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Research Article

Nutritional Status and Prevalence of Anaemia among In-school Adolescents in Urban and Rural Secondary Schools in Nsukka Local Government Area, Enugu State, Nigeria

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Abstract

The prevalence of malnutrition in Nigeria has been an age long problem. There is dearth of data on the magnitude of nutrition status and anaemia among adolescents in Nigeria; moreover there are consequential effects of iron deficiency anaemia. Iron deficiency anaemia is a major global and public health problem affecting many people. The study assessed the nutritional status and prevalence of anaemia among in-school adolescents of urban and rural communities in Nsukka local government area, Enugu State, Nigeria. A cross sectional study of stratified simple random sample by ballot without replacement was used to select 375 in - school adolescents (10-19 years) of government owned secondary schools in Nsukka Local Government Area. Socio-demographic, anthropometric, and health information were elicited with the use of validated questionnaire. Blood samples were obtained from 20% (75) of the sample size (375) to assess biochemical parameter (haemoglobin (Hb). Biochemical data was categorized with WHO standards to classify anaemic and normal subjects. Data was subjected to statistical analysis using Statistical Product and Service Solution version 21. Descriptive result was presented as frequency, percent, mean and standard deviation. Inferential analysis was performed with Pearson's correlation and chi-square, significant level was set at $p < 0.05$. Result showed that 69.3% of the respondents were females, while 30.7% were males. More (48.5%) of the respondents were in the age range of 14-16 years (middle adolescence). Result obtained from the Hb indicated that 25.3% of the respondents were anaemic. There was a statistical significant ($p < 0.05$) association between BMI class and iron status of respondents. The study shows that a substantial amount of the adolescents were underweight and had iron deficiency anaemia.

Keywords: Adolescents; Anaemia; Iron Deficiency; Haemoglobin; Prevalence

Introduction

The main nutritional problems affecting adolescent population include under-nutrition and iron deficiency anaemia besides other factors [15]. Most adolescents do not meet dietary recommendations for fruits, vegetables and calcium rich foods rather they have excesses of total fats, saturated fats, cholesterol, sodium and sugar [17]. One of the most important diet considerations during adolescence is an increase in the intake of iron-rich foods; as lean meats, fish, beans, dark green vegetables, nuts and iron-fortified cereals and other grains, crayfish, periwinkle and other sea foods, milk, uziza (black pepper), amaranthus, liver, pumpkin, African yam bean, Bambara nut, pigeon pea, dika nut (ogbono) all have some amounts of iron [6]. Haem iron (animal foods) are better absorbed than iron from non-animal sources (non-haem iron), though Vitamin C and other components found in vegetables enhance the absorption of non-haem iron [3].

Iron deficiency is the most prevalent nutritional deficiency and the most common cause of anaemia [1]. One is said to be anaemic when the haemoglobin level falls below the normal for individuals of his age and sex. Adolescents are especially vulnerable to anaemia due to rapid growth and development- their increased blood volume and muscle mass during growth and development, inadequate dietary intake and their chaotic way of eating [9]. Due to changes in the nutritional requirements of adolescents -at menarche in girls and as a result of the hormonal changes at puberty in boys - haemoglobin levels differ as a function of gender, age or stage of sexual maturity and increased body weight [16]. These raises their need of iron for building up haemoglobin; the red pigment in blood that carries oxygen, and for the related protein myoglobin, in muscle. In Nigeria, iron deficiency is mostly caused by parasitic infections, inadequate dietary intake, diseases, and menstrual loss especially chronic ones [8]. In a study at Orrissa, India correlating anaemia

with socio-economic status, it was observed that anaemia was high 43.1% in adolescent of lower socio-economic group than 4.1% of those in high socio-economic group [5]. Iron deficiency includes a whole lot of consequences like reduced work capacity, impaired body temperature regulation, impairment in behavior and intellectual performance, increased susceptibility to lead poisoning and increased resistance to infection.

The need for dietary iron in adolescence cannot be overemphasized, hence the need to assess the iron status of the study population as about 90% of total dietary supply of iron in Nigeria comes from plant [13]. This is also applicable to Nsukka area of Enugu state as more of plant foods are consumed, making haem iron not available.

