control by the Seventh day Adventist Church of Nigeria, and the students are Nigerian and International. The school is residential and healthful vegetarian meal is firmly entrenched in the campus, the majority of the students are aware of the benefits of vegetarian diet, they indulge in eating between meals and consuming a lot of carbonated soft drinks with little or no exercise. The halls of residence are close to the lecture theaters and school buses are available to take students to and from wherever they have academic activities outside the school premises.

A total number of 108 young Babcock students were enrolled for this study, they are 55 males and 53 females, and they reside in the school hall; eating three times a day in the school cafeteria for at least 3 weeks. The mean age of these students is 21.1 (± 0.51) years. Informed consent was obtained from all the participants and 7.5 mls of whole blood were collected aseptically from the antecubital veins using a 21G needle with minimum stasis, 4.5 ml of the blood was put into citrate bottle and 3.0 ml in EDTA bottle.

The blood in the citrate bottle was spun at 2500 rpm for 15 minutes, at room temperature and the plasma separated into plain tube and kept at 4°C, after which it was processed within twenty four hours for prothrombin time (PT), activated partial thromboplastin time (APTT) according to Dacie and Lewis method [11], and plasma fibrinogen concentration (PFC) was determined according to Ingram weigh method [12]. The blood in EDTA bottle was processed for hematocrit (Hct), Hemoglobin concentration (Hb), total white cell count (WBC), and platelet count (PLT) using Mindray Auto analyzer, and the Westergreen procedure was followed to determine the erythrocyte sedimentation rate (ESR) [13].

Weights (WT) were measured on a Seco beam balance to the nearest 100 g with shoes and heavy outer garments removed. Height (HT) was measured to the nearest 0.1 cm using a stadiometer height board; shoes were removed and hair flattened maximally. Body Mass Index (BMI) was calculated by dividing weight in kilogram by the square of height in meter. Waist circumference (WC) was taken as the minimum circumference between the umbilicus and xiphoid process and measured to the nearest 0.5 cm. Hip circumference (HC) was measured as the maximum circumference around the buttocks posteriorly and the symphysis pubis anteriorly and measured to the nearest 0.5 cm. Waist- Hip Ratio (WHR) was calculated by dividing WC by HC. After sitting for at least 5 minutes, systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured in the right arm using a standard mercury sphygmomanometer.

Comparative analysis of the data obtained was done by finding the mean and standard error of mean (SEM) at $P < 0.05$ using the SPSS package.

3. Result

Table 1 shows the mean and standard error of mean of anthropometric parameters in male and female semi vegetarians. Weight, height and systolic blood pressure are significantly higher in male than in their female counterparts ($P < 0.05$), while BMI, waist circumference, hip circumference, waist-hip ratio, and diastolic blood pressure are statistically insignificant ($P > 0.05$).

Table 1
Mean and standard error of mean of Anthropometric parameters in male and female Semi-vegetarians

	Male	Female	P value
	N=55	N=53	
	Mean	Mean	
HT (cm)	175.00 ± 1.24	162.00 ± 1.17	<0.05
WT (kg)	71.90 ± 1.94	62.20 ± 2.48	<0.05
BMI (m ² /kg)	23.50 ± 0.60	23.60 ± 0.89	>0.05
WC (cm)	85.10 ± 1.18	84.60 ± 1.93	>0.05
HC (cm)	97.90 ± 2.23	96.60 ± 2.00	>0.05
WHR	0.87 ± 0.01	0.88 ± 0.02	>0.05
SBP (mmHg)	124.00 ± 3.16	113.00 ± 2.59	<0.05
DBP (mmHg)	74.50 ± 2.85	77.30 ± 2.86	>0.05

Table 2
Mean and standard error mean of hematological and hemostatic parameters in male and female Semi-vegetarians

