

1       **MAGNITUDE OF STUNTING AND UNDERWEIGHT AMONG HIV INFECTED**  
2       **CHILDREN IN A TERTIARY HOSPITAL SOUTH EAST NIGERIA: A PROSPECTIVE**  
3       **ASSESSMENT BETWEEN URBAN AND RURAL INHABITANTS**  
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7       **Abstract**

8       **Background:** Nutrition plays an important role in infections. Human Immunodeficiency virus  
9       infection and Acquired Immune Deficiency Syndrome, is commonly complicated by  
10       malnutrition, which results to severe illness. Malnutrition therefore needs to be taken into  
11       account to guarantee proper care for the HIV sero-positive child. There is paucity of data on the  
12       magnitude of malnutrition among HIV infected children in Nigeria. This study aims to determine  
13       the magnitude of malnutrition among HIV infected children at Federal Teaching Hospital Owerri  
14       and to compare the anthropometry of rural and urban inhabitants of children living with HIV.  
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16       **Methods:** A prospective study, in which one hundred and two HIV sero-positive children  
17       majority of whom are on HAART, aged 1-18 years were recruited consecutively over four  
18       months at the pediatric infectious disease clinic of the Federal University Teaching Hospital  
19       Owerri. Socio demographic variables were collected. Anthropometric characteristics; weight and  
20       height of each participant were measured using a stadiometer (RGZ-160 England). The weight  
21       and height were classified as normal, underweight, overweight, obese and stunted, normal and  
22       tall stature using CDC classification.  
23

24       **Results:** 102 Participants aged 1-18 years included 53 females and 49 males, 22.5% of children  
25       were underweight, 34.3% were stunted and 5.8% were obese. All forms of malnutrition both  
26       underweight and overweight were more common in children living in rural areas. 14 children  
27       from rural areas were underweight while 10 children from urban areas were underweight.  
28       Similarly, 3 children from rural areas were overweight as compared to 2 children from urban  
29       areas. Stunting was also more common among rural dwellers.  
30

**Conclusion:** Malnutrition is common among HIV infected children attending the paediatrics infectious disease clinic in Federal University Teaching Hospital Owerri. Appropriate nutritional care needs be provided for HIV sero positive children.

**Keywords:** Nutrition, HIV, Children, Malnutrition.

## Introduction

Worldwide, both malnutrition and human immunodeficiency virus (HIV) are highly prevalent, particularly in the sub-Saharan Africa region.<sup>1</sup> Among the estimated 38.4 million people living with HIV globally in 2021, 2.73 million were children aged 0-19 years.<sup>2</sup> In 2018, approximately 49 and 149 million under-five children were stunted and wasted, respectively, and more than 90% lived in low and middle-income countries.<sup>3</sup> The magnitude of stunting and wasting in Sub-Saharan Africa varies in the region by as much as 32% and 10%, respectively.<sup>4</sup> Nigeria accounted for 59% of all new child HIV infections in west and central Africa in 2016.<sup>5</sup> In 2018, the UNAIDS,<sup>5</sup> estimated that there were about 37.9 million (32.7 million - 44.0 million) people living with HIV 36.2 million adults and about 1.7 million (1.3 million - 2.2 million) children (<15 years).

Nigeria currently has the largest burden of paediatric HIV infection in the world, with an estimated 321,000 children living with the human immunodeficiency virus (HIV) in Nigeria as at 2010.<sup>6</sup> HIV/AIDS, poverty, and food insecurity are the main causes of these high under-nutrition problems.<sup>7</sup> Studies have shown that stunting, under-weight, and wasting are more prevalent among HIV infected children than uninfected children.<sup>8-10</sup>

HIV/AIDS is associated with nutritional deficiencies in infected children;<sup>11</sup> While under nutrition influences disease progression, increases morbidity and lowers survival of HIV infected persons.<sup>12</sup> Additionally, HIV/AIDS has enormous impact on food security of affected households;<sup>13,14</sup> especially when the most productive members of the family is affected, the household's economic capacities and the agricultural production are reduced, leading to a situation of food insecurity<sup>15</sup>

In malnourished children, lymphoid tissues are damaged, and CD4 T-cell concentration is decreased<sup>16</sup>. Deficiencies in vitamins and minerals contribute to oxidative stress, which can accelerate immune cell death<sup>17</sup> and increase HIV replication<sup>18</sup>. On the other hand, HIV infection increases the risk of malnutrition, because of a high pro-inflammatory cytokine activity which can cause growth impairment among children<sup>19</sup>. HIV-related opportunistic infections such as persistent diarrhoea or oral and oesophageal candidiasis have a negative impact on nutritional status among children<sup>20</sup>. HIV infection can also indirectly affect the child's nutritional status, when it has an impact on the child's social environment. Furthermore, poor weaning practices among HIV-infected mothers can also have an impact on the child's nutritional status<sup>21</sup>. Low weight-for-age has been reported in up to 50 % of untreated HIV-infected children in resource-limited settings<sup>22</sup>. Among children with severe malnutrition, mortality risk is three times higher in HIV-infected children than in non-HIV-infected children<sup>23</sup>. Therefore, nutritional care should be part of the pediatric HIV care.

