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Research Article

Burden of HIV Infection in Children with Severe Acute Malnutrition at the University of Abuja Teaching Hospital Gwagwalada, Nigeria

Abstract

Background: Human Immunodeficiency Virus pandemic has adversely affected the nutritional status of many children in the sub region, an area where malnutrition is also endemic. The study was aimed at assessing the burden of HIV infection among under five with severe acute malnutrition, determine its common forms, the outcomes and associated co-morbidities.

Method: A three year prospective study (April 2011 to March 2014) of children aged 6 weeks to 5 years with diagnosis of severe acute malnutrition was carried out in our health institution for the above objectives. Data analysis was conducted using SPSS version 16.0 software and statistical significance set at $p < 0.05$.

Result: Of the 286 severely malnourished children studied, 142(49.2%) males, and 144 (50.3%) females, HIV sero-prevalence was 199 (69.6%, 95% CI = 63.5-76.3%) and highest in the first year of life 85(42.7%). Though uptake of provider-initiated HIV testing and counseling was 100%, 95.3% of positive children came in WHO stage 3 and 4 diseases. Persistent diarrhoea 58(29.1%), bronchopneumonia 53(26.6%), septicaemia 49(24.6%), pulmonary tuberculosis 39(19.6%), and oral candidiasis 35(17.6) were the common associated co-morbidities, with vesico-vaginal fistula 4 (2) being the least co-infection. Marasmus 161 (80.9%) was the major form of severe acute malnutrition in positive children, mortality was significantly higher in positive than in negative children (22.6.4% vs. 9.2%; P<0.001), however no difference was seen in those that left against medical advice (13.6% versus 11.5, p value <0.724 among the two groups.

Conclusion: Human Immunodeficiency Virus burden was high in children with severe acute malnutrition in our environment, mortality and those that were left against medical advice was also high. Marasmus was the commonest form of severe malnutrition in positive children, and provider initiated counseling should be offered to children at all service delivery points in the hospital and other levels of health services for early detection of HIV infection. Some co-morbidity even when rare could be useful indication for further evaluation for HIV.

Introduction

Worldwide, more than 3 million children are infected with (HIV) infection; the pandemic continues to plague many countries in the developing world, with sub-Saharan alone contributing to over 90% of the global burden [1]. Without treatment, mortality in HIV infected children is extremely high with more than half of infected infants dying before the age of 2 years, and median survival of only 23 months [2]. Nigeria which has the third largest burden of HIV globally has a sero-prevalence of 3.1% in 2012, with over 360,000 children below 15 years of age being infected [3,4].

Malnutrition affects over one-quarter of under five in the developing world and contributes a third of deaths (1–2 million per year) in this age group [5]. HIV and malnutrition often coexist; the two conditions are intricately interwoven, and there co-existence contributes substantially to higher co-morbidities and mortality in affected individuals. Prevalence of concurrent HIV infection in children presenting with severe acute malnutrition (SAM) is variable, with figures as high as 71.8% [6], and 29.2% in a meta-analysis of 17 large studies in sub-Saharan Africa [7]. SAM is defined by the World Health Organization (WHO) as a weight-for-height z-score of less than –3, or a mid-upper arm circumference (MUAC) of less than 11.5 cm in children aged 6 months to 5 years [8,9]. It can present as non-oedematous (marasmus) or oedematous disease (kwashiorkor or marasmic-kwashiorkor), with marasmus being more common in HIV-positive children [8,9]. Importantly, mortality from SAM is more than three times higher in HIV-positive children than their HIV-negative peers [7,10], in addition they have higher risk of infectious co-morbidities such as tuberculosis, respiratory tract infections, gastroenteritis, candidiasis and other complications like persistent diarrhoea and poor oral intake [7]. Poor growth is a one of the clinical manifestation of HIV infection in children. In the absence of treatment, their nutritional status is often severely compromised [10,11]. The beneficial effects of antiretroviral treatment (ART) on the nutritional status and growth of infected children have been well documented in both developed countries [12] and resource-poor settings [13,14] with significant improvements in height-for-age, weight-for-age and weight-for-height z-scores.

Despite the huge global burden of HIV infection, an estimated 80% of HIV infected adults in resource poor settings do not know their HIV status[15,16]. Uptake of Voluntary and counseling testing (VCT) services is relatively limited [15,16]. The uptake is even much lower in children when compared with adults, as demonstrated in a study by Akhigbe et al. [17], who reported uptake of only 3.5% in children less than 14 years in a primary health care center in Nigeria over a 3 year period. Many patients get to know their HIV status at a late stage in the disease [18,19]. Provider initiated testing and counseling (PITC) was introduced by the WHO in 2007 with the aim of increasing the uptake of HIV testing, improving access to health care services for people living with HIV and creating new opportunities for HIV presentation [20]. Diagnosis of HIV in children with SAM is very crucial considering similarity in the clinical presentation of the two disease conditions with associated high mortality and morbidity when both co-exist. The aim of the present study is therefore to assess the burden of HIV infection among under five with SAM, determine its commonest form, the outcome of such co-existence, and associated co-morbidities.

