



## **Prevalence and Pattern of the Nutritional Status of Adolescents Attending Public Secondary Schools in Gokana, A Rural Community in Rivers State, Nigeria**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. All authors were involved in the design of the study. Authors RUO and EOA performed the statistical analysis, wrote the protocol, wrote the first draft of the manuscript and managed the literature searches. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Aims:** To evaluate the prevalence and pattern of malnutrition among adolescents in public secondary schools in a rural community.

**Study Design:** A school based cross-sectional descriptive study.

**Place and Duration of Study:** Public secondary schools in Gokana Local Government Area, Rivers State, Nigeria between August and October, 2016.

**Methodology:** A total of 300 adolescents between 10 and 18 years were recruited from students attending public secondary schools in Gokana Local Government Area of Rivers State using a two staged simple random sampling technique. Information from respondents was obtained using a pretested semi-structured interviewer administered questionnaire. The respondents' weights and heights were measured and used to calculate their body mass index (BMI). BMI was used to classify them into stunted, underweight, normal and overweight/obese adolescents using the 2007 World Health Organisation's reference population. Data analysis was done using the Statistical Package for Social Sciences (SPSS) version 20.

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**Results:** The prevalence of stunting, underweight and overweight/obesity in this study were 14.3%, 15.6% and 0.0% respectively. Male and older adolescents were more likely to be underweight and stunted compared to female and younger adolescents.

**Conclusion:** Acute and chronic under-nutrition is still a major problem among adolescents in rural communities in Rivers State unlike overweight / obesity. Our findings have implications for intensified nutrition programmes generally and specifically for adolescents at all levels of government.

*Keywords: Adolescents; malnutrition; public schools; rural; Rivers State.*

## 1. INTRODUCTION

Until recently, childhood and adolescents overweight and obesity were mostly associated with affluence and the developed world [1,2]. These conditions have however significantly increased in low and middle income countries (LMICs) over time [3]. As of 2011, children overweight remained highest in high income countries (15%) but was increasing rapidly in developing countries as shown by the estimated 7% and 5% prevalence in Africa and Asia respectively [4]. Overweight and obesity in children and adolescents now co-exist with underweight, stunting and wasting which historically were associated with LMICs [5]. The paradox of these two extremes often referred to as the “double burden of malnutrition” [6] co-existing and largely attributable to nutrition transition in developing countries, is a challenge to public health [7].

Although there is no consensus definition at its core, nutritional abnormality also referred to as malnutrition is primarily (but not exclusively) a function of the in-balance between caloric intake and expenditure but other factors can independently influence either the intake or expenditure of calories [8] and as such the spectrum of nutritional abnormality includes stunting, wasting, underweight and obesity. The World Health Organisation’s (WHO’s) definitions of childhood weight abnormality are as follows [9].

Stunting is defined as height for age < -2 standard deviation of the WHO Child Growth Standards Median (CGSM).

Wasting is defined as weight for height < -2 standard deviation of the WHO CGSM.

Underweight is defined as weight for age < -2 standard deviation of the WHO CGSM.

Overweight/Obesity is defined as weight for height > +2 standard deviation of the WHO CGSM.

Given the negative health outcomes associated with the double burden of malnutrition, it is especially important to fully understand its prevalence and pattern in school-aged adolescents. As besides the first year of life, adolescence defined as the transition between childhood and adulthood (usually between 10 years to 18 years), is the single most critical period of physical growth [10].

In the last three decades, the focus of international nutritionists on childhood under-nutrition and the related problem of how to feed the world’s burgeoning population especially children and adolescents [11]. Today, the World Health Organisation finds itself needing to deal with the new pandemic of obesity and its accompanying non communicable diseases, while the challenge of childhood malnutrition is still far from over [11].

In 2009, WHO estimated 155 million or one in 10 school-aged (5 – 17 years old) children worldwide to be either overweight or obese. In Africa, the estimated prevalence of childhood overweight increased from 4% in 1990 to 7% in 2011 and is expected to reach 11% in 2025 [4], while underweight was projected to increase albeit at a slower pace from 24% in 1990 to 26.8% by 2015 [12]. Overall as of 2004, the prevalence of overweight (including obesity) was 8.4% while for obesity alone; the prevalence was 1.9% [13].