The World Health Organization recommends that an asymptomatic HIV-infected child should increase his energy requirements by 10 %, compared to a non-infected child; this is extended to 20 to 30 % during symptomatic HIV infection or episodes of opportunistic infections, and up to 50 to 100 % when a severe malnutrition episode occurs<sup>24</sup>. A better understanding of this problem is necessary to improve HIV care in children, especially in sub-Saharan Africa.

Other covariates of child malnutrition have been documented including child level factors such as age and birth weight; maternal level factors such as maternal age and education; household level factors such as food insecurity and social economic status; and community level factors such as sanitation and environmental factors.<sup>25-27</sup> Therefore malnutrition is a key problem for HIV sero positive children, as it creates a vicious cycle worsening HIV disease by affecting the immune system negatively.

This study therefore aimed to determine the magnitude of malnutrition of HIV infected children at Federal University Teaching hospital Owerri, compare its prevalence among urban and rural dwellers and to further advocate that appropriate nutritional care is provided for children living with HIV.

## **Methods:**

### **Study design, period and setting.**

A hospital based prospective study. Conducted from April 2018 to July 2018 at the paediatric infectious disease clinic of FUTH Owerri Imo State. Owerri is the capital of Imo State in the South East Geopolitical Zone of Nigeria.<sup>28</sup> Imo state has an estimated population of about 3,927,563 with about 403,425 people living in Owerri.<sup>29</sup> The hospital is the major tertiary health care facility in the state which serves as a referral centre for those living in Owerri and the surrounding towns as well as neighboring states of Abia, Rivers and Anambra.

### **Inclusion criteria**

All HIV positive children aged 1-18 years whose parents consented to the study.

### **Exclusion criteria**

HIV positive children whose parents declined consent.

### **Study population**

HIV positive children aged 1-18years.

### **Sampling procedure**

One hundred and two HIV positive children that met the inclusion criteria were enrolled consecutively.

### **Data collection**

A structured interviewer administered questionnaire was developed and administered to parents and guardians, to obtain child's demographic data, mode of HIV transmission. Physical examination including anthropometry, (weight [kg], height[cm], mid upper arm circumference [MUAC][cm]) was done and documented.

### **Weight**

Weight of each participant was measured using a stadiometer (RGZ-160 England) after standardization using a known weight. The children wore only inner clothing without shoes and they stood on the weighing scale with their head erect and hands loosely hanging by their side. Reading was taken three times in kilogram and the average recorded. The measurement was taken to the nearest 0.1kg.<sup>30</sup>

### **Height**

Height was measured using a stadiometer (RGZ-160 England). They stood straight without their shoes on the stadiometer, with back on the board, both legs positioned together bringing the knees and ankles together, head held straight up and arms hanging by their side. The movable part of the head piece brought onto the uppermost point of the head and the readings were taken thrice in centimeters and the average recorded. The measurement was taken to the nearest 0.1cm.<sup>30</sup>

### **MUAC**

MUAC was measured using a measuring tape. The left upper arm of the children aged 24 – 60months were exposed. The circumference of the left upper arm was measured at the mid-point between the tip of the shoulder and the tip of the elbow (acromium and olecranon process respectively). The average of two readings was taken. Measurement was taken to the nearest 0.1cm.<sup>30</sup>

### **Data analysis**

The data collected was coded and imputed into Statistical Package for Social Sciences (SPSS) version 20.0. Frequency tables and figures were used to present relevant variables. Descriptive statistics (mean and standard deviation) was used to summarize quantitative variable (age and social class). Qualitative variables were summarized as proportions. The Chi-square test was used to compare associations between proportions.

### **Bias**

Several strategies were employed to minimize bias in the study. Selection bias was addressed by applying strict inclusion and exclusion criteria, ensuring that the study population was

representative of the broader pediatric population seen in the HIV clinic. Information bias was minimized through standardized data collection methods and the cross-verification of data sources. Measurement bias was minimized by taking average of multiple measurements and standardization of measuring equipments.

#### **Ethical approval**

Ethical approval was obtained from the ethics committee of Federal Medical Center Owerri. Informed consent of the parents and assent of 7 years and above child were gotten for the study.

## RESULTS

A total of 102 patients were recruited from April 2018 to June 2018. 53 were females while 49 were males. Majority (67) are rural dwellers. Majority (95) are on HAART as shown in table 1 below.

