

# Under-five malnutrition in a South-Eastern Nigeria metropolitan city

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## Abstract:

**Background:** Malnutrition (under and overnutrition) presents significant threats to child health. The co-existence of under and overnutrition in a population is increasingly being described in the literature .

**Objective:** To identify the prevalence of malnutrition among under-five children in Enugu metropolis.

**Methods:** A cross-sectional study of pre-primary school children conducted from January to May 2016. using stratified sampling technique. Caregiver-administered questionnaire was used to obtain relevant information. Weights and heights were measured using a standard weight scale and stadiometer/ length mat respectively. Wasting, stunting, overweight and obesity were determined based on the recommended WHO Growth Standard. Data analysis was done with SPSS version 20.0. The associations between nutritional status on one hand, and categorical variables such as age grouping, sex, socio-economic status, and maternal education were determined using chi square. . P-value < 0.05 were reported as statistically significant.

**Results:** Eighteen (2.4%) and 26 (3.5%) subjects were wasted and stunted respectively. Eleven (1.5%) subjects were overweight while another 11(1.5%) subjects were obese. Risk factors for undernutrition were maternal education and low socioeconomic class while risk factor for overnutrition was upper socioeconomic class..

**Conclusion:** There is a low rate of malnutrition in the area of study. However, sustained efforts must continue to prevent further rise and possibly eliminate the scourge of malnutrition.

**Keywords:** Malnutrition, Nigeria.

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## Introduction

Malnutrition has been defined as a pathological state resulting from inadequate or excess nutrition.<sup>1</sup> The spectra includes undernutrition due to insufficient intake of energy and other nutrients, overnutrition due to excessive consumption of energy as well as other nutrients and micronutrient deficiency due to insufficient intake of one or more specific vitamins or minerals.<sup>1</sup>

Malnutrition, in every form, presents significant threats to human health.<sup>5</sup> Undernutrition is estimated to contribute to more than one third of all child deaths, although

it is rarely listed as the direct cause.<sup>2</sup> The World Health Organisation (WHO) and United Nations Children's Fund (UNICEF) in 2013 reported that at least 99 million children were affected by undernutrition.<sup>3</sup> Among the survivors who are affected during the first two years of life, their ability to resist disease, undertake physical work, study and progress in school are all impaired.<sup>4</sup> The interaction between undernutrition and infection results in a vicious cycle of worsening illness and poor nutritional status.<sup>5</sup> Stunted growth and impaired cognitive ability can also follow poor nutrition in the early years of a child's life.<sup>5</sup> On the other hand, worldwide, an estimated 42 million children under the age of five years were affected by overnutrition as at 2013.<sup>3</sup> Rising rates of overnutrition worldwide have been linked to a rise in chronic diseases such as hypertension and type II diabetes.<sup>2,4</sup> Three stages of malnutrition have been clearly documented in literature to reflect the current global nutrition trend.<sup>6</sup> These stages correspond to epidemiologic and de-

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mographic patterns in an environment. First is the stage of undernutrition which is associated with a high prevalence of infectious diseases. The second stage represents a phase of receding undernutrition as epidemiologic and demographic changes associated with development occur. With development, increases in chronic diseases such as overweight and obesity characterize the third phase and undernutrition and infectious diseases become past problems.<sup>6</sup> Today, however, the burden of disease and malnutrition do not fit neatly into these classic stages but reflect a modified pattern, a fourth stage, referred to as the protracted polarized model, where infectious and chronic diseases co-exist over long periods of time.<sup>6</sup> This invariably, is paralleled by co-existence of undernutrition and overnutrition. Evidence of this has been documented in developing countries as diverse as China and South Africa.<sup>6</sup> This co-existence of undernutrition and overnutrition in a population has been referred to as the double burden of malnutrition.<sup>4</sup> Sadly, most developing countries may now be faced with this double burden of malnutrition. In Africa for instance, there is still high prevalence of undernutrition (14-45%)<sup>7</sup> while 7% of children were recently reported to be overweight.<sup>8</sup>

Although there seems to be a clear evidence of the double burden of malnutrition at the global level, most Nigerian studies had focused on one end of the spectrum- undernutrition. This study seeks to highlight the burden of both undernutrition and overnutrition among under-five children as well as the associated risk factors.

