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FOOD CONSUMPTION PATTERN AND IRON STATUS OF YOUNG ADULT IN THE UNIVERSITY OF UYO, NIGERIA

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ABSTRACT: The study assessed food consumption pattern and the iron status in one hundred and twenty young adults in the University of Uyo, Nigeria. Dietary study, samples of the food consumed and their blood samples were used to assess the consumption pattern as well as their iron status. 56 (46.7%) of the students had breads, cornflakes, Quaker oats, moi-moi (steamed bean's cake), akara balls (fried bean's cake), ogi (corn starch) with milk, milo drink and ovaltine for breakfast. Garri, cassava fufu, semovita with 'afang', 65 (54.2%) soup and 'edikang ikong', 35 (29.2%) soup were highly consumed than spaghetti, macaroni, noodle, rice with fish/beef stew and chicken for lunch. In dinner, the value 38 (31.67%) of highly consumed meals of garri, semovita and cassava (*Manihot esculentus*) fufu with 'afang' soup was not significantly ($P > 0.05$) different from 36 (30%) in spaghetti, macaroni, noodle, rice with fish/beef stew and fried rice with chicken/beef. Protein values of 'afang' (36.05%) and 'edikang ikong' (36.62%) soups were lower than okro (*Abelmoschus esculentus*) soup (49.35%) but significantly ($P > 0.05$) higher than spaghetti meal (15.17%). Ash contents of 'afang' (15.56%) and 'edikang ikong' (15.23%) soups were significantly ($P > 0.05$) higher than spaghetti (3.01%) and okro soup (9.64%). The high values of the ash in this study reflect the present of high mineral content which influence, the serum ferritin concentration representing normal to iron overdose of both sex (74ng/ml to 379ng/ml). However, male students had significantly ($P > 0.05$) high concentration values (94.7ng/ml) for normal range as against female with 3 (74ng/ml to 89.5ng/ml) and 116ng/ml to 300 ng/ml for slightly overdose while female had 105.3ng/ml to 289ng/ml. There was no significant ($P > 0.05$) different between female iron overdose concentration 4 (305ng/ml to 379ng/ml) and 5 (305ng/ml to 379ng/ml). The iron status was normal and adequate even to support them for body tissues and organ development; ability to concentrate and learn; decrease fatigue; successful reproductive life, and increase in productive life.

INTRODUCTION

Young adulthood (19 to 30 years) is a period of transition from teenage year where growth and development is rounding off to maturity, productivity and reproduction. It has been reported that adopting diet and lifestyle practices that minimizing a decline in the body function in the adult years is an investment in their future health (ADA, 2005). One of the teenage nutritional problems and concern is iron deficiency anaemia sometimes appear in girls after they start menstruating (menarche) and in boys during growth spurts. Iron deficiency anaemia is a highly undesirable condition for a teen. It can produce increased fatigue and decrease ability to concentrate and learning school physical performance may suffer (Kleinman, 2004).

According to Wardlaw and Hamp (2007) about one billion people in the world have iron deficiency. Nearly one in six people worldwide is chronically undernourished – too hungry to lead a productive life. About 2 billion people in the world suffer from a micronutrient deficiency.

Micronutrients are required in small amount to regulate the body processes. Their deficiencies exist among people whose diets are high on yam, cassava, corn and rice. More than two thirds of the world population is presently living with one form of micronutrient malnutrition or the other. The most common ones are iron, iodine and vitamin A in women and children being as well as men. In Nigeria, the prevalence of iron deficiency anaemia is estimated at about 20 – 40% in adult women; 20 – 25% in children and 10% in adult men (Adelekan, 2001). Also, about 2,000 million people are at risk of iron deficiency anaemia. The prevalence ranges between 40 – 60% in pregnant women, 20 – 40% in women of children bearing age and 10% in adult men and school children.

During the past 30 years, it has become more acceptable that growth retardation of a foetus or child is related to their state of health in adulthood (Atinmo, 2010). The significance of the developmental origins of adult health and disease by Barker's hypothesis, suggests that countries with a high prevalence of under nutrition or low birth weight babies may be at risk of hosting a large population of adults at an increased risk for chronic diseases.

Based on these, it became necessary to examine the state of nutritional status of young adults found in the University of Uyo Community. The objective of this study was to investigate the influence of food consumption on iron status of the young adults in the University of Uyo Community.