**Table I. Socio demographic Characteristics of participants**

Variable	Min	Max	Mean	SD
Age (years)	1	18	9.72	3.11
MAC (cm)	12.5	14.0	13.16	0.51

Variable	Frequency	Percentage
<b>Gender</b>		
Male	49	48.1
Female	53	52.0
<b>Place of Residence</b>		
Rural	67	65.7
Urban	35	34.3
<b>Age Band</b>		
0 -4	5	5.1
5-9	43	43.4
10-14	39	39.4
15 – 19	12	12.1
<b>ART Use</b>		
On ART	95	93.1
Not on ART	7	7.0

To determine the magnitude of malnutrition of HIV infected children at FUTH Owerri using BMI, it was observed that twenty three out of 102 (22.5%) of Children living with HIV seen at FUTH Owerri are underweight as depicted in table II

**Table II. Magnitude of malnutrition in Children Living with HIV**

<b>BMI Classification</b>	<b>Frequency</b>	<b>Percentage</b>
Underweight	23	22.5
Normal	69	66.9
Overweight	4	3.9
Obessed	6	5.8
Total	102	100

All forms of Malnutrition both underweight and overweight are commoner among children living with HIV in rural areas compared to urban dwellers, however this did not reach statistically significant level p-value 0.41 as displayed in Table III

**Table III. Nutritional status of Participants by Place of Residence**

<b>Nutritional Status</b>	<b>Place of residence n(%)</b>		<b><math>\chi^2</math></b>	<b>p-value</b>
	<b>Rural</b>	<b>Urban</b>		
Underweight	14 (20.8)	10 (28.6)		
Normal	46 (68.6)	21 (60.0)	2.9	0.41
Overweight	3 (4.4)	2 (5.7)		
Obessed	4 (5.9)	2 (5.7)		
Total	67 (100)	35 (100)		

Thirty two out of 102 (31.4%) of children living with HIV in FUTH Owerri are stunted as shown in table IV



**Table IV. Summary of Ht for Age Characteristics of CALHIV in FMC Owerri**

Height for Age	Frequency	Percentage
Stunted	32	31.4
Normal	66	64.7
Tall Stature	4	3.9
Total	102	100

Stunting is commoner among rural dwelling CALHIV compared to urban counterparts though this is not statistically significant as seen in table V

**Table V. Comparison of Ht for Age between Rural and Urban dwelling CALHIV**

Height for Age	Place of residence		$\chi^2$	p-value
	Rural	Urban		
Stunted	23 (34.3)	9 (25.7)		
Normal	43 (64.2)	23 (65.7)	2.86	0.24
Tall Stature	1 (1.5)	3 (8.6)		
Total	67 (100)	35 (100)		

## Discussion

This study aimed to determine the magnitude of malnutrition amongst HIV infected children aged 1-18 years attending the federal Teaching hospital Owerri Imo state South East Nigeria, and to compare the anthropometry of urban and rural dwelling children living with HIV.

The current study shows that 22.5% of the study population were underweight. Further more, 34.3% of participants were stunted. This is similar to the Ibadan study by Okafor et al.<sup>31</sup> Results in this study were also similar to those in the Oyo study by Fagbamigbe et al.<sup>32</sup>

Prevalence of underweight and stunting in this study were lower than the Central and West African study by Jesson<sup>33</sup> et al and Malawi study by Weigel et al<sup>34</sup> whom observed that almost

half and more than half of their study participants respectively were stunted and underweight. The differences in the results may be due to the fact that majority of the study participants in the current study were on HART and were not immunosuppressed, as compared to the Malawi study whom the participants were just initiating HART as at the time of the study.

This study also depicts that underweight and stunting were more common in rural than urban dwellers. This finding was similar to that by Alyson et al in the USA study.<sup>35</sup> This may be due to the fact that people living in rural communities face significant barriers to accessing prevention and treatment services for HIV. These communities have fewer options for health care. This means rural residents usually need to travel for health care, often with the added burden of transportation.

Health care providers in the rural areas may also lack the knowledge or training to treat HIV and often don't understand the complex medical needs of those living with HIV, which involves treating ongoing issues like malnutrition, depression, pain, and substance use disorder.

Rural communities may not have access to health insurance and financial resources like those in urban areas. Those with HIV need help paying for treatment if they don't have health insurance. People with the disease face negative beliefs about their condition due to stigma. When you live in a small, closely connected community, it could be difficult maintaining confidentiality while getting the care you need. This may result to refusal to get tested and treated. Some HIV/AIDS groups even avoid advertising their services in rural areas to avoid stigma.<sup>35</sup>

#### **Limitations of study**

This is a single center study. A multi center study may provide a broader view of magnitude of malnutrition in HIV infected children.

## Conclusion

Underweight and stunting are common in HIV infected children at FUTH Owerri. Stunting and underweight are also more common in rural areas than in urban dwellers. We therefore recommend that HIV infected children be given adequate nutritional care including micronutrient deficiency. Also, quality health care for rural areas regarding HIV diagnosis and treatment is advocated.

**Conflict of interest:** Authors declare no conflict of interest.

**Funding:** Study received no external funding

## Author contributions:

**Chinelo Vivian Okeke:** conceptualization of study, writing, expertise, review, data collection, data analysis, result interpretation, supervision.

**Victor Ikechukwu Ogoke:** writing, data collection, review, result interpretation.

**Maureen Anikpe Okumoko:** writing, review, result interpretation.

**Ann Oluchi Ikeabbah:** writing, data collection, review, data analysis

**Stella Ijeoma Umeh:** writing, review, data analysis

**Abbas Mohammed Abdulsalam:** conceptualization, writing, expertise, review.

**Oluwafunke Morounkeji Olugbade:** writing, review, data analysis

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