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Dietary and Haematological Evaluation of Adolescent Females in Nigeria

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Abstract: Four hundred and eighteen adolescent females aged 12-18 years from Akwa Ibom State were studied for the effect of dietary intake and haematological values on the nutrition of adolescents. The mean intake of energy and nutrients calculated were below FAO Standard with an exception of Vitamin C. Iron, folacin and calcium were most deficient in the diets of the adolescents. More than 50% of the adolescent females had acceptable values of plasma protein, albumin and globulin. The haematological and biochemical study revealed low level of anaemia of about 4% among the subjects investigated. The result of the analysis showed positive correlation between protein, vitamin C riboflavin, and albumin ($r = 0.95$, $p<0.01$ and $r = 0.27$; $p<0.05$). However, calcium intake correlated negatively with haemoglobin level ($r=0.27$; $p<0.05$). The findings of the study offer an insight into the nutritional status of the adolescent females in Akwa Ibom State as applied to Nigeria.

Key words: Adolescent, anaemia, calcium intake, malnutrition

Introduction

Malnutrition among the adolescents particularly that related to protein is a major public health problem in Nigeria as majority of young people cannot afford enough to eat due to poverty. It is estimated that 60-70 percent of the youths are affected with sub-clinical symptoms (Eka, 1989). Quality food consumption level in Nigeria is quite low when compared with the levels of consumption in other countries, and both the intake of calories and protein had fallen short of minimum recommended requirements (World Bank, 1991).

Nutrition assumes and important role during adolescence because of the possibility of teenage pregnancy. Many malnourished adolescents become pregnant before reaching full physical and reproductive maturity, presenting risks to themselves and their infants. The percentage of women giving birth by the age of 18 is approximately 28 percent in Asia. In some countries such as Cameroon and Nigeria, 10 percent of girls become mothers before the age of 15, adolescents under the age of 18 are three times more likely to die during childbirth than women between the age of 20 and 29, (World Bank, 1991). Their infants are more likely to enter the world malnourished with lower birth weights from infants born to older mothers. But a reduction in the number of adolescent pregnancies is said to lower material and infants mortality rates (Ogunfeyitmi, 2002; Okonofua, 2001; WHO, 1993). The present study was therefore undertaken to evaluate the effect of dietary intake and haematological values on the nutritional status of adolescent females in Akwa Ibom State of Nigeria.

Materials and Methods

Four hundred and eighteen adolescent females aged 12-18 years from secondary schools were randomly selected from sixteen local government areas in Akwa Ibom State in Nigeria. The modified methods according to method of Science and Education (1978); Gronlund (1976) and Daniel (1974) were adopted for the selection of subjects. Blood was obtained by venipuncture and determination of haematological variables and plasma protein were carried out using methods reported by Jelliffee and Jelliffee (1989); AOAC (1984); Schalm *et al*. (1975); ICNND (1963) and Rendina (1981). The mean Standard deviations of energy, nutrients and biochemical variables were computed. The results were compared with FAO/WHO (1988) allowances and biochemical references standard (Caliendo, 1979). Simple correlation coefficients between energy, nutrients intake and biochemical variables were obtained (Steel and Torrie, 1980).

Results

Dietary intake: Table 1 summarizes the energy and nutrient intakes of the adolescent females studied. Sixty six percent of the subjects had the energy intake between 100-67% FAO/WHO Standard. The means intake of protein was 72% FAO/WHO. The intake of iron was poor with a value of 50% FAO/WHO. The intake of folacin and calcium were also noted to be poor. Twenty-eight percent, 12% and 31% of the subjects had iron, folacin and calcium between 100-67% FAO/WHO standard respectively. Sixty-seven percent is two-third and is greater than a half. Pao (1981) suggesting that

Table 1: Energy and Nutrient Intake of Adolescent Females Compared with Recommended FAO Intake Allowance