MATERIALS AND METHOD

Selection of Subjects

One hundred and twenty students were randomly chosen from the Department of Home Economics and Microbiology (female – 64 and male 56). They were screened for HIV, sickle cell, last day/month/week for malaria/typhoid treatment and menstruation as well as deworming and other sicknesses/diseases for proper assessment. Three soup samples ('Afang' (*Gnetum africana)*, 'edikang ikon' and okro soups) with garri and spaghetti as most popularly eaten (Tables 1 and 2) were taken from students and analysed chemically for proximate composition.

BIOCHEMICAL ASSESSMENT, CHEMICAL AND METHOD OF ANALYSIS

Biochemical analysis was conducted among the subjects using their serum. The serum was obtained from their blood samples. This was centrifuged, extracted using pasteur pipettes. The serum was then mixed with ferritin reagent and the result was read against standard at 540nm. Proximate composition of the soups with garri and spaghetti as consumed by the students as well as samples brought were analysed chemically by A.O.A.C. (2000) method.

STATISTICAL ANALYSIS

The food consumption data were subjected to descriptive statistics using SPSS 10 while the biochemical data results were reported using concentration in ng/ml. The cut off points were adopted from Maziya *et al* (2004) as used for Nigeria Food Consumption and Nutrition Survey 2001 – 2003. Readings and calculation were carried out as shown below.

	BLK	STD	Sample
Serum (μ)	-	-	50
Standard (μu)	-	50	-
Blank (μu)	57	-	-
Reagent (μ/L)	1000	1000	1000

Mixed content read at 540nm

Calculation = (Sample / Standard) x 100ng/ml
Where concentration of standard = 100ng/ml.
The results were also tested at 5% significant level.

RESULTS AND DISCUSSIONS

The results of the investigations are shown in Tables 1 to 4. Table 1 shows the varieties of foods consumed by the students surveyed for breakfast, lunch and dinner and the proportion of the students who consumed them. A high proportion of the respondents consumed breads, cornflakes, quaker oats, moi-moi, akara balls, ogi, golden morn with milk, milo, ovaltine, cowbell chocolate, peak chocolate, bournvita and lipton tea (46.7%); boiled plantain, yam, rice, maize, cocoyam with egg sauces, fish and meat stew (African oil based stew), vegetable soup ('edikang ikon') (27.5%). Less than half of the students consumed fried plantain, fried yam, fried potato, fried cocoyam, with lipton tea, milk, milo, ovaltine, bournvita (5.833%); boiled plantain, yam, rice, maize, cocoyam and beans cooked with pumpkin leaves, crayfish and dryfish (5.833%); spaghetti, macaroni, noodle, rice with fish/beef (3.333%), garri, cassava fufu, semovita with vegetable soup – 'afang' soup (3.333%) and 'edikang ikong (3.333%) respectively. Garri, cassava 'fufu', semovita with vegetable – 'afang' 65 (54.2%) and 'edikang ikong' soups 35 (29.2%) were consumed by the students at the highest proportion during lunch than with okro, oha, melon and ogbono soups 7 (5.833%). Less than half of the students consumed boiled spaghetti, macaroni, noodle, rice, with fish/beef stew, and fried rice with chicken/beef 11 (9.2%), and pounded yam with vegetable soup, white soup (afia efere) 3 (1.7%). There was no significant ($P > 0.05$) difference between the consumption of garri, cassava fufu, semoitva with vegetable soup – 'afang' soup 38 (31.666%), and spaghetti, macaroni, noodle, rice with fish/beef stew and fried rice with chicken/beef 36 (30%) by the students at dinner. However, the proportion of students that consumed garri, cassava fufu and semovita with vegetable soup – 'edikang ikong' soup 27 (22.5%) was also significantly ($P > 0.05$) higher than garri, cassava fufu and semovita consumed with oha, melon, ogbono and okro soups 14 (11.666%). There was no significant ($P > 0.05$) different between proportion of respondents that ate boiled plantain, yam, rice, maize, cocoyam and beans cooked with pumpkin leaves, crayfish and fish 3 (2.5%) and boiled plantain yam, rice, maize, cocoyam, with egg sauce, fish/beef stew, 'edikang ikong' 2 (1.7%) for dinner.