Some workers (de Onis et al. [14]) did a systematic analysis in the year 2000, on nationally representative data derived from surveys conducted in developing countries and found that nearly one-third of the children in the developing world were either underweight or stunted and more than 30% of them suffered from micronutrient deficiencies. The United Nations University in collaboration with UNICEF in the year 2000 reported that more than 200 million school-age children were stunted and if no action was taken about one billion stunted

school children would be growing up by 2020 with impaired physical and mental development [15]. According to Wang and Lobstein in a study conducted in 2006, the prevalence of overweight and obesity among school-age children was rising in almost all industrialised countries with available research data, and in several lower-income countries [16].

Together, under-nutrition-related diseases, infectious diseases and obesity-related diseases contribute substantially to the burden of disease in low and middle income countries, of which Nigeria is one [17]. Impaired cognitive development and poorer educational achievement are the adverse effects of under-nutrition in adolescents and can result in a high risk of obesity in adulthood [18]. On the other hand, adolescent obesity is associated with serious health problems in adolescence and later adulthood, including a heightened risk of psychosocial morbidity, cardiovascular complications, type 1 and type 2 diabetes, impaired social integration and premature death [19]. Thus an increase in the prevalence of under-nutrition and over-nutrition in adolescents will potentially result in increased health cost in the next decade.

The neglect of the study of adolescent nutrition still persists in Nigeria and there are few studies focusing on nutritional health during this period of increased nutritional need [20]. A rural based study in south-west Nigeria on the relative height and weight of males and females aged 5 – 30 years found that more than 60% of males aged 13 – 16 years were stunted and the prevalence of underweight was highest during the adolescent periods in males aged 13 – 14 years (36.8%) and females aged 11 – 12 years (22.7%) [21].

This study therefore aimed at describing the prevalence and pattern of the nutritional status of adolescents from Gokana Local Government Area, a rural dwelling in Rivers State, South Southern Nigeria giving the peculiarities of the locality.

## 2. METHODOLOGY

### 2.1 Study Location

Gokana is one of the twenty three local government areas (LGA) of Rivers State with headquarters at Kpor. It has an area of 126 square kilometres and a population of 233,813

according to the 2006 national population census [22]. Given a projected annual population growth rate of 3% in this LGA, the estimated population for 2016 was 323,160 [23]. Gokana lies on the coastal low land of the Niger Delta in the South Eastern part of Rivers State. It is about 54 kilometres by road from Port Harcourt. The local government is made up of 18 communities and 17 electoral wards.

The LGA has a total of twelve public secondary schools with an estimated 9000 pupils in both junior and senior public secondary schools [23].

### 2.2 Study Population and Design

This was a school based cross-sectional study. The study population comprised adolescents between 10 and 18 years attending public secondary schools in the study area.

### 2.3 Sample Size Estimation

The sample size for this study was determined using the formula for single proportion.

$$n = \frac{Z_{\alpha}^2 pq}{d^2}$$

A minimum sample size of 267 was arrived at using the above formula with the assumption of 22.4% as the prevalence of malnutrition of school children and adolescents from a previous study [24] and at 5% tolerable margin of error at 95% confidence interval. Considering a non-response rate of 10%, the calculated sample size was adjusted to 294. However, 300 adolescents participated in this study.

### 2.4 Sampling Technique

The sampling technique used for this study involved two stages of simple random sampling;

The first stage involved the selection of six public secondary schools out of the twelve public secondary schools in Gokana L.G.A by balloting.

The second stage involved the random selection of 50 students from each school. A minimum of 8 adolescents were selected from each of the six class groups (Junior secondary 1 to senior secondary 3) using simple random sampling. The attendance register of each class was used as the sampling frame and the table of random numbers was used to select the study participants.

## 2.5 Data Collection

The research was conducted through administration of a semi structured interviewer administered questionnaire from 1<sup>st</sup> to 31<sup>st</sup> August 2016. Six trained research assistants were involved. Information on the sociodemographic, socioeconomic, physical activity and parental support index of respondents were obtained. The instruments for anthropometric measurements were a Seca<sup>®</sup> electronic bathroom weighing scale for weight and a stadiometre for height.

Participants wore only their school uniforms and were barefooted while their weights and heights were being measured. The height of each student was taken as the maximum vertical distance from the floor to the highest point on the skull (i.e. the vertex) while the head was held in the Frankfort plane. The students stood erect, barefooted, heels together, both heels touching the base of the stadiometre and arms hanging freely before height measurement was taken. Measurement of weight was to the nearest tenth of a gram while measurement of height was to the nearest tenth of a centimeter.