Energy and nutrient intake	Result value*	100-67% (FAO WHO Standard[1])
Energy (kcal)	1140+326.6	66
Protein (gm)	31.69+7.8	62
Iron (mg)	10.01+5.37	28
Vitamin C (mg)	148.29+80.29	90
Folacin (mg)	0.27+0.20	12
Nicotinic Acid (mg)	8.12+2.15	58
Riboflavin (mg)	1.05+0.79	72
Vitamin B_6 (mg)	1.34+0.76	33
Vitamin B_{12} (mg)	2.20+0.33	71
Thiamine (mg)	0.06+0.17	52
Calcium (mg)	340.47+34.17	31

*Means + SD (No. of subjects = 418) .[1]percentage of subjects
Legend:FAO = Food and Agricultural Organization
WHO = World health Organization

the means nutrient intake below 67% of RDA indicate problem nutrient, and below 67% in deficient status.
Thirty and forty percent of the subject had intake of nicotinic acid and riboflavin above FAO/WHO allowances respectively. About 35% had thiamine intake below 67% FAO/WHO. Sixty-seven percent had vitamin B_6 below 67% FAO/WHO. However, the dietary intake consumption of vitamin C was adequate.

Haematological evaluation: The summary of haematological evaluation is presented on Table 2. The mean and standard deviation values of plasma protein, and albumin and globulin were 7.30+1.74 gm/100ml; 4.0+1.26 gm/100ml and 3.3+0.72 gm/100ml respectively. More than 50% of the adolescent females had the acceptable values of plasma protein, albumin and globulin. However, 12%, 8% and 10% were deficient in plasma protein, albumin, and globulin<6.0 gm/100ml, <2.8gm/100m and 2.65gm/100ml respectively. More than 50% of the subjects were observed to have acceptable values of haemoglobin and haematocrit of 11-14.5gm/100ml and 38-48% respectively. However, forty percent of the subjects were noted to have low levels of haemoglobin and haematocrit. Four percent of the adolescent females studied were deficient in haemoglobin and haematocrit with the values less than 10.0 gm/100ml and 30% respectively indicating anemia.
Correlation Coefficient of energy, nutrient intake and haematological variables.
The correlation coefficients of nutrients intake and haemoatological variables result of the adolescent females is summarized on Table 3. There was significant and positive correlation between protein intake and albumin level. Significant and positive correlation was also noted between vitamin C intake and albumin level of the adolescent females in the study at P<0.01. However, significant and negative correlation

Table 2: Haematological Evaluation of Blood of Adolescent Females in Akwa Ibom State

Blood Variables	Result value*	Status Level% Acceptable
Total Plasma Protein	7.3+1.74	70
Albumin (g/100ml)	4.0+1.26	60
Globulin (g/100ml)	3.3+0.72	60
Haemoglobin Hb (g/100ml)	13.33+1.06	60
Haematocrit (PCV) %	40.44+4.67	60

* Means + SD

was observed between the intake of vitamin B_6 and haemoglobin level. Calcium intake also correlated significantly negative with globulin ($r = -0.29$, $p<0.05$). Also significant and negative correlation was noted between haemoglobin level and Vitamin B_6 intake ($r = -0.295$, $p<0.01$).

Discussion

Malnutrition may be found in adolescent population, which do not have access to adequate amounts and types of food. Inadequate intake energy in diets of adolescents has been reported Oguntona, (1987). This is in agreement with this study. The process of energy production involves several other nutrients in addition to those which yield calories. The last step of carbohydrate oxidation depends on a co-enzyme, thiamine pyrophosphate (TPP) which contains the thiamine. Riboflavin and nicotinic acid are also concerned with energy production. Flavin adenine dinucleotide and niacin adenine dincucleotideare also concerned with energy production.
The restricted diets consumed by many adolescents frequently contain inadequate amounts of vitamins and minerals. Iron deficiency is one of the most common nutritional deficiencies and adolescents are at special risk (Ogunfeyitmi, 2002). Rapid growth, coupled with a fast lifestyle and poor dietary choices, can still result in iron deficiency or anaemia. Teenage girls need to pay special attention to iron as their iron stores are depleted each month following menstruation. Iron is found in both red meat and non-meat sources, such as fortified breakfast cereal, bread and green vegetables. The body does not quite as easily absorb iron from non-meats. However, Vitamin C (found in citrus fruits and green leafy vegetables) enhances the absorption. In contrasts, tannins found in tea reduce the absorption of iron.
Calcium deficiency has also been reported to be common among the adolescent (Oguntona, 1987). This has serious implications for the future, with respect to bone health. For instance, osteoporosis is a bone disease that causes bones to become brittle and break very easily. Bone continue to grow and get stronger until the age of 30 with the teenage years being the most important for development. Vitamin D, calcium, and phosphorus are vital for this process and calcium rich