The potency of each of the three soups and spaghetti meal as consumed by the respondents are shown in Table 2 for proximate composition. Moisture values ranged from $81.87 \pm 0.006\%$ to $71.12 \pm 0.00\%$. The value from okro soup was significantly ($P > 0.05$) higher than spaghetti. The ash values of 'afang' ($15.56 \pm 0.84\%$) and 'edikang ikong' 15.23 ± 0.81 had no significant ($P > 0.05$) difference but were significantly ($P > 0.05$) higher than okro soup ($9.64 \pm 0.03\%$) and spaghetti ($3.01 \pm 0.014\%$) meals. The soup and spaghetti mixtures had their ash values that were lower than values obtained by Oguntona and Akinyele in the blend of eba and afang and edikang ikong + fufu. Also, the protein values from the respondents' diets (36.24 ± 0.66, 49.35 ± 0.059, $36.62 \pm 0.87\%$ and $15.176 + 0.00$) respectively for afang, okro, edikang ikong soup and spaghetti were lower than 62% obtained by Oguntona and Akinyele (1995).

The obtained values for fibre 'afang' (7.23%), 'edikang ikong' (7.17%) and okro soup (6.13%) soups were significantly (30.05%) higher than spaghetti (1.11%). The same trend is applicable to the lipids content of the three soups but spaghetti is slightly significant ($P > 0.05$) than the soups. Generally, the blend of soups with garri was significantly lower than values from only soups because of the dilution factors.

Table 1: Food Consumption Pattern of the Students (in %), Key: F – frequency

S/N	Foods	Breakfast	Lunch	Dinner
1	Boiled plantain, yam, rice, maize, cocoyam with egg sauce, fish/beef stew, 'edikang ikong'	33^F 27.5	-	2^F 1.7
2	Garri, cassava fufu, semovita with vegetable soup (Afang soup)	5^F 4.2	65^F 54.2	38^F 31.666
3	Garri, cassava fufu, semovita with vegetable soup (edikang ikong soup)	4^F 3.333	35^F 29.2	27 22.5
4	Garri, cassava fufu, semovita with oha, melon, ogbono (*Irvingio gabonensis*) and okro soups	4^F 3.333	7^F 5.833	14^F 11.666
5	Boiled plantain, yam, rice, maize and cocoyam, and beans cooked with pumpkin leaves, crayfish, fish	7^F 5.833	-	3^F 2.5
6	Bread, corn flakes, quaker oats, moi moi, akara balls, ogi with milk milo, lipton tea, ovaltine, bournvita	56^F 46.7	-	-
7	Fried plantain, fried yam, fried potato, fried cocoyam with lipton, tea, milk, milo, ovaltine bournvita	7^F 5.833	-	-
8	Spaghetti, macaroni, noodle, rice with fish/beef stew and fried rice with chicken/beef	4^F 3.333	11^F 9.2	36^F 30%
9	Pounded yam with vegetable soup, white soup ('afia efere')	-	2^F 1.7	-

Table 2: Proximate composition of some food samples consumed by the students

S/N	Food Samples	Moisture %	Ash %	Fibre %	Protein %	Lipids %	CHO %	Kcal %
1	'Afang' soup with dry fish, crayfish, periwinkle, beef steak	76.60 ± 0.03	15.5 ± 0.84	7.23 ± 0.64	36.24 ± 0.66	25.33 ± 0.65	15.63 ± 2.66	435.46 ± 2.92
2	'Afang' soup with the blend of yellow garri	80.32 ± 0.06	5.22 ± 0.10	4.11 ± 0.02	27.24 ± 0.05	8.11 ± 0.04	55.22 ± 0.01	403.23 ± 0.05
3	'Edikang ikong' soup with the blend ingredient as in 'afang' soup	78.46 ± 0.34	15.23 ± 0.81	7.17 ± 0.25	36.62 ± 0.87	27.24 ± 2.32	16.74 ± 2.32	478.5 ± 1.87
4	'Edikang ikong' soup with the blend of yellow garri	81.25 ± 0.05	7.32 ± 0.05	5.16 ± 0.15	26.59 ± 0.13	9.23 ± 0.02	51.7 ± 0.05	396.23 ± 0.08
5	'Okro' soup with dry fish, crayfish, periwinkle, beef (steak), pumpkin leaves	81.87 ± 0.06	9.64 ± 0.03	6.13 ± 0.02	49.35 ± 0.05	24.80 ± 0.06	10.15 ± 0.01	461.17 ± 0.07
6	'Okro' soup with blend of the yellow garri	86.13 ± 0.04	6.44 ± 0.10	4.02 ± 0.01	32.14 ± 0.21	7.08 ± 0.12	50.32 ± 1.01	393.56 ± 0.05
7	Spaghetti with chicken dark green carrot leafy vegetable fresh tomatoes	71.12 ± 0.00	3.01 ± 0.04	1.11 ± 0.00	15.176 ± 0.00	30.84 ± 0.087	49.821 ± 0.002	45.70 ± 0.07