Materials and Methods

Cross sectional survey was adopted for this study. The study involved male and female adolescents (10- 19 years) in government secondary schools of rural and urban communities in Nsukka local government area, Enugu state. Multistage sampling procedure was first used to stratify government established secondary schools in Nsukka local government area into rural and urban schools. According to the US bureau in [3] an urban area is a place that has a population density of 6,475 or more persons per square kilometer (2500 or more persons per square mile). Rural area according to national population council of 1991 is used to describe a community with a population of less than 5000. Based on these criteria, there were 22 rural and 8 urban secondary schools in Nsukka. Thirty percent of the schools was chosen for this study. These schools were selected by balloting without replacement

$$\frac{30 \times 22}{100} = 6.6 \approx 7 \text{ rural schools}$$

$$\frac{30 \times 8}{100} = 2.4 \approx 2 \text{ urban schools}$$

A Preliminary visit was made to Nsukka Local Government Post Primary School Management Board was visited with an identification letter obtained from the Head of Department, Department of Home Science, Nutrition and Dietetics to obtain the total number of government secondary schools in the area. The principals of the selected schools were also visited to obtain permission to carry out the study before eventually entering into the field. A random sampling technique by balloting without replacement was used to select study participants from the nine secondary schools for both questionnaire administration and biochemical analysis. In each school, the class registers for the different classes was used to obtain the total number of students in each class that fell within the expected age range (10-19 years).

Inclusion criteria

Secondary school adolescents 10-19 years of age that sailed the hurdle of the exclusion criteria were used in this study.

Exclusion criteria

Students with sickle cell disease, female adolescents who are menstruating, students in examination class of Senior Secondary School were excluded from the biochemical analysis.

Ethical consideration and informed consent

An ethical clearance was obtained from the Health, Research and Ethics Committee of University of Nigeria Teaching Hospital Ituku - ozalla, Enugu state. Consent to participate in the study was obtained from the respondents by giving them a consent form after a detailed explanation of the study protocol had been given. Only the respondents who consented that were recruited for the study.

Data collection method

A Structured questionnaire titled: Nutritional status and lifestyle behaviour assessment of secondary school adolescents in rural and urban communities of Nsukka local government area, Enugu state" was developed and validated by lecturers in the Department of Home Science, Nutrition and Dietetics, University of Nigeria, Nsukka. The questionnaire gave information on the socio-demographic characteristics of the study population, food consumption pattern, food consumption frequency, dietary diversity of the respondents. The questionnaire was a combination of self-administered and interviewer administered method as the section C was interviewer administered.

Anthropometric measurements

All anthropometric data were collected following standard norms set up by WHO, as a height meter graduated in centimetres was used for height measurement, and respondents' height was taken with their shoes removed; both feet parallel to each other and with the heels, buttocks, shoulders and back of head touching the height meter. The head were kept comfortably erect, with the lower body of the orbit in the same horizontal plane as the auditory meatus. Height measurement was read to the nearest 0.1m after converting from centimetre to metre.

Also, weight measurements were taken using Hanson's bathroom weighing scale, graduated in kilograms with a capacity of 120kg. With no shoes on and with minimal clothing, the respondents were made to stand at the centre of the platform of the weighing scale without touching or leaning on anything. With head held erect and arms hanging by the sides, readings were taken to the nearest 0.1kg.

Body mass index

Body Mass Index (BMI) is an international standard that is defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). The BMI of these adolescents was classified using the BMI for age Z-scores obtained from [7]. The classification for BMI for age of the respondents was classified into severe underweight (< -3 z-score), moderate underweight (< -2 and ≥ -3 z-score), normal (≥-2 and ≤+2 z-score), overweight (> +2 and ≤ +3 z-score) and obesity (> +3 z-score) respectively.

Blood sample collection, preservation and analysis

Venous blood sample of 2ml was drawn by a phlebotomist with disposable syringes to avoid contamination and infection. Blood samples were stored in EDTA tubes that contain anti-coagulant. All the laboratory results were classified with the normal provided by the laboratory.

Heamoglobin (HB) concentration was determined using cyanomethaglobin technique as outlined by Ochei and Kolhatkar (2008). Drabkin's solution which contains potassium ferricyanide, potassium cyanide and potassium dihydrogen phosphate was mixed with the haemoglobin. The ferricyanide forms methaemoglobin which is converted to cyanmethaemogloin by the cyanide. The cyanmethaemoglobin produces a colour which is measured colorimetrically.

Procedure

Whole blood (20 µl) was added to 4 ml of Drabkin's solution in a test tube in a 1:250 dilution. This was well mixed, allowed to stand for 10 minutes at room temperature and the absorbance was read with colorimetrically at 540 nm with Drabkin's solution as a blank.

$$\text{Heamoglobin (HB)} = \frac{\text{Reading of test}}{\text{Reading of standard}} \times \frac{\text{conc standard}}{4}$$

Statistical analysis

The data obtained was analyzed using Statistical Product and Service Solution (SPSS 21.0). Descriptive result was presented as frequency, percent, mean and standard deviation. Inferential analysis was performed with Pearson's correlation and chi-square, significant level was set at $p < 0.05$.