Table 3: Correlation Coefficients of Haematological Variables and energy, nutrient intake of Adolescents Females in Akwa Ibom State

Energy and Nutrient Intakes	Haematological variables[a]				Haematocrit (PCV)
	Total protein plasma	Albumin	Globulin	Haemoglobin	
Energy	NS[b]	NS	NS	NS	NS
Protein	NS	0.354	NS	NS	NS
Iron	NS	NS	NS	NS	NS
Vitamin C	NS	0.450	NS	NS	NS
Folacin	NS	NS	NS	NS	NS
Nicotinic Acid	NS	NS	NS	NS	NS
Riboflavin	NS	0.350	NS	NS	NS
Thiamine	NS	NS	NS	NS	NS
Vitamin B_6	NS	NS	NS	-0.295	NS
Vitamin B^{12}	NS	NS	NS	NS	NS
Calcium	NS	NS	-0.290	NS	NS

[a] all figures except those marked "NS"were highly significant; r = 0.354, P<0.01 r = 0.273, p<0.05. [b] 'NS' signifies not significant

food should be consumed on daily basis. The findings in the present study showed that the average iron and calcium intake of the adolescent females were lower than FAO/WHO allowance.

Biochemical changes usually occur after body tissue stores are depleted before composition of blood and urine and other tissues to reflect recent dietary intake (Caliendo, 1979). Dietary protein serves as the amino acids utilized for the synthesis of plasma protein. About 12% of the adolescent females were found to be deficient in total plasma and 18% found to have a low value of albumin. The low plasma protein may occur as a result of low protein intake over prolonged periods or may be present in disease conditions involving loss of protein in urine as a result of kidney disease. This may result in a net afflux of fluids, a condition known as oedema. Although this condition was not diagnosed among the adolescent females, however, the results showed that 4% of the subjects had albumin deficiency. Haemoglobin level < 10gm/100ml is an indicative of anaemia and 4% of the adolescent females in the study were considered to be anaemic. The values of haemoglobin for 40% of the subjects ranged between 12.0 and 12.4 gm/100ml. There should be iron therapy for those with haemoglobin less than 10 gml ml and a good supply of vegetables, meat, egg, milk and fruit is highly encouraged.

In the present study, albumin correlated positively significantly with protein intake. Low albumin level may be noticed in the malnutrition with low protein intake. Vitamin C plays an essential role in the intercellular substance that binds the body cells together. Vitamin C improves the availability of iron from the vegetable sources, which is useful in the treatment of anaemia. Positive and significant correlation was noted between vitamin C intake and albumin levels of the adolescent fames in the study.

The correlation that can be expected among the data obtained by dietary and biochemical variables may not be high. The failure of the joint methods to show more uniform agreement in all nutrients may be attributed partly to the fact that the dietary record or various possible reasons, is not truly a representative of routine eating habits. Furthermore, the result of biochemical tests for certain nutrients reflect current dietary levels, others correspond to a long-term deficiency. Blood levels may reflect stored reserves due to previous intake even in the face of present low dietary level. Altogether, it is best to interpret nutritional data jointly. Each present different aspects of some nutritional picture, and each is inadequate in itself to make the full appraisal.

The findings of the study offer the first real insight into the nutritional status of adolescent females over 12 years in Akwa Ibom State. The link between diet and health has long been established. From the foregoing results, it can be concluded that the adolescent females in Akwa Ibom State consumed liberal amounts of protein, Vitamins A. C, B_6 and riboflavin. The intake of iron folacin, calcium were most deficient in the diets. Four percent were anaemic. These deficiencies indicated the need for balanced diet with vitamins and mineral supplements. Nutrition programme in the school system should be given more attention.

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