



Some Haematological and Haemostatic Indexes in Young Semi-vegetarians in Sub-Sahara Africa

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Authors' contributions

This work was carried out in collaboration between all authors. Authors AAA, OAO and AAF designed the study, managed the analysis of the study, wrote the protocol and wrote the first draft of the manuscript. Authors YOM and OIA performed the statistical analysis. Authors OAA and AAA managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: The protective power of vegetarian diet against diseases is not a hype but there is a scarcity of information concerning the impact of semi-vegetarian meals on wellbeing, especially, in young adults living in Africa.

Study Design: This study investigates the impact of semi-vegetarian diets on some haematological and haemostatic indexes in young semi-vegetarians in a Seventh day Adventist cohort in Nigeria.

Results: Packed Cell Volume (PCV), and Hemoglobin concentration (HB) Platelet count (PLT), Prothrombin Time (PT), and Partial Thromboplastin Time (PTT) of the subjects are significantly higher than that of the controls ($P < 0.05$), Erythrocyte Sedimentation Rate (ESR) is not significant in

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both groups, and Plasma Fibrinogen Concentration (PFC) is significantly lower in the subjects than in controls ($P < 0.05$).

Conclusion: Semi-vegetarian diets may have a positive impact on cardiovascular and hemostatic risk factors in young semi-vegetarians in Nigeria, and likely to be superior to omnivorous diets.

Keywords: Vegetarian diet; cardiovascular diseases; haemostatic risk factors; vegetarians; thrombosis.

1. INTRODUCTION

There is a growing awareness of the potential benefits of vegetarian diets, even non vegetarians are advised to include plant-derived foods in their meals. A healthy vegetarian diet is characterized by more frequent consumption of fruits and vegetables, whole grains, legumes and nuts, which results in higher intake of dietary fibers, antioxidants and phytochemicals compared with non-vegetarian diets [1]. Vegetarian diets have a positive impact on ischemic heart disease risk factors, such as blood lipids, lipoproteins, blood pressure and lipid peroxidation thereby reducing overall mortality from ischemic heart disease, and have a favorable impact on haemostasis too, [2,3,4,5] also, they moderate blood pressure, fibrinogen concentration, plasma viscosity and lipids, haemorheological and hemostatic parameters in Nigerians [6].

Vegetarianism has become more popular in recent years due to its benefits and positive impacts on disease conditions, even in non-vegetarians, thus, there are information that provide insight into the differences between those following omnivorous diets and those on plants based diets. Although popular opinion tends toward vegetarianism being a healthier option than omnivorous, some studies show that it has negative influences on some hematological variables which predispose vegetarians to the risk factor for cardiovascular diseases and iron deficiency anemia [7,8]. In Nigeria, many young adults especially those in connection with Seventh day Adventist, fancy semi-vegetarianism because it is believe to be a healthier option than omnivorous. Semi-vegetarianism is one of the types of vegetarianism in which meat/poultry/fish is eaten occasionally. Although it is opined that vegetarianism is salubrious by all standard, does this apply to semi-vegetarianism as well? The intent of this study is to investigate the effect of semi-vegetarian diets on some haematological and hemostatic variables in young semi-vegetarian in Nigeria, for there is a need to monitor the impact of this diet on their wellbeing.

2. MATERIALS AND METHODS

2.1 Study Population

506 young semi-vegetarian Babcock University students were enrolled for this study, they were 255 males and 251 females, resided in the school campus and were eating three times a day in the school cafeteria. The mean age of these students was $21.1(\pm 0.51)$ years. 498 young students were enrolled as controls they were residing in the school campus, but, were not eating in the school cafeteria, they were 248 males and 250 females and were eating omnivorous meals thrice daily. The control group had a mean age of $23.5 (\pm 0.26)$ years.

2.2 Study Area

This cross sectional study was carried out in the 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, with more than 20,000 Nigerians and international students. The school is residential and semi-vegetarian meals are served in the school cafeteria.

2.3 Sample Collection and Methods

Informed consent was obtained from all the participants and an ethical approval was gotten from the university authority, 7.5 mls of whole blood were collected aseptically from the antecubital veins using a 21G needle, a minimum stasis was maintained during the blood collection. 4.5 ml of the blood was put into citrate bottle and 3.0 ml in EDTA bottle, and the blood were properly mixed.

The blood in the citrate bottle was spun in a Uniscope Laboratory bench centrifuge, model SM112, made by Surgifriend Medical, England, at 2500rpm for 15minutes at room temperature, and the plasma separated into plain tube and kept at 4°C , after which it was processed within

twenty four hours. The blood in the EDTA was processed immediately using Mindray 5300 Auto analyzer for the analysis of hematocrit (HCT), Hemoglobin concentration (Hb), and platelet count (PLT). Westergreen procedure was followed to determine the Erythrocyte sedimentation rate (ESR) [9].

The plasma obtained from the citrate bottle was processed for Prothrombin time (PT), and Partial thromboplastin time (PTT) using Dacie and Lewis method [10], and Plasma fibrinogen concentration (PFC) was determined using the Ingram weigh method [11].