## **Methodology**

**Study area:** The study was conducted in Enugu North Local Government Area, Enugu, South East geopolitical zone of Nigeria. The estimated population is 310,171 persons with an under-five estimate of 51,641.<sup>9</sup> The under-five school enrollment rate for children aged one-five years is approximately 60% with a male-female ratio of one.

**Study design:** The study was a cross-sectional study.

### **Determination of sample size**

The minimum sample size of 782 was determined using standard statistical formula for prevalence rates.

### **Sampling method**

A stratified single stage sampling technique was used. There are 13 wards in Enugu North Local Government

Area with a total of 185 pre-primary (public and private) schools. One private and one public school were selected by simple random sampling from each ward. Samples were allotted to selected schools based on the total number of pupils in the schools, using the proportionate allocation method. With proportionate allocation, the sample size of each school is proportionate to the population size of the school. The allocated sample size for each school was re-allocated proportionately across pupils in the different classes. Within each class, the number of allotted pupils was selected randomly using a computer generated table of random numbers. A total of 749 children were recruited for the study as shown in Appendix I.

### **Selection of subjects**

The inclusion criteria were children aged 12-59 months who have lived in the study area for at least 6 months. Children with any known chronic debilitating illness that can affect growth such as sickle cell anaemia, HIV infection, chronic kidney disease and congenital heart defect were excluded.

### **Ethical considerations**

Ethical approval was obtained from the Health Research Ethics Committee of University of Nigeria Teaching Hospital Enugu. Approvals were also obtained from the Enugu State Ministry of Education and heads of the participating schools. Signed and/or thumb printed informed consent was obtained from the parents/caregiver.

### **Data collection**

Information regarding the subjects and their caregivers were entered into the questionnaire by the caregiver. Illiterate parents were encouraged to seek help from the subjects' class teachers' in completing the questionnaire. The socioeconomic status of the parents were determined based on Oyediji's classification.<sup>10</sup> Exclusive breastfeeding in this study was defined as breast milk only feeds for the first 6 months of life.<sup>11</sup>

### **Anthropometric Measurements**

A general examination was done prior to anthropometric measurements to identify any obvious anomaly. Anthropometric measurements were done twice. Discrepant readings necessitated a third reading. The average of the two closest readings was used for analysis. The z-scores of the anthropometric parameters of weight for height/

length (WH) and height/length (HA) for age were calculated using WHO Anthro software.<sup>12</sup> Weight was measured using a standardized digital weighing scale (OMRON HN289) to the nearest 0.1kg. Length was measured to the nearest 0.1cm, using a length mat (SECA 210), for children aged < 2 years. Height was measured to the nearest 0.1cm, using a stadiometer (SECA 213), for children aged 2-5 years.

### Data analysis

Data analysis was done with Statistical Package for Social Sciences (SPSS) version 20.0 (Chicago II). Frequency and percentage were used to summarize categorical variables such as the nutritional status, age category and socio-economic status while means and standard deviations were used to summarize continuous variables such as weight for height and height for age z-scores. The associations between nutritional status and categorical variables (age category and socio-economic status) were determined using chi square. All reported p-values <0.05 were taken as statistically significant. Results are presented in tables and charts.

### Results

Seven hundred and forty nine out of 782 recruited children were studied. An attrition rate of 4.2% was recorded and this constituted children whose parents did not return their forms or were absent on the scheduled day for measurements.

### Demographic characteristics of study subjects

Out of the 749 children, 379 (50.6%) were males while 370 (49.4%) were females. Seventy-seven (10.2%) and 244 (32.6%) children were aged 36-47 and 12-23 months respectively while 214 (28.6%) each were aged 24 -35 and 48-59 months. There were 658 (87.8%) respondents with complete data set for socioeconomic class. Two hundred and sixty-six (40.4%) respondents were from the upper socioeconomic class. Two hundred and six (31.3%) respondents were from the lower class while 186 (28.3%) were from the middle class.

### Anthropometric data of subjects

The mean WH and HA Z-scores for the different age groups is shown in Table I. The mean WHZ-score for children aged 12-23 months was  $-0.1 \pm 1.25$  while the mean HAZ-score was  $0.85 \pm 1.52$ . The mean WHZ-score for children aged 24-35 months was  $-0.02 \pm 0.96$  while the mean HAZ-score was  $0.40 \pm 1.49$ .