## 2.6 Data Analysis

Analyses were conducted using the Statistical Package for Social Sciences (SPSS) version 20. Summary statistics were generated and presented using frequency tables. Inferential statistics to test for associations between variables was done using the chi-square test. Level of statistical significance was set at 5%. The cut-off values of Body Mass Index (BMI) used for this study were from the 2007 World Health Organization's reference for adolescent BMI.

## 3. RESULTS

### 3.1 Socio-demographic Characteristics of Respondents

Three hundred adolescents were randomly selected for this study comprising 175 males (58.3%) and 125 females (41.7%). Completed interviews were conducted with 294 respondents giving an overall response rate of 98.0%. The response rate for the male and female adolescents was 97.7% (171 males) and 98.4% (123 females) respectively. Slightly more males (58.2%) than females (41.8%) participated in the

study. All respondents were of Ogoni tribe. Higher proportions of the interviewed adolescents (53.1%) were from families with 5 or more children from the same mother. The mean age of the respondents was  $14.59 \pm 2.19$  years. Fathers were mainly the head of households and most of the respondents were from a monogamous family setting (Table 1).

**Table 1. Socio-demographic characteristics of respondents**

| Variable                                | Frequency:<br>n = 294(%) |
|---|--------------------------|
| <b>Age group (years)</b>                |                          |
| 10 – 14                                 | 135(45.9)                |
| 15 – 18                                 | 159(54.1)                |
| <b>Gender</b>                           |                          |
| Male                                    | 171(58.2)                |
| Female                                  | 123(41.8)                |
| <b>Class group</b>                      |                          |
| J.S 1 – 3                               | 161(54.8)                |
| S.S 1 – 3                               | 133(45.2)                |
| <b>Number of children in the family</b> |                          |
| 1 – 4                                   | 138(46.9)                |
| 5 and above                             | 156(53.1)                |
| Mean age $\pm$ SD                       | 14.59 $\pm$ 2.19         |
| <b>Head of household</b>                |                          |
| Father                                  | 224(76.2)                |
| Mother                                  | 56(19.0)                 |
| Uncle                                   | 14(4.8)                  |
| <b>Family setting</b>                   |                          |
| Monogamous                              | 252(85.7)                |
| Polygamous                              | 42(14.3)                 |

### 3.2 Socioeconomic Characteristics of Respondents

The parents of the respondents were mainly semi-skilled (tailors, welders, mechanics etc.) and unskilled (petty trading, mason, bricklayers etc.) workers. A good proportion of the respondents (60.2) had television sets in their homes while those who did not have a generator set at home (52.7%) were slightly in the majority compared to those who had. Air conditioners (6.5%) and cars (14.3%) were uncommon properties in the homes of majority of the adolescents interviewed (Table 2).

### 3.3 Prevalence of the Nutritional Status of Respondents

The prevalence of underweight and stunting in this study were 14.3% and 15.6% respectively. None of the respondents were overweight or

obese. Mean BMI was  $18.36 \pm 2.80 \text{ kg/m}^2$  and mean height was  $1.55 \pm 0.11$  metres (Table 3).

**Table 2. Socioeconomic characteristics of respondents**

| Variable                     | Frequency:<br>n =294(%) |
|------------------------------|-------------------------|
| <b>Fathers' occupation</b>   |                         |
| Unemployed                   | 5(1.7)                  |
| Skilled worker               | 37(12.6)                |
| Semi-skilled                 | 191(65.0)               |
| Unskilled                    | 61(20.7)                |
| <b>Mothers' occupation</b>   |                         |
| Unemployed                   | 47(16.0)                |
| Skilled worker               | 5(1.7)                  |
| Semi-skilled                 | 93(31.6)                |
| Unskilled                    | 149(50.7)               |
| <b>Own television set(s)</b> |                         |
| Yes                          | 177(60.2)               |
| No                           | 117(39.8)               |
| <b>Own generator set</b>     |                         |
| Yes                          | 140(47.3)               |
| No                           | 154(52.7)               |
| <b>Own air conditioner</b>   |                         |
| Yes                          | 19(6.5)                 |
| No                           | 275(93.5)               |
| <b>Parents own car(s)</b>    |                         |
| Yes                          | 42(14.3)                |
| No                           | 252(85.7)               |

