ORIGINAL ARTICLE

Nutritional Status of Young Children newly diagnosed with HIV-Infection at Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Nigeria

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ABSTRACT

Background: Poor nutrition contributes to deaths associated with the infectious diseases especially among under-5 children in developing countries. The growth of young children could be impacted with increasing burden of HIV/AIDS and increasing food insecurity. This results in an increased malnutrition among this vulnerable group. **Objective**: To determine the nutritional status of children aged ≤5 years newly diagnosed with HIV infection in UDUTH, Sokoto. **Methods**: A prospective descriptive cross-sectional study among children aged ≤5 years newly diagnosed with HIV infection at the Paediatric units and Paediatric ART Clinic, UDUTH, Sokoto between January 1st, 2015 and December 31st 2019. The nutritional status was determined using WHO growth standards. The data were analyzed using SPSS version 22.0 and p-value ≤0.05 was taken as significant. **Results**: Sixty-seven children aged ≤5 years were diagnosed with HIV infection in UDUTH within the period. Twenty (30.3%) were aged 1.1 – 2.0 years with the mean age of 2.9(±1.4) years. The M:F ratio approximately 2:1. Forty-five (67.2%) were from lower socio-economic class. Sixteen (23.9%) were diagnosed using PCR for HIV-DNA. Forty-eight (71.6%) presented in clinical stage I. Twenty-three (34.3%), 24 (35.8%) and 12 (17.9%) of the children were stunted, underweight and wasted respectively. The rate of undernutrition was found to be significantly related to the age of the child (p=0.03) and socio-economic status of the family (p=0.02). **Conclusion**: The nutritional status of young children newly diagnosed with HIV infection was suboptimal and majority was stunted and underweight in our environment.

Key words: Nutritional, status, young, children, HIV-infection.

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Introduction

Young children are undergoing rapid physical and mental growth and adequate nutrition is needed for normal growth and development which are very prominent in this group.[1] Infant and young children nutrition is a cornerstone to adequate linear growth, development and healthy outcome in adulthood.[1,2]Undernutrition has negative impact on young children as they are in the process of active physical growth and mental development. It is responsible directly or indirectly to about 53% under-5 mortality worldwide annually in addition to physical

and mental handicaps on the survivors such as poor cognitive development, reduced human capital, premature death, cardiovascular diseases, and cancers etc.[3-5]Undernutrition and HIV infection are closely related as HIV infection causes undernutrition and undernutrition accelerates the progression of HIV disease, increases morbidity and lowers survival of HIV infected individuals.[3,6,7]

Undernutrition plays an important role in HIV-related morbidity and mortality.

It is associated with immunosuppression, predisposes to infections and increased mortality, hence, worsens the progression of HIV disease. Poor nutrition contributes to more than a third of deaths associated with the infectious diseases especially among under-5 children in developing countries.[3,6,8]

HIV/AIDS has enormous impact on food security of affected households which affects the optimal nutrition of under-5 children, hence their nutritional staus.[9,10]

The HIV infection affect child's health and survival directly via the infection among the children and indirectly through the mother's infection by HIV and resultant maternal death.

The nutritional consequences of HIV infection resulted in its initial description as slim disease. It has been estimated that over 90 per cent of children with HIV infection will experience delayed growth.

The major reasons include poverty, poor nutritional intake, chronic diarrhea, malabsorption and the HIV infection itself.

The interactions are relevant because of the significant geographical overlap between regions with high HIV prevalence and regions where food insecurity and undernutrition are also common.[11-14]

Both conditions are major health problem in the sub-Saharan Africa.

The rapidly fatal disease nature of HIV/AIDS has been converted to a rather chronic disease with the availability of anti-retroviral therapy (ART) and this has improved the survival of HIV-infected children.[15,16]

This has resulted in an increased challenge of managing various aspects of chronic care in children such as nutrition.

Efforts at reducing malnutrition and child mortality will depend in part on the ability of policymakers to address the health and nutritional status of all children including those affected or infected by HIV/AIDS.

The screening of under-5 children with severe acute malnutrition for HIV infection will help in identifying otherwise missed cases of HIV infections and increased uptake of HAARTs.

This, in addition to nutritional care among other measures, will increase the survival of under-5 children with HIV infection in particular and under-5 children in general.

With increased household food insecurity, and a greater disease burden associated with HIV/AIDS, the growth of children under-5 could be impacted, resulting in increased undernutrition and hence, increased morbidity and mortality for this vulnerable group.