**Table I.** Descriptive statistics of anthropometric data

Age	N	Minimum Z score	Maximum Z score	Mean Z score	Std. Deviation
<b>12-23 months</b>	77				
WFH		-4.29	3.23	-0.10	1.25
HFA		-1.75	6.00	0.85	1.52
<b>24-35months</b>	214				
WFH		-2.91	5.23	-0.02	0.96
HFA		-3.81	6.60	0.40	1.49
<b>36-47months</b>	244				
WFH		-3.76	4.28	0.07	1.03
HFA		-4.42	4.66	0.40	1.25
<b>48-59months</b>	214				
WFH		-2.50	4.02	-0.11	1.08
HFA		-4.33	3.58	0.33	1.22
<b>Total N</b>	749				

WFH= Weight for height/length. HFA=Height/Length for age

### Nutritional status of study subjects

Six hundred and eighty-five (91.5%) children had normal nutritional status. The overall prevalence of malnutrition was 8.5%. Forty-four (5.9%) had a form of undernutrition while 22 (3%) had overnutrition. Eighteen children (2.4%) were wasted of which two (0.4%) were severely wasted. Twenty-six (3.5%) children were stunted. Eleven

(1.5%) children were overweight while another 11 (1.5%) were obese. Nutritional status and age

The nutritional status of the study participants according to age groups is presented in Table II. Stunting was found in 5.1% of subjects aged 24-35 months. Obesity was found in 1.9% of those aged 48-59 months while it was 0.9% in those aged 24-35 months. None of these differences were found to be statistically significant.

**Table II:** Nutritional status distribution according to age

Nutritional status	Age group (months)				p-value
	12 - 23	24 - 35	36 - 47	48 - 59	
Normal	70 (90.9)	199 (92.6)	225 (91.8)	191 (89.3)	
Wasting	4 (5.2)	2 (0.9)	6 (2.4)	6 (2.8)	0.21
Stunting	0 (0.0)	11 (5.1)	6 (2.4)	9 (4.2)	0.32
Overweight	1 (1.3)	1 (0.5)	5 (2.0)	4 (1.9)	0.51
Obesity	2 (2.6)	2 (0.9)	3 (1.2)	4 (1.9)	0.68

### Nutritional status and gender

Seventeen (4.5%) male children were stunted compared to nine (2.4%) female children. Four males (1.0%) were overweight compared to seven females (1.9%). Seven (1.8%) males were obese compared to four (1.1%) females. None of these findings were statistically significant.

### Nutritional status and maternal education

There were 725 respondents for mother's education. Two hundred and forty respondents (33.1%) had their highest level of education as primary school while 485 (66.9%) had at least post primary education. Wasting was found in five (2.1%) children whose mothers had only primary education compared to 13 (2.7%) children among those whose mothers had post primary education. There were two (0.8%) overweight children among those whose mothers had only primary education compared to nine (1.9%) overweight children among those whose mothers had post primary education. Obesity was found in three

(1.2%) subjects whose mothers had primary education while eight (1.6%) obese children had mothers with post primary education. These differences were not statistically significant. However, ten (2.1%) children whose mothers had post primary education were stunted compared to 13 (5.4%) stunted children among those whose mothers had primary education ( $p = 0.023$ , OR 0.379, 95% C.I 0.163-0.877).

### Nutritional status and socioeconomic class

Twenty-one out of 26 stunted and 15 out of 18 wasted children had complete data on socio-economic status. There were 13 (61.9%) stunted children from the lower socioeconomic class while eight (38.1 %) stunted children were from the upper socioeconomic class. Stunting was four times more common among children from lower socio-economic class ( $p = 0.004$ , OR= 3.74, 95% C.I: 1.52 – 9.17). The detailed of the comparison of the various nutritional status between upper and lower socio-economic classes is shown in Table III.