Results

Table 1.1a and 1.1b shows the socio-demographic and socio-economic information of the respondents. This table shows that 69.3% of the respondents were females while 30.7% were males. Majority of the respondents were in the age range of 14 -16 years of age and from junior secondary school three (jss3). More respondents were gotten from rural school as can be depicted from the 65.6% value as against 34.4% from urban schools, 99.2% of the respondents were Igbo indigenes while a minority as recorded by 0.8% were Yoruba's. Parents of the respondents were mostly traders as shown by the value of 53.1% and 37.1% for mothers and fathers respectively. Level of education attainment was mostly secondary schools for both fathers and mothers (43.7% and 39.7% respectively). The monthly income was on a low scale of 10,000 naira to 20,000 naira as denoted by a 36.6% for most of the parents.

Parameter	Frequency	Percentage
Sex		
Male	115	30.7
Female	260	69.3
Total	375	100.0
Age		
10-13yrs	70	18.7
14-16yrs	182	48.5
17-19yrs	123	32.8
Total	375	100.0
Class		
JSS 1	74	19.7
JSS 2	66	17.6
JSS 3	28	7.5
SSS 1	146	38.9
SSS 2	61	16.3
Total	375	100
Ethnic group		
Igbo	372	99.2
Yoruba	3	0.8
Total	375	100

Table 1.1a: Socio-Demographic Information of the Respondents.

Parameter Frequency Percentage
Mothers Occupation
Civil servant 74 19.7
Trader 199 53.1
Self-employed 80 21.3
Others 22 5.9
Total 375 100
Fathers' occupation
Civil servant 90 24.0
Trader 139 37.1
Self-employed 115 30.7
Others 31 8.3
Total 375 100
Education level of mother Frequency percentage
No formal education 39 10.4
Primary education 96 25.6

Secondary education 164 43.7
Post-secondary education 76 20.3
Total 375 100
Educational level of father
No formal education 41 10.9
Primary education 86 22.9
Secondary education 149 39.7
Postsecondary education 99 26.4
Total 375 100
Income of parents (₦)
10,000 to 20,000 135 36.0
21,000 to 30,000 52 13.9
31,000 to 40,000 54 14.4
41,000 to 50,000 26 6.9
51,000 and above 108 28.8
Total 375 100

Table 1.2b: Illustrates the occupation and education level of parents.

Table 2.1a shows the BMI class of the sample size while table 2.1b shows the correlation between BMI and iron status. There is a great level of significance between BMI and iron status of the respondents at p =.000. Table 3 shows the biochemical characteristics of the respondents**.** The prevalence of anaemia using haemoglobin test showed that 25.3% were anaemic. This was based on [18] recommended cutoff points of Hb ≥12 g/dl as normal and Hb value of ≤ 12g/dl as anaemic.

Class	Frequency	Percent
Underweight	89	23.7
Normal	278	74.1
Overweight	4	1.1
Obesity	4	1.1
Total	375	100.0

Table 2.1a: Shows the summary of BMI Classification.

		BMI Classification				Total	Pearson Chi-Square Value	p-value
		Underweight	Normal	Overweight	Obesity			
Iron	Normal	16	54	0	1	71	18.161[a]	.000
		22.5%	76.1%	0.0%	1.4%	100.0%		
	Below normal	1	2	1	0	4		
		25.0%	50.0%	25.0%	0.0%	100.0%		
TOTAL		17	56	1	1	75		
22.7%		74.7%	1.3%	1.3%	100.0%			

Table 2.1b: Shows the correlation between BMI and iron status.