The Northwestern part of Nigeria has been known for high prevalence of malnutrition and it is not left out in the HIV epidemics in Nigeria and sub-Saharan Africa as a whole. The study was, therefore, set out to assess the nutritional status and associated risk factor(s) among children aged 5 years and below who are newly diagnosed with HIV infection in UsmanuDanfodiyo University Teaching Hospital, Sokoto.

Materials and Methods

It was a prospective and cross-sectional study involving children aged 5 years and below who were newly diagnosed with HIV

infection at the Paediatric units and Paediatric Antiretroviral Therapy (ART) Clinic of UsmanuDanfodiyo University Teaching Hospital, Sokoto. The study was over a span of 5 years (between January 1st, 2015 and December 31st 2019). The hospital is a tertiary health facility in Sokoto, the Sokoto State capital. It serves as a referral centre for people in Sokoto, Zamfara, Kebbi and Niger States as well as people in the neighbouring Benin and Niger Republics.

Ethical approval was obtained from the Ethics and Research Committee of the hospital and consent (written and verbal) obtained from the caregivers of the children. The subjects were recruited consecutively as they were diagnosed and enrolled at the Anti-Retroviral Therapy clinic after appropriate pre- and post-test counseling done by the trained counselors at the Voluntary Testing and Counseling Unit in the hospital. The HIV infection was diagnosed with HIV-DNA assay using PCR machine for those aged <18 months; and 2 rapid tests kits (Uni-Gold™ and Determine™) concurrently according to WHO guidelines.[17]

The age, gender, weight, length/height of the children and level of education and occupation of both the parents/caregivers were documented. The weight of the children was measured to nearest 0.1Kg using the appropriate weighing scales following the standard procedures and their length or height were measured to the nearest 0.1cm using length measuring board (infantometre) for those aged 2 years or less and height measuring board (standiometre) for those aged more 2 years. They were also examined for the presence or absence of nutritional oedema. The nutritional status was determined using WHO growth standards.[17]Wasting was defined as weight for length/height < -2SD/z-score and severe wasting as weight for length/height < -3SD/z-score. Underweight was defined as weight for age < -2 SD/z-score while stunting was defined as length/height for age < -2 SD/z-score. The socio-economic status was determined using Ogunlesi's classification.[19]

The data were analyzed using SPSS version 22.0. The results are presented in frequency tables and appropriate charts. The p-value of 0.05 or less was taken as significant.

Results

Sixty-seven children aged 5 years and below were newly diagnosed with HIV infection in the Paediatric Units and Paediatric ART clinic of Usmanu Danfodiyo University Teaching Hospital, Sokoto within the study period. Twenty (29.8%) were aged 1.1 – 2.0 years with the mean age (±SD) of 2.9±1.4 years as shown in figure 1. There were 43 (64.2%) and 24 (35.8%) females with an approximate M:F ratio of 2:1 as depicted in figure 2. Figure 3 shows the distribution of socio-economic background of the subjects with 45 (68.2%) of the children from lower socio-economic class. All the cases were acquired perinatally. Sixteen (23.9%) and 51 (76.1%) were diagnosed using polymerase chain reaction machine for HIV-DNA assay and rapid antibody tests respectively. Forty-eight (71.6%) presented in clinical stage I, 7 (10.4%) stage II, 5 (7.5%) in stage III, and 7 (10.4%) in stage IV.

Thirty-seven (55.2%) of the under-5 with HIV-infection were well-nourished while 30 (44.8%) had a form or more of undernutrition at diagnosis. Among the undernourished, 10 (33.3%), 7(23.3%) were aged 1.1 – 2.0 years, 2.1 – 3.0 years and < 1year respectively as shown in Table I. Twenty-four (80%), 4 (13.3%) and 2 (6.7%) were from lower, middle and upper socio-economic backgrounds respectively. The rate of undernutrition was found to be significantly related to the age of the child

(p=0.02), socio-economic status of the family (p=0.02) and clinical stage of the disease (p=0.0001) as shown on Table 1. Twenty-three (34.3%), 24 (35.8%) and 12 (17.9%) of the children were stunted, underweight and wasted respectively. Table 2 depicts the association between the forms of undernutrition and variables such as the age, socio-economic background and clinical stage of the disease. The rate of stunting was significantly associated with the clinical stage of the disease (χ^2=20.6, p=0.0001). The rate underweight was significantly associated with the age of the child (χ^2=19.3, p=0.001) and the clinical stage of the disease (χ^2=47.5, p=0.0001) while the rate of wasting was found to be significantly associated with the age (χ^2=27.7, p=0.0001) and the clinical stage of the disease (χ^2=38.8, p=0.0001).