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

3. RESULTS

The Mean and Standard Error of Mean for Hematological parameters in semi-vegetarians and controls is shown in Table 1. HCT, Hb, PLT, PT, PTT are significantly higher in semi-vegetarians than in controls ($P < 0.05$), while PFC is significantly lower in the semi-vegetarians than in the control. ESR shows no significant difference in both groups ($P > 0.05$). The Table 2 compares Mean and Standard Error of Mean for Hematological parameters in both genders of the semi-vegetarians. The HCT, Hb, and PLT are significantly higher in male semi-vegetarians than female ($P < 0.05$), while the ESR is significantly lower in the male than female ($P < 0.05$). There is no significant difference in WBC, PT, PTT, and PFC in both genders ($P > 0.05$).

4. DISCUSSION

Semi-vegetarians consume meat/poultry/fish occasionally along with vegetables and fruits. Vegetables and fruits are major constituent of semi-vegetarian diets and they impact positively on health due to the action of phytochemicals, anti-oxidant, and fibers present in them [12]. The haematocrit (HCT), and Hemoglobin concentration (Hb) are significantly higher in semi-vegetarians than controls ($P < 0.05$), this suggests that haemoglobin level is better in the semi-vegetarian than the omnivores. The finding in our study disagrees with the previous study carried out on vegetarians and non-vegetarians [13]. It's likely that while the bioavailability of the iron present in plant foods is lower, the high concentrations of ascorbic acid in plant-based

foods (devoid in animal foods) promotes better intestinal absorption of iron, since ascorbic acid is necessary for iron absorption. Sources of iron in plant foods, such as greens and whole grains, appear to be good sources of iron for vegetarian diets and serve to maintain healthy haemoglobin levels, as appears to be the case in this population. The hematocrit level is significantly higher in male semi-vegetarians than in their female counterparts ($P < 0.05$). This may be as a result of their physiological differences and genetic make-up.

The ESR of both the semi-vegetarians and controls show no significant difference ($P > 0.05$ respectively), but it is significantly higher in female than male semi-vegetarians ($P < 0.05$). This may be due to the difference in their hematocrit value because hematocrit is said to be one of the factors that determines ESR [11]. The semi-vegetarians have a significantly increased platelet count (PLT) than the controls ($P < 0.05$). This does not agree with previous report by Obeid et al. [7] who reported low platelet count for the vegetarians [7]. This disparity may be due to the fact that semi-vegetarians diets are rich in vitamin B which enhance haematopoiesis, hence, this again suggest the likely superiority of the semi-vegetarian diet to the omnivorous diet.

The haemostatic parameters (PT, PTT) in semi-vegetarians are significantly prolonged than in controls ($P < 0.05$ respectively), this agrees with previous studies and further support the notion that vegetarianism promotes healthy haemostasis [2,4]. This may be due to the natural aspirin present in fruits and vegetables [14]. Aspirin prolongs PT, and PTT, and also inhibits platelet aggregation, this may protect the semi-vegetarians against thrombotic risk factors despite the high platelet count. This is likely be one of the benefits of the semi-vegetarian meals because they are rich in vegetable, fruit and fiber.

The male semi-vegetarians have a higher platelet count than their female counterpart, this may be as a result of higher calorie intake by the males because they have a tendency to consume more food than the females [15] the effect of which may be higher thrombopoiesis in the males.

There is a significant decrease in fibrinogen concentration ($P < 0.05$) in semi-vegetarians when compared to that of the controls, this finding is in

Table 1. Mean and standard error mean of hematological and hemostatic parameters in semi-vegetarians and controls

	Semi-vegetarians N = 506	Controls N = 498	P value
	Mean	Mean	
HCT (%)	41.22 ±0.71	37.66 ±0.53	<0.05
Hb (g/dl)	12.32 ±2.49	11.48 ±1.88	<0.05
ESR (mm/hr)	9.46 ±0.94	10.78 ±0.67	>0.05
WBC (X10 ⁹ /L)	5.64 ±0.19	5.24 ±0.11	>0.05
PLT (X10 ⁹ /L)	300.76 ±8.15	217.33 ±4.33	<0.05
PT(Seconds)	17.96 ±0.27	17.20 ±0.15	<0.05
PTTK (Seconds)	29.27 ±0.59	26.44 ±0.38	<0.05
PFC (g/L)	1.95 ±0.16	2.34 ±0.40	<0.05

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

	Males N = 255	Females N = 251	P value
	Mean	Mean	
HCT (%)	44.70 ±0.84	37.60 ±0.33	<0.05
Hb (g/dl)	13.42 ±0.15	11.19 ±0.2	<0.05
ESR (mm/hr)	6.70 ±0.78	12.30 ±0.93	<0.05
WBC (X10 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
PTTK (Seconds)	28.90 ±0.84	29.60 ±0.83	>0.05
PFC (g/L)	2.20 ±0.31	1.70 ±0.03	>0.05

support of previous findings [2,12] and it further buttress the fact that the phytochemicals present in fruits and vegetables - the major constituent of semi-vegetarian diet, have a positive effect on fibrinogen. This may be a protective property of the semi-vegetarian meal against cardiovascular diseases as fibrinogen is an independent risk factor for cardiovascular diseases. There is no significant difference in fibrinogen concentration in both genders (P >0.05), this may suggest that the meal has the same effect on them.

5. CONCLUSION

This work provides additional support to the existing literature supporting the safety and likely superiority of vegetarian diets to omnivorous diets. The phytochemicals and fiber which are the major constituent of the semi-vegetarian diets might ameliorate known cardiovascular and thrombotic risk factors in the young semi-vegetarians in Africa.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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