**Table III:** Nutritional status and socioeconomic class

	n (%)	P value	OR	95% C.I
<b>Wasting</b>				
Lower	3 (20.0)	0.06	0.30	0.08 – 1.06
Upper	12 (80.0)			
<b>Stunting</b>				
Lower	13 (61.9)	0.004	3.74	1.52 – 9.17
Upper	8 (38.1)			
<b>Overweight</b>				
Lower	2 (18.2)	0.354	0.48	0.10 – 2.25
Upper	9 (81.8)			
<b>Obesity</b>				
Lower	2 (18.2)	0.354	0.48	0.10 – 2.25
Upper	9 (81.8)			

### Nutritional status and exclusive breastfeeding

A total of 445 children were exclusively breastfed. Ten children (2.2%) who were wasted were exclusively breastfed compared to eight (3.0%) who were not exclusively breastfed. Eight (1.8%) children who were exclusively breastfed were overweight compared to two (0.7%) who were not. Obesity was documented in nine (2%) exclusively breastfed subjects compared to two (0.7%) who were not.

### Discussion

In this study, the prevalence of undernutrition was 5.9% with wasting accounting for 2.4% and stunting 3.5%. A previous study in 2004 recorded 10.1% 21.1% prevalence of wasting and stunting respectively among children aged 2-5years.<sup>13</sup> The study, however, did not include children who were less than two years and the anthropometric measurements were not interpreted using the recommended WHO 2006 standard since it was nonexistent then. In Kenya, Olack et al<sup>14</sup> noted prevalence rates of 2.7% and 47% for wasting and stunting respectively. The reported 2.7% rate wasting is similar to the index study. However, a very high rate of stunting compared to this study may be due to the fact that subjects were recruited following a period of violent crisis and also from a rural community only. The prevalence rate of overnutrition

among the studied children was 3% with overweight and obesity rates of 1.5% each. This prevalence of 3% compares to the global nutrition report on Nigeria which puts under-five overnutrition rate at 5%.<sup>15</sup> The observed rate of 3% in this study is in keeping with the Nigeria Demographic Health Survey finding which reported prevalence of 2.6% in the South-East where Enugu North Local Government Area is located.

In this study, there was no statistically significant association between nutritional status (undernutrition or overnutrition) and age of the study participants. This is in keeping with the study by Manyike et al<sup>16</sup> in Abakiliki, Ebonyi state in which similar findings were noted. Duru et al<sup>17</sup> in Imo state, also noted no statistically significant association between age and overweight. However, Bloss et al<sup>18</sup> in Kenya reported that study subjects in their second year of life were significantly at risk of stunting. There are conflicting reports in the literature regarding the role of gender on malnutrition.<sup>14</sup> In our study, no statistically significant association was found between nutritional status and gender. Duru et al<sup>17</sup> in Imo state, reported significantly more overweight males than females. It is posited that behavioural and cultural patterns play a role in this outcome.<sup>17</sup> However, Manyike et al<sup>16</sup> in Ebonyi State documented no significant association between stunting or wasting, and gender.

Many authors have documented the impact of socioeconomic status on nutritional status.<sup>18-20</sup> It was noted in this study that belonging to the lower socioeconomic class is an associated factor for stunting. Children from the upper socioeconomic class were significantly more overweight and obese. According to Onyire et al<sup>21</sup> in Abakiliki, South-East Nigeria, prevalence of stunting was higher in children of the lower socioeconomic class. It is believed that socioeconomic class can affect the quality and quantity of food available to children in the families.<sup>22</sup>

Children whose mothers' highest level of education was primary were significantly more stunted than children whose mothers had post primary education. Previous studies have documented that stunting were significantly higher among children of mothers with primary or no education.<sup>8, 17, 23</sup> The fact that the mothers with post primary education tend to have better health-seeking behaviour and are able to access and adhere to written medical instructions may explain this finding. Exclusive breastfeeding did not have any association with the nutritional status. This finding was corroborated by Onubogu et al<sup>24</sup> who looked at breastfeeding and nutritional status of under-fives using the Nigerian Demographic Health Survey data. However, only about half of the respondents provided information on breastfeeding in the first six months.

### Conclusion

The prevalence rates of undernutrition and overnutrition were 5.9% and 3% respectively. Nutrition programs addressing undernutrition among under-fives must continue and be expanded to include policies to prevent overnutrition and its attendant problems in the society.

### Limitation of the study:

Some data were collected by self-administered with or without an assistant. For uniformity, a researcher-administered questionnaire would have been more appropriate.

### Conflict of interest

None.

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