Table 1: Age distribution of the rate of Undernutrition among HIV-infected Young Children in UDUTH, Sokoto.

Age Groups (years)	Number	Percentage
< 1.0	7	23.3
1.1 – 2.0	10	33.3
2.1 – 3.0	7	23.3
3.1 – 4.0	4	13.4
4.1 – 5.0	2	6.7
Total	**30**	**100**

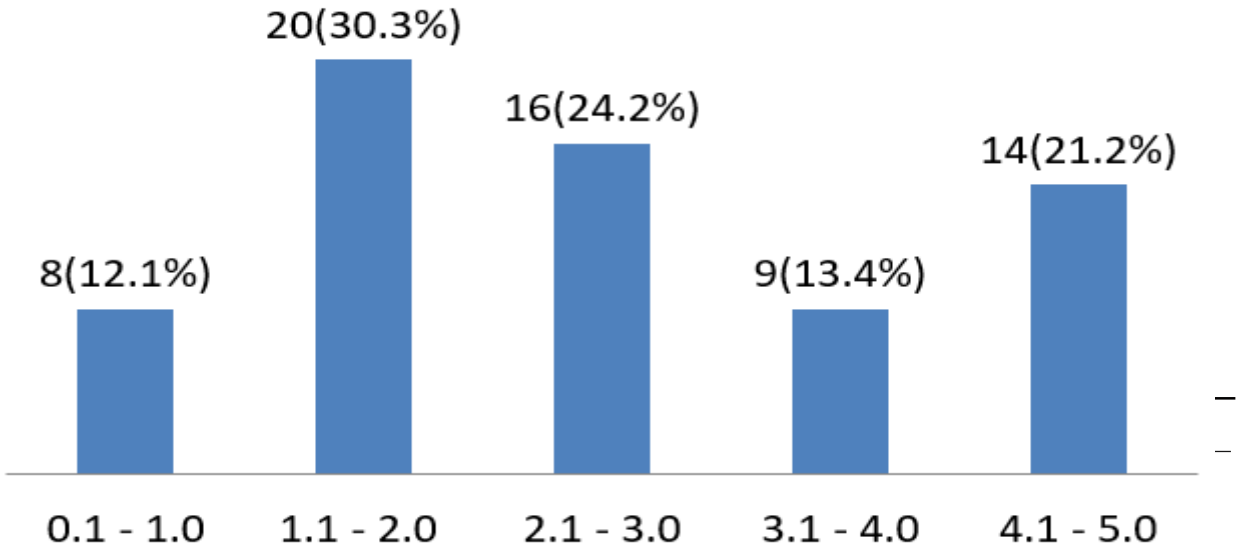

Figure 1: Age distribution in years

Table 2: The Association between Undernutrition and some Clinico-demographic Parameters of HIV-infected Young Children in UDUTH, Sokoto.

Variables	Nutritional Status		Total
	Normal	Undernutrition	
Age (years)*			
< 1	1	7	8
1.1 – 2.0	10	10	20
2.1 – 3.0	9	7	16
3.1 – 4.0	5	4	9
4.1 – 5.0	12	2	14
Total	**37**	**30**	**67**
Gender£			
Male	21	22	43
Female	16	8	24
Total	**37**	**30**	**67**
Socio-Economic Class+			
Upper	-	2	2
Middle	15	4	19
Lower	22	24	46
Total	**37**	**30**	**67**
Clinical Stage±			
I	37	11	48
II	-	7	7
III	-	5	5
IV	-	7	7
Total	**37**	**30**	**67**

NB: *χ^2 =11.44, p= 0.02; £ χ^2 =1.62, p= 0.20; + χ^2 =8.09, p= 0.018; ±χ^2 =32.7, p= 0.0001