Materials and Methods

A prospective study of children aged 6 weeks to 5 years with SAM and admitted in the pediatric medical ward (PMW) of the University of Abuja Teaching Hospital (UATH) was carried out from April 2011 to March 2014. Ethics approval was obtained from the Ethics Committee of UATH and informed written down consent from the parents/caregivers of the children. UATH is a 350 bedded tertiary referral health care centre located in Gwagwalada, one of the area councils in the Federal Capital Territory (FCT), Abuja of Nigeria. The hospital serves its host community, Gwagalada, other parts of FCT, and the surrounding states which include Nasarawa, Kogi, Kaduna and Niger States. It is one of the first six centers that started offering free HIV services to HIV/AIDS victims in the country since 2005 through President's Emergency Plan for AIDS Relief (PEPFAR), courtesy of government of United States of America, in collaboration with the Federal government of Nigeria.

PMW is one of the units in the department of pediatrics that provides in-patient services to chronically ill patients and those recuperating from acute illnesses. All children admitted to the PMW with SAM, as defined by the WHO participated in the study. Exclusion from the study were those whose parents/ caregiver refuse to give consent in the study, those above 5 years or less than 6 weeks of age. An estimated sample size of 286 was calculated using HIV prevalence of 50% among malnutrition children. Recruitment was continued prospectively until the sample size was reached. The recruitment process was started within the first 24 hours of admission, after the attending medical team had completed their initial assessment and managed life threatening complications. For all eligible children, the study was explained to the parent or guardian, and written informed consent was sought. The child was then enrolled if the parent/ guardian consented.

PITC was offered to all children admitted with SAM as per the unit management protocol of the malnourished children. VCT officer was invited to offer pre- and post HIV counseling test for the parent/caregiver of the patient while on admission. Blood sample of the patients were collected and tested for HIV infection by a trained laboratory scientist using 2 rapid HIV antibody tests (Determine and Uni-gold). Deoxy-ribonucleic acid (DNA) polymerase chain reaction (PCR) was offered to children < 18 months of age when tested positive to antibody test. These children were deemed as HIV exposed and not necessarily infected until the DNA PCR test is positive before being categorizes as HIV infected. Parents of positive children were further counseled and tested for HIV infection themselves using antibody test. The anthropometric measurements of the patients was carried out by the admitting Doctor using beam weighing scale for the weight, standiometer or infantometer for the height or length, measuring tape for the head circumference, and Shakirs strip for the mid-arm circumference. Relevant laboratory, socio-demographic, and clinical data were also recorded in the case report form. Diarrhoea was assumed if the patient had frequent watery diarrhoea of greater than three in a day. A diagnosis of pulmonary tuberculosis (PTB) was made based on a combination of history of chronic cough of greater than 3 weeks duration, or contact with adult with chronic cough, and results from laboratory investigations (mainly chest radiograph, positive mantoux test, gastric aspirate for acid fast bacilli (AFB), and raised electrolyte sedimentation rate). A diagnosis of bacteraemia/ septicaemia was made if there was a positive blood culture isolate. Malaria was diagnosed only if malaria parasites were seen on blood film.

Patients were initially started on a starter formula, F-75 which contains 75kcal of energy and 0.9 grams protein per 100mls until the child is stable. F-100, a catch up formula for rebuilding wasted tissues was introduced as soon as the patient was stable which usually occurs between 2-7 days of commencing of F-75. It contains 100kcal of energy, and 2.9grams of protein per 100mls. HIV sero-positive children were treated and stabilized in PWM before referring them to paediatric out-patient special treatment clinic (POSTC) for enrollment, evaluation and commencement on anti-retroviral therapy (ART) for their HIV infections. Most patients are commenced on ART before discharged especially those that are not very ill on admission, or those that have stayed greater than 2 weeks on admission.

Data analysis was conducted using SPSS version 16.0 that produced frequencies, percentages, means, and standard deviations. The tests for associations and differences were done by student t-test, and statistical significance set at p value <0.05.

Results

HIV seropositive status and socio-demographics characteristics

A total of 286 children were recruited for the study. One hundred and forty two (49.2%) were males, and 144 (50.3%) females giving a male to female ratio of 1:1. Their mean age at recruitment was 19.55± 7.6 months, with the youngest being 3 months, and the oldest 57 months. One hundred and twenty six (44.0%) were below the aged 12 months, while only 10 (3.5%) were between the ages of 49-60 months. Their mean body weight was 6.9±4.6 kg, their length/ height was 70.06±21.55 cm, their head, and mid-arm circumference 43.23±3.7cm, and 11.30±7.7cm, while their WHZ score was -4.26-. PITC uptake was 100%. One hundred and ninety nine (69.6% 95%

CI = 63.8- 75.3%) of the recruited subjects were positive for HIV infection, with 189 (95.0%) being in WHO stage 3 & 4 disease, and sero-positive prevalence highest in the first year of life 85 (42.7%).The mean age of HIV sero-positive subjects was 15.7 months whereas that of HIV sero-negative patients was 23.4 months (p-value = 0.013). The mean WHZ for positive and negative children -4.51± 1.7 and -4.02 ± 2.1, (p =0.071). Thirty six (18.1%) of positive children were from high socio-economic class (SEC), no negative child was from high SEC, however 63 (72.3%) of them (the negative children) were from low SEC. Whereas 89 (44.2%) of mothers of HIV positive malnourished children are either divorced or widowed, only 20 (23.0%) of mothers of negative are divorced or widowed (p=0.04). Fourteen (4.9%) of the malnourished children studied were orphans, 11 (78.6%) were positive for HIV infection, and 3 (21.4%) were negative. All the 11 positive orphaned children were from the orphanage, 7 (63.6%) lost both parents, 4 (36.4%) were maternal orphans (Table 1).