	Male	Female	P value
	N=55	N=53	
	Mean	Mean	
HCT (%)	44.70 ± 0.84	37.60 ± 0.33	<0.05
Hb (g/L)	134.2 ± 1.5	111.9 ± 2.0	<0.05
ESR (mm /hr)	6.70 ± 0.78	12.30 ± 0.93	<0.05
WBC (x 10 ⁹ /L)	5.58 ± 0.32	5.70 ± 0.21	>0.05
PLT (x10 ⁹ /L)	324.7 ± 12.1	275.90 ± 9.85	<0.05
PT (seconds)	17.90 ± 0.46	18.10 ± 0.29	>0.05
APTT (seconds)	28.90 ± 0.84	29.60 ± 0.83	>0.05
PFC (g/L)	2.20 ± 0.31	1.70 ± 0.03	>0.05

Table 2 is the mean and standard error of mean for hematological and hemostatic parameters in male and female semi-vegetarians. While hematocrit, hemoglobin concentration, and platelet count are significantly higher in male than in female ($P < 0.05$), erythrocyte sedimentation rate is significantly lower in males than in females. The total white cell count, prothrombin time, activated partial thromboplastin time, and plasma fibrinogen concentration show no significant difference in both genders ($P > 0.05$).

4. Discussion

Men are more susceptible to risk of cardiovascular diseases than premenopausal women [10]. In this study, the height, weight and SBP are significantly higher in male than in their female counterparts ($P < 0.05$). There are science based evidence that weight is closely related to blood pressure, and it stimulates elevation of blood pressure especially in males [14, 15]. The males having more weight than their female counterparts may be due to consumption of larger calories of food, and this is because males have a tendency of eating more food than the females [16].

The significant increase in the systolic blood pressure of male vegetarians may be as a result of high weight exhibited by them, and this correlates with other studies that have no preference on the type of diet taken by the subjects on this matter [14, 15]. This may indicate that irrespective of the choice of diet weight has the same influence on systolic blood pressure, this is unhealthy for the male semi-vegetarians because systolic blood pressure is a known risk factor for cardiovascular diseases and they may be susceptible to the disease on the long run. Body mass index,

waist and hip circumferences, waist-hip ratio, and diastolic blood pressure show no significant difference in both genders ($P > 0.05$). This may be an indication that vegetarian meal may have the same effect on these parameters in both genders.

Hematocrits (Hct), and hemoglobin concentration, are significantly higher in males than in females ($P < 0.05$), erythrocyte sedimentation rate is significantly lower in males than females ($P < 0.05$), while the total white cell count shows no significant difference in both genders ($P > 0.05$). Hematocrit is an independent predictive factor of cardiovascular diseases [17]; and a determinant of hemoglobin concentration, hence, the observed increase in the hemoglobin concentration may be as a result of high hematocrit level, however, higher value of hematocrit in males may be due to larger meal intake, which may result in a high intake of vitamin B-12, and iron that may eventually stimulates erythropoiesis [18]. High hematocrit level in male may predispose them to cardiovascular diseases because it may increase the whole blood viscosity, hence reducing the blood flow and this may lead to some degree of stasis consequently stimulating platelet activation, enhance fibrinogen activation and therefore increased risk of thrombotic and cardiovascular diseases. Erythrocyte sedimentation rate is one of the major hemorheological indexes, and it has a positive correlation with blood pressure in male hypertensive Nigerian [19]. In our study, male semi vegetarians have low ESR which is an indication of hyper-viscosity, again, this makes them susceptible to cardiovascular diseases. The significant increase in platelet count of males may also be as a result of more calories intake, and may consequently increase thrombopoiesis. Elevated platelet count may cause platelet hyper-aggregability, which is associated with coronary artery disease [20], this also may predispose the young male semi-vegetarians to the risk of cardiovascular diseases.

There is no significant difference in PT, PTTK and plasma fibrinogen concentration in both genders ($P > 0.05$). This may suggest that vegetarian meals may have the same effect on these parameters in both genders.

5. Conclusion

The males when compared with the females, have higher weight, increase systolic blood pressure, higher platelet count, and pronounced hyper-viscosity. We therefore conclude that although vegetarian diet may ameliorate or delay the onset of certain diseases in both genders, male is more susceptible to cardiovascular diseases than female irrespective of the choice of diet taken.

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