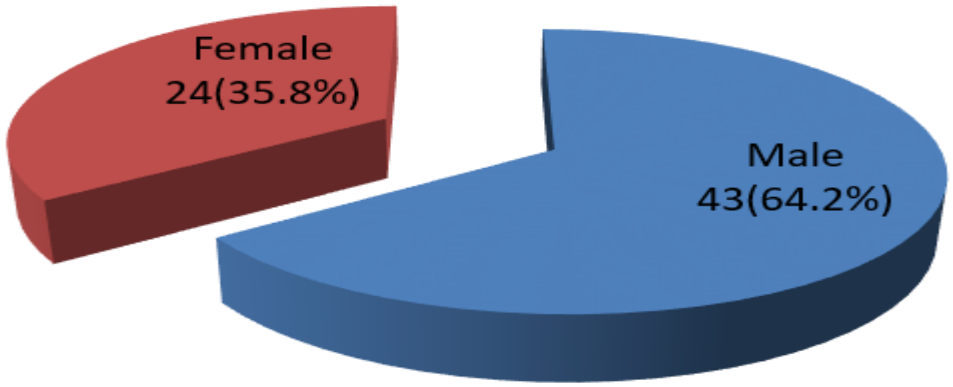

Figure 2: Gender Distribution

Table 3: The Association of Age with Forms of Undernutrition among newly HIV-infected Young Children in UDUTH, Sokoto.

Age Group (years)	Forms of Undernutrition		
	Stunting*	Underweight+	Wasting±
< 1	3	7	6
1.1 – 2.0	7	10	6
2.1 – 3.0	7	5	-
3.1 – 4.0	4	2	-
4.1 – 5.0	2	-	-
Total	**23**	**24**	**12**

NB: *χ^2 =6.4, *p*= 0.63; + χ^2 =19.3, *p*= 0.001; ±= χ^2 =27.7, *p*= 0.0001

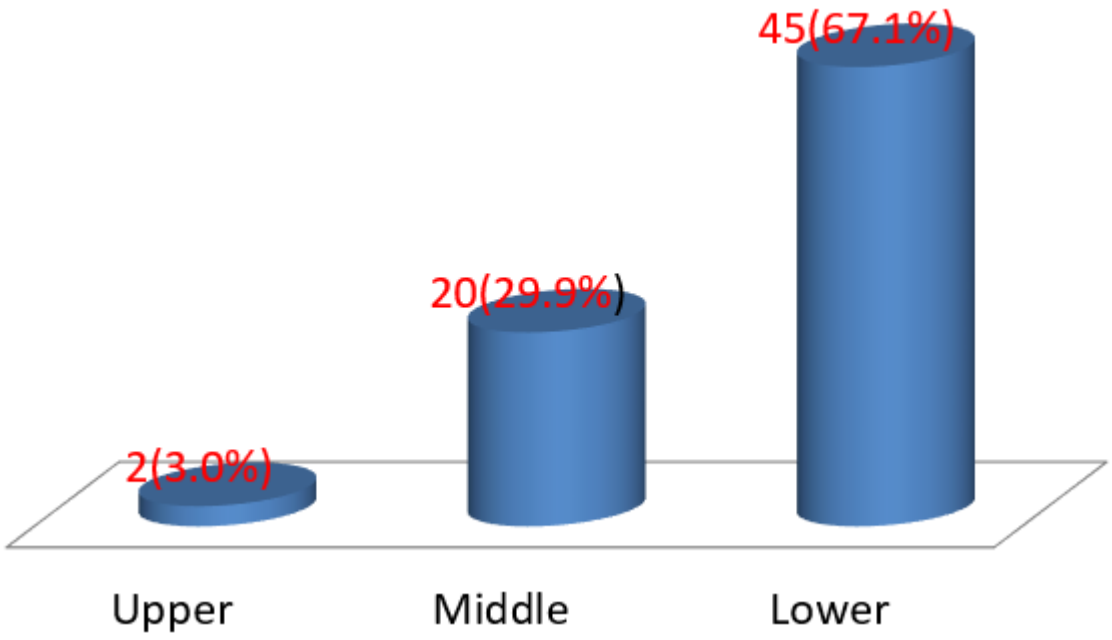

Figure 3: Distribution by Socio-economic class

Table 4: Association of Socio-Economic Status with Forms of Undernutrition among newly HIV-infected Young Children in UDUTH, Sokoto.

SEC	Forms of Undernutrition		
	Stunting*	**Underweight+**	**Wasting±**
Upper	2	2	1
Middle	3	3	3
Lower	18	19	8
Total	**23**	**24**	**12**

NB: *χ^2 =8.01, p= 0.09; + χ^2 =7.64, p= 0.02; ±χ^2 =1.44, p= 0.49

Table 5: Association of between Clinical Stageand Forms of Undernutrition among newly HIV-infected Young Children in UDUTH, Sokoto.