Discussion

Education levels attained by parents were mostly secondary school; 43.7% mothers and 39.7% fathers respectively. Adolescents whose fathers had secondary education had a normal BMI of 70.5% and a prevalence of obesity to be 2%. This was not in concordance to what [11] found among in-school adolescents in Ondo state. In their work students whose mothers had secondary school education as the highest attainment had a very high prevalence of overweight and obesity. Generally, 1.1% of the respondents were overweight and obese respectively, a deviation from what was obtained in a study in Lagos state where 3.7% and 0.4% of adolescents were overweight and obese respectively [4]. Father's education level had a correlation with the BMI of the respondents at a p-value = 0.05. Body mass index class affects the haemoglobin level of individuals; hence the findings from this study showed that underweight adolescents have the greatest risk of being anaemic. This result was not in tandem with the study done in Jiangsu province, China among adult women where there was an inverse relationship between overweight/obesity and anaemia [19]. Classification of anaemia based on public health importance has four categories; prevalence rate ≤ 4.9% is of no public health problem, 5.0 - 19.9% is of mild public health importance, 20.0 - 39.9% signifies moderate public health problem and ≥40 is severe health problem [18]. In this study the prevalence of anaemia was 25.3%. This finding is in line with those reported from Kenya (26.5%) [12], Somali region of Filtu (23.66%) [10]. Studies conducted in the city of Porto in Portugal revealed a prevalence of anemia to be 2.6% in adolescents, with that rate being higher in girls (4.1%) compared to boys (1.0%) [16]. In developing countries like Nigeria, the situation is more serious and this could be attributed to our food consumption pattern, location or tribe, socio economic factors and health status. A study conducted in north-western Nigeria shows that the prevalence of anaemia among schoolgirls was of severe public health problem (47.5%) [14] whereas this study found anaemia to be of moderate public health problem (25.3%).

Conclusion

The problem of iron deficiency anaemia needs the collaborative effort of planners, policy makers and the community at large. Furthermore, with increasing age, adolescents' personal choices and preferences gain priority overeating habits acquired in the family, and they have progressively more control over what they eat, when and where thereby making themselves to be more susceptible to iron deficiency anaemia. Also, dietary sources of iron play a huge role in the iron status of the populace. There is a need to create more awareness of the haem sources of iron or what should be incorporated into non-haem sources to make it readily available for body absorption. Iron rich foods and dietary diversity should be considered.

Bibliography

1. Alton I. "Iron deficiency anemia in: Stang, J and Story, M., (edition)". *Guidelines for Adolescent Nutrition Services* 9 (2005): 101-108.

2. Amit M. "Vegetarian diets in children and adolescents". *Paediatric Child Health* 15.5 (2010): 303-314.

3. Ani PN., *et al*. "Prevalence of overweight, obesity and thinness among adolescents in rural and urban areas of Enugu state, Nigeria". *International Journal of Basic and Applied Sciences* 3.1(2014): 1-7.

4. Ben-Bassey UP., *et al*. "Prevalence of overweight and obesity in Eti-Osa LGA, Lagos, Nigeria". *Obesity Reviews* 8.6 (2007): 475-479.

5. Bullivy M., *et al*. "Haemoglobin status of non-school going adolescent girls in the three districts of orrissa, India". *International Journal of Adolescent Medical Health* 19 (2007): 395-405.

6. Ene-obong HN. "Eating Right". A nutrition guide,. Calabar: The university of calabar press (2001).

7. FANTA. "Anthropometry: children under" (2011): 5.

8. Federal Ministry of Health, Nigeria. Abuja, Nigeria (2005).

9. Finne E., *et al*. "Overweight children and adolescents- is there a subjective need for treatment". *International Journal of Public Health* 54.2 (2009): 112-116.

10. Gutema B., *et al*. "Anemia and associated factors among school age children in Filtu town, Somali region, Southeast". *BMC Hematology* 14.13 (2014): 4-7.

11. Mustapha RA and Sanusi RA. "Overweight and Obesity among In-school Adolescents in Ondo State, Southwest Nigeria". *African Journal of Biomedical Resources* 16 (2013): 205-210.

12. Nehma D. "Prevalence and determinants of anaemia among adolescent girls in secondary schools in Yala division Siaya district, Kenya". *Universal Journal of Food and Nutrition Science* 3.1 (2015): 1-7.

13. Nnam NM. "INACCG symposium: iron deficiency in early life, challenges and progress". Peru (2005).

14. Olumakaiye MF. "Adolescent girls with low dietary diversity score are predisposed to iron deficiency in Southwestern Nigeria". *Infant, Child and Adolescent Nutrition* 5.2 (2013).

15. Rita S. "Socio-demographic factors causing Anaemia in Adolescent girls in Meerut". *Health and Population Perspectives and Issues* 31.3 (2008): 198-203.

16. Romilda CA., *et al*. "Iron deficiency anemia in adolescents; a literature review". *Nutricionhospitalaria: organooficial de la Sociedad Espanola de Nutricion Parenteral y Enteral* 29.6 (2014): 1240-1249.

17. Sangi R. "California Nutrition and Physical activity guidelines for adolescents" (2013).

18. World Health Organisation. "The Global prevalence of anaemia in 2011". WHO. Geneva, Switzerland (2014).

19. Yu Q., *et al*. "Anaemia in relation to body mass index5 and waist circumference among Chinese women". *BMC Nutrition Journal* 12.10 (2013).