Table 3: Iron Concentration (ng/ml)/Status of the Students

S/N	Serum Ferritin Standard	Age Range for this Study	Frequency Percent	Concentration ng/ml	Iron Status
1.	<10ng/ml (10 + 15 years	-	-	-	Iron deficiency
2.	<12ng/ml (16 to 74 years)	-	-	-	Iron deficiency denotes complete exhaustion of iron
3.	<20ng/ml	-	-	-	Iron depletion
4.	20 – 100ng/ml	20 to 26 years	4 (3.33%)	74.0 ± 4.58 to 94.7 ± 1.42	Normal range
5.	101 – 300ng/ml	19 to 30 years	107 (89.16%)	105.3 ± 1.11 to 289.0 ± 1.89	Slightly above normal
6.	>300ng/ml	22 to 29 years	9 (7.5%)	305 ± 1.51 to 379.0 ± 3.42	Iron overload

Adapted from Nigeria Food Consumption and Nutrition 2001 – 2003 Summary (Maziya *et al*., 2004).

Table 4: Serum Ferritin Concentration of the Students by Sex and Iron Status

S/N	Sex	Age	Frequency/ Percent	Concentration ng/ml (Mean ± SD)	Iron Status
1.	Female	24 to 26 years	3 (2.5%)	74 ± 4.58 to 89.5 ± 1.42	Normal range
		19 to 30 years	57 (47.5%)	105.3 ± 0.6 to 289.0 ± 1.87	Slightly above normal
		22 to 29 years	4 (3.33%)	305 ± 1.51 to 379 ± 1.40	Iron overload
2	Male	20 years	1 (0.83)	94.7 ± 1.42	Normal range
		19 to 30 years	50 (41.66%)	116.0 ± 1.31 to 300 ± 3.52	Slightly above normal
		22 to 29 years	5 (4.16)	305 ± 0.98	Iron overload

Adapted from Nigeria Food Consumption and Nutrition 2001 – 2003 Summary (Maziya *et al*., 2004).

The mean iron status of the respondents is shown in Table 3. 4 (3.33%) of the respondents, age 20 to 26 years had concentration of 74.0ng/ml to 94.7 ng/ 100ml. This is an indicator for normal range of 20ng/ml to 100ng/ml according to the cut off point used by Maziya *et al*. (2004) during food consumption and nutrition survey. 107 (89.16%) respondents aged 19 to 30 years had concentration from 105.3ng/100ml to 289.0ng/100ml. This is slightly above normal of 101 – 300ng/ml (Maziya *et al*., 2004). 9 (7.5%) respondents age 22 to 29 years had concentration from 300ng/100ml to 379.0ng/ml an indicator of iron overload (> 300ng/ml).

The serum ferritin concentration and iron status of male and female young adults are shown in Table 4. 4 (3.33%) female aged 22 to 29 years with the concentration of 305ng/ml to 379ng/ml were iron overload. There was no significant ($P > 0.05$) difference between the later and the male of 22 to 29 years, 5 (4.16%) with the concentration of 305ng/ml to 379ng/ml. However, 50 (41.66%) male at age 19 to 30 years had significantly ($P > 0.05$) high concentration, 116.0ng/ml to 300ng/ml than female, 57 (47.5%) with the concentration of 105.3ng/100ml to

289.0ng/ml at 19 to 30 years. Also, a male of 20 years, 1 (0.83%) with a concentration 94.7ng/ml as a normal range was significantly ($P > 0.05$) higher than the female mean concentration, 74ng/ml to 89.5ng/ml from 3 (2.5%) at 24 to 26 years.

These results have shown that young adult, males had the highest iron status than female. This has confirmed the report from Wardlaw and Hamp (2007) that one group that tends not to be at high risk are adult males who consume meat regularly. Also, young adult women as well as teenage girls are often at risk for iron deficiency due to blood losses and lower than average meat consumption.

The iron overdose for the young female adult is not problematic since monthly loses is a continuous process until menopause. However, overdoses for young male adult can be screened and withdrawn for blood bank.

CONCLUSION

The dietary intakes of both young female and male adults in the University of Uyo were adequate enough to support iron status from normal to iron overdose. It is also adequate to prevent anaemia and maternal malnutrition during this reproductive year especially women at childbearing age. It will lead to increase productivity for individual and the nation at large and will reduce lack of concentration and learning disability and good performance in school. This study is intended to extend to the wider society to checkmate iron status in them.

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