Clinical Stage	Forms of Undernutrition		
	Stunting*	**Underweight+**	**Wasting±**
I	9	5	2
II	5	7	2
III	5	5	1
IV	4	7	7
Total	**23**	**24**	**12**

NB: *χ^2 =20.6, p= 0.0001; +χ^2 =47.5, p= 0.0001; ±= χ^2 =38.8, p= 0.0001

Discussion

HIV infection is a risk factor for undernutrition and undernutrition accelerates the progression of HIV disease and both conditions are prevalent in sub-Saharan Africa, Northwestern Nigeria inclusive. This study has demonstrated the nutritional statuses of the newly diagnosed HIV-infected young children seen in UsmanuDanfodiyo University Teaching Hospital, Sokoto. Majority of the children were from lower socio-economic class with poor educational background. This is in consonance with earlier reports in the literature.[12-15]It is a reflection of the poverty level in the study area and indeed sub-Saharan Africa. This portends food insecurity at home, risk of recurrent illnesses such as diarrhoea, respiratory tract infections; and

hence, undernutrition. In this series all the cases of HIV infection acquired the infection perinatally. This is similar to the earlier reports in the literatures as about 95% of Paediatric HIV infection is via mother-to-child transmission.[16,17]

HIV infection is a recognized risk factor for undernutrition; and undernutrition enhances the progression of the disease especially among under-5 children. In this study the prevalence of undernutrition was 44.8%. This is high but not unexpected as HIV is associated with undernutrition which is a known clinical feature of HIV infection. Undernutrition is one of the major health problems in the study area and indeed sub-Saharan Africa as a result of the prevalent risk factors such as poverty, ignorance and recurrent infections as depicted in this series. The majority of the HIV infected in this series was observed to be well-nourished. This may be related to early presentation or could be that the majority of the cases are the slow progressive type. The prevalence of stunting, underweight and wasting in this series were 34.3%,35.8% and 17.9% respectively. The findings of stunting and underweight are similar to the findings reported among HIV-infected children by Sunguya *et al*[20] in Tanzania but however, lower to those reported by Nalwoga *et al*,[21] Kimani-Murage *et al*[22] and Ambey *et al*[23] in rural Uganda, South Africa and central India respectively. This may not be unconnected to the number of cases and the higher prevalence of paediatric HIV-infection in these study areas. The poor nutritional status, especially stunting and underweight, demonstrated in this study suggests that chronic malnutrition is seen in HIV-infected young children than acute malnutrition. This is due to the impact of HIV-infection on young children as it affects the nutritional intake and availability of nutrients for body use over a long period of time. HIV-infection exacerbates the effect(s) of food insecurity on young children living in poverty-ravaged community as demonstrated in this study. It can affect the child's nutritional status and health directly through lowered which predisposes to recurrent infections such as diarrhoea, pneumonia etc. or indirectly through maternal deprivation.[25-27] The high prevalence of stunting among these children may later have effect on their cognitive development and indirectly productivity of the community in the future. This will require a long term planned interventions in the community in order to reduce the poor health and economic outcome in the community and continent at large. A better well-planned food and nutritional strategies will enhance a healthy and self-reliant community. Socioeconomic factors, age of the child at presentation and the clinical stage of the disease are some of factors found to be associated with the poor nutritional status of newly HIV-infected young children in the study area. This is similar to the earlier documented findings from previous studies from other localities such as East and Southern Africa and Asia.[21-24]

Both HIV and undernutrition worsen the immunity of the children which further increases their susceptibility to recurrent infections such as diarrhoeal diseases, ARI which further reduces their chances of survival. In resource limited settings like Nigeria, this impact of HIV-infection on children is further compounded by poverty, food insecurity, poor infrastructures and limited access to basic health services. Improved access of HIV-infected children to antiretroviral treatment(ART) will help to reduce the negative impact of HIV infection on children's nutritional status.[28, 29]

In conclusion, the nutritional status of young children newly diagnosed with HIV infection is suboptimal with majority being stunted and underweight in our environment and factors such as poverty, child's age and the clinical stage at diagnosis are found to be associated with poor nutritional status. These findings are vital and underscore the need for a regular nutritional assessment of young children with HIV infection. More concerted efforts on early HIV testing for the exposed or at risk children followed by appropriate medical care with nutritional supplementation is therefore recommended in order to improve their nutritional status and their survival. Improved availability and utilization of prevention of mother-to-child transmission of HIV infection and effective interventions on maternal nutrition and child health are also important. Furthermore, efforts at family empowerment and poverty eradication should be pursued with more vigour.

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