**Table 3. Prevalence of the nutritional status of the respondents**

| Variable                     | Frequency**      |
|------------------------------|------------------|
| Normal weight                | 248(84.5)        |
| Underweight                  | 42(14.3)         |
| Overweight/Obesity           | 0(0.0)           |
| Stunted                      | 46(15.6)         |
| Mean BMI ( $\text{kg/m}^2$ ) | $18.38 \pm 2.80$ |
| Mean height (Metres)         | $1.55 \pm 0.11$  |

\*\* Multiple Responses Applicable (MRA)

### 3.4 Pattern of the Nutritional Status of Respondents

A higher proportion of underweight (88.1%) and stunted (78.3%) adolescents were males. Also, older adolescents comprised majority of underweight and stunted respondents. Adolescents from homes with 4 children or less comprised a higher proportion of underweight pupils while those from homes with 5 or more children comprised a higher proportion of stunted respondents. Likewise, adolescents from monogamous settings suffered more stunting (58.7%) and underweight (88.1) just like those

whose parents were semi-skilled or unskilled workers (Table 4).

## 4. DISCUSSION

This study assessed the prevalence and pattern of malnutrition among adolescents attending public secondary schools in a rural community in Rivers State, Nigeria. The prevalence of underweight and stunting in this rural community based study was 14.3% and 15.6% respectively. This is similar to the Rivers State's prevalence of 11.4% and 16.1% for underweight and stunting respectively according to the 2013 Nigerian Demographic and Health Survey [22] and the prevalence of 17.3% (underweight) as observed by some authors in South Western Nigeria [25]. Other researchers have reported adolescents' underweight prevalence as high as 70% in some rural communities in Nigeria [26].

The trend of under-nutrition is not different in most African countries. A large scale survey on adolescent malnutrition by Manyanga et al. in seven African countries (Benin, Djibouti, Egypt, Ghana, Malawi, Mauritania and Morocco) revealed that the prevalence of under-nutrition ranged from 12.6% in Egypt to as high as 31.9% in Djibouti [27]. As in most low and middle income countries (LMICs), the prevalence of underweight and stunting is still considerably high in Asian countries. A study by Jafar and his colleagues among school aged children in Pakistan reported a prevalence of 29.7% and 16.7% respectively for underweight and stunting [28]. In developed countries, the scenario is different. A summary of international literature published since year 2000 and summarised by Van Niekerk et al. in 2014 revealed that under-nutrition in adolescents is not an issue in the developed countries of North America and most European countries [29]. Only in Turkey was the prevalence of underweight adolescents (12.8%) reported in this international summary [30].

It is instructive to note that no single case of overweight/obesity was reported in this study. This corroborates the findings of researchers who reported that the prevalence of childhood and adolescent overweight /obesity was low in rural communities in Nigeria [31]. It is apparent from findings in this study and many others that childhood and adolescent under-nutrition is the major nutritional problem in many rural communities in Nigeria, though childhood / adolescent obesity seems to be on the rise in many urban communities [25].

