

1 **Some haematological and hemostatic indexes in young** 2 **semi-vegetarians in sub-Sahara Africa.**

3 **Abstract**

4 **Background**

5 The protective power of vegetarian diet against diseases is not a hype but
6 there is not much talk on the impact of semi-vegetarian meals on wellbeing,
7 especially, in young adults living in Africa.

8 **Study Design**

9 This study investigates the impact of semi-vegetarian diets on some
10 haematological and hemostatic indexes in young semi-vegetarians in a Seventh
11 day Adventist cohort in Nigeria.

12 **Result**

13 Packed Cell Volume (PCV), and Hemoglobin concentration (HB) Platelet
14 count (PLT), Prothrombin Time (PT), and Partial Thromboplastin Time (PTT)
15 of the subjects are significantly higher than that of the controls ($P<0.05$),
16 Erythrocyte Sedimentation Rate (ESR) is not significant in both groups, and
17 Plasma Fibrinogen Concentration (PFC) is significantly lower in the subjects
18 than in controls ($P<0.05$).

19 **Conclusion**

20 Semi-vegetarian diets may have a positive impact on cardiovascular and
21 hemostatic risk factors in young semi-vegetarians in Nigeria.

Keywords: Vegetarian diet, cardiovascular diseases, Hemostatic risk factors, Vegetarians, Thrombosis

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. 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 hemostasis too,^{2, 3,4, 5 6,} also, they moderate blood pressure, fibrinogen concentration, plasma viscosity and lipids, haemorheological and hemostatic parameters in Nigerians⁷.

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.^{8,9} 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.

Study Population

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

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

65 students. The school is residential and semi-vegetarian meals are served in the
66 school cafeteria.

67 **Sample collection and Methods**

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

73 The blood in the citrate bottle was spun in a bench centrifuge at 2500rpm
74 for 15minutes at room temperature, and the plasma separated into plain tube and
75 kept at 4⁰c, after which it was processed within twenty four hours. The blood in
76 the EDTA was processed immediately using Mindray 5300 Auto analyzer for
77 the analysis of hematocrit (HCT), Hemoglobin concentration (Hb), and platelet
78 count (PLT). Westergreen procedure was followed to determine the Erythrocyte
79 sedimentation rate (ESR) ¹¹.

80 The plasma obtained from the citrate bottle was processed for
81 Prothrombin time (PT), and Partial thromboplastin time (PTT) using Dacie and
82 Lewis method¹², and Plasma fibrinogen concentration (PFC) was determined
83 using the Ingram weigh method¹³.

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

87 **Result**

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

98 **Table 1: Mean and standard error mean of hematological and hemostatic**
 99 **parameters in semi-vegetarians and controls**

100				
101		Semi-vegetarian	Control	
102		N=506	N=498	
103				
104		Mean	Mean	P value.
105	HCT (%)	41.22±0.71	37.66±0.53	<0.05
106	Hb (g/dl)	12.32±2.49	11.48±1.88	<0.05

107	ESR (mm/hr)	9.46$\pm$0.94	10.78$\pm$0.67	>0.05
108	WBC (x10⁹/L)	5.64$\pm$0.19	5.24$\pm$0.11	>0.05
109	PLT (x10⁹/L)	300.76$\pm$8.15	217.33$\pm$4.33	<0.05
110	PT (Seconds)	17.96 $\pm$0.27	17.20$\pm$ 0.15	<0.05
111	PTTK (Seconds)	29.27$\pm$0.59	26.44 $\pm$0.38	<0.05
112	PFC (g/L)	1.95$\pm$0.16	2.34 $\pm$0.40	<0.05

113

114

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

	Male	Female	
	N=255	N=251	
	Mean	Mean	P value
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 (x 10⁹ /L)	5.58 ± 0.32	5.70± 0.21	>0.05
PLT (x10⁹/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

Discussion

Semi-vegetarians consume meat/poultry/fish occasionally along with vegetables and fruits. Vegetables and fruits are major constituent of vegetarian diets and they impact positively on health due to the action of phytochemicals, anti-oxidant, and fibers present in them ¹⁴. The haematocrit (HCT), and Hemoglobin concentration (Hb) are significantly higher in semi-vegetarians than controls ($P<0.05$), this agrees with the previous study carried out on semi-vegetarians and red meat eaters³ and suggested that increased in haematocrit and hemoglobin may be as a result of high intakes of vegetables and fruits which may increase intake of vitamin B –complex and iron that may eventually stimulates erythropoiesis. High haematocrit increases whole blood viscosity and reduces the blood flow leading to some degree of stasis consequently stimulates platelet activation, enhances fibrinogen activation and therefore increases thrombotic and cardiovascular disease risk factors,¹⁵ this may predispose the semi-vegetarians to thrombosis on the long run.

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.¹² The semi-vegetarians have a significantly increased platelet

count (PLT) than the controls ($P<0.05$). This may be due to increased thrombopoiesis which may be as a result of the consumption of semi-vegetarian meals.³ The hemostatic parameters (PT, PTT) in semi-vegetarians are significantly prolonged than in controls ($P<0.05$ respectively), this may be due to natural aspirin present in fruits and vegetables¹⁶. Aspirin prolongs PT, and PTT, and also inhibits platelet adhesion, 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,¹ 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 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, although low fibrinogen concentration can predispose the subjects to bleeding tendency on the long run, there should be no cause for concern as high platelet count will ameliorate this effect. 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.

Conclusion

Although high platelet count predispose the semi-vegetarians to thrombosis, reduced fibrinogen concentration shield them against it. Again, prolong PT/PTT and reduced fibrinogen concentration may predispose them to bleeding tendency, high platelet count confers a protection against bleeding tendency. This interaction may be the effect of phytochemicals and high fiber content of the semi-vegetarian diet and this might ameliorates known cardiovascular and thrombotic risk factors in the young semi-vegetarians.

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