**Table 4. Pattern of the nutritional status of respondents**

| <b>Variable</b>                         | <b>Normal: n =248(%)</b> | <b>Underweight:<br/>n = 42(%)</b> | <b>Stunting:<br/>n = 46(%)</b> |
|---|--------------------------|-----------------------------------|--------------------------------|
| <b>Gender</b>                           |                          |                                   |                                |
| Male                                    | 133(53.6)                | 37(88.1)                          | 36(78.3)                       |
| Female                                  | 115(46.4)                | 5(11.9)                           | 10(21.7)                       |
| <b>Age grade</b>                        |                          |                                   |                                |
| 10 – 14                                 | 115(46.4)                | 19(45.2)                          | 14(30.4)                       |
| 15 – 18                                 | 133(53.6)                | 23(54.8)                          | 32(69.6)                       |
| <b>Class group</b>                      |                          |                                   |                                |
| J.S 1 – 3                               | 161(64.9)                | 28(66.7)                          | 28(60.9)                       |
| S.S 1 – 3                               | 87(35.1)                 | 14(33.3)                          | 18(39.1)                       |
| <b>Number of children in the family</b> |                          |                                   |                                |
| 1 – 4                                   | 106(42.7)                | 32(76.2)                          | 16(34.8)                       |
| 5 and above                             | 142(57.3)                | 10(23.8)                          | 30(65.2)                       |
| <b>Family setting</b>                   |                          |                                   |                                |
| Monogamous                              | 211(85.1)                | 37(88.1)                          | 27(58.7)                       |
| Polygamous                              | 37(14.9)                 | 5(11.9)                           | 19(41.3)                       |
| <b>Head of household</b>                |                          |                                   |                                |
| Father                                  | 187(75.4)                | 32(76.2)                          | 27(58.7)                       |
| Mother                                  | 51(20.6)                 | 4(9.5)                            | 4(8.7)                         |
| Uncle                                   | 10(4.0)                  | 6(14.3)                           | 15(32.6)                       |
| <b>Fathers' occupation</b>              |                          |                                   |                                |
| Unemployed                              | 6(2.4)                   | 10(23.8)                          | 3(6.5)                         |
| Skilled                                 | 24(9.7)                  | 5(11.9)                           | 6(13.0)                        |
| Semi-skilled                            | 148(59.7)                | 12(28.6)                          | 29(63.0)                       |
| Unskilled                               | 70(28.2)                 | 15(35.7)                          | 8(17.5)                        |
| <b>Mothers' occupation</b>              |                          |                                   |                                |
| Unemployed                              | 28(11.3)                 | 6(14.3)                           | 6(13.0)                        |
| Skilled                                 | 6(2.4)                   | 3(7.1)                            | 1(2.2)                         |
| Semi-skilled                            | 81(32.7)                 | 12(28.6)                          | 7(15.2)                        |
| Unskilled                               | 133(53.6)                | 21(50.0)                          | 32(69.6)                       |

As regards the pattern of adolescents' malnutrition, male adolescents had a higher prevalence of underweight and stunting in this study. This concurs with what has been reported by other workers in sub-Saharan Africa [31]. Reasons for this difference could include cultural beliefs about body image and higher levels of physical activity including harder chores and manual labour among adolescent boys in low and medium income countries than girls [32]. Also, the early exposure of some female adolescents to sexual relationship with its attendant monetary benefit could be a factor. This study also observed a higher prevalence of

stunting and underweight among the older adolescents.

There is a relationship between family size, family setting and head of households with the nutritional status of adolescents in this study. This may not be difficult to understand as large families usually put a lot of strain on the family income and as such little will remain to ensure food security for the family. Adeomi et al. [25] had noted that even in communities where farming is the major occupation, heads of large families may be forced to sell most of the food they produce on the farm in order to take care of

their large families. All these will result to limited food for the family with many children to take care of.

Adolescents from the lower socioeconomic class had a higher prevalence of underweight and stunting. This finding corroborates the report by previous researchers who have all highlighted the relationship between nutritional status and socioeconomic factors [14,20].

## 5. CONCLUSION AND RECOMMENDATION

This study revealed that acute and chronic under-nutrition is a major problem among adolescents in Gokana Local Government Area, Rivers State, South South Nigeria and that overweight and obesity are not much of a concern in this part of the country. Also decades of crude oil spillage have had tremendous negative impact on the sociocultural and socioeconomic life of the inhabitants of the study area.

Based on the above, we recommend creative and innovative programmes by state and local government authorities that will ensure that every child in public school gets a good meal during school hours, as this will help to improve the nutritional status of these children. The federal government should also fast track the on-going oil spillage clean up exercise so as to boost farming and other economic activities in these rural communities.

## 6. LIMITATIONS OF THE STUDY

One of the challenges encountered in the course of this study relates to the tense environment in which the study was carried out. The inhabitants of this area were very suspicious of strangers and tended to be aggressive due to several years of communal clashes. We were advised by some inhabitants of this area to steer clear of some very volatile communities such as Barako and Nwebiara and as such adolescents from these volatile communities were not part of this study.

## CONSENT AND ETHICAL ISSUES

Ethical approval for the study was obtained from the University of Port Harcourt Ethical Review Committee. Permission for the study was also sought from the local government authorities,

community leaders as well as authorities of the schools where the research was carried out. Informed consent was also obtained from the adolescents who participated in this study as well as their parents. The students and their parents were given health education on balanced diet based on the available local food staples.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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