Severe forms of malnutrition among the study population

Marasmus was statistically commoner in HIV positive children with SAM than in the negative ones in this study (80.9% Vs 14.9%, p> 0.001). Body weight and WHZ score were also statistically significant (4.4±1-8kg,-4.8, Vs 5.8±0.9kg, -4.6, p values: 0.025 for body weight and 0.043 for WHZ score) among the two groups, while their length/

Table 1: Baseline characteristics of under-five malnourished recruited children.

Characteristic	All malnourished child n = 286 (%)	HIV +ve n = 199 (%)	HIV –ve n = 87 (%)	p-value
Age Group in months 0.5-12.99	 126 (44.0)	 85 (42.7)	 41 (47.1)	 0.559
13-24.99	96(33.6)	57 (28.6)	39 (44.8)	0.067
25-36.99	35(12.2)	29 (14.6)	6 (9.0)	0.054
37-48.99 49-60	19(6.6) 10 (3.5)	18 (9.0) 10 (5.0)	1 (1.1) 0 (0.0)	0.072 0.065
Gender				
Male	142 (49.7)	97(48.7)	45 (51.7)	0.857
Female	144 (50.3)	102 (51.3)	42 (48.3)	0.718
Anthropometry at Recruitment ± SD				
Weight (kg)	6.51±4.65	6.24±4.04	6.82±5.95	0.506
Height/length (cm)	66.1±21.5	65.0±20.8	67.3±23.4	0.177
Head circum (cm)	44.23±3.7	44.02±4.1	44.32±3.0	0.927
Mid-arm Circum (cm)	11.30±7.7	11.17±6.0	11.46±5.8	0.506
Mean Z-score at recruitment SD				
Weight-for-height	-4.26 ± 1.2	-4.61 ± 1.7	-4.12 ± 2.1	0.041
Religion				
Christianity Islam	104(36.4) 182(63.3)	74(37.2) 125 (62.8)	30(34.5) 57(65.5)	0.378
WHO Disease stage				
Stage 1		1(0.5)		
Stage 2		9(4.5)		
Stage 3		125(62.8)		
Stage 4		64 (32.5)		
Mothers Marital status				
Married	169 (59.1)	104 (52.3)	65 (74.7)	0.029
Separated/Divorced Widowed	48 (16.8) 60 (21.0)	39 (19.6) 49 (24.6)	9 (10.3) 11 (12.6)	0.052 0.036
Single Polygamous Monogamous Socio Economic Status	9 (3.1) 94 (32.9) 75 (26.2)	7 (3.5) 72 (36.2) 32 (16.1)	2 (2.3) 22 (25.3) 43 (49.4)	0.226 0.071 0.065
Upper Middle Low	36 (12.6) 108 (37.8) 142 (49.7)	36 (18.1) 84 (42.2) 79 (39.7)	0 (0.0) 24 (27.6) 63 (72.4)	0.063 0.081
Values are means ± SD.				

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height and head circumference were not significant (64.8±18.9cm, 43.8±3.5 cm Vs 65.1±20.1 cm, 43.9±3-7 cm, P= 0.245, 0.227). Only one case (0.5%) of kwashiorkor was recorded. For the non-positive HIV subjects, marasmic kwashiorkor 35(40.2%) was the commonest form of SAM, followed by kwashiorkor 22(25.3%). The mean WHZ for 286 severely malnourished children in this study was -4.3 (SD =1.0). HIV positive subjects were significantly more wasted than the negative ones (-.4.6 Vs -4.0, p=0.041). Whereas mixed feeding 105(52.8%) was observed to be the leading form of infant feeding practice among mothers of positive children, predominate feeding 48 (55.2%) was commonest among infants of negative mothers, while exclusive breastfeeding (EBF) for up to 6 months of age was rare for both mothers. Introduction of complimentary feeding before the age of 6 months was also found to be common to both mothers, 107 (53.8%) for positive mothers, and 53 (60.9%) for the negative ones, p<0.05, so also was the use of unfortified plain pap for complimentary food being common to both mothers, 87 (43.7%) for mothers of positive children, and 41(47.2%) for the mothers of the negative ones, p<0.05, while use of infant cereal was rare for mothers of negative children, 1(1.1%) (Table 2).

Associated co-morbidities and outcome

The four commonest morbidities seen in HIV positive children include: persistent diarrhea 58 (29.1%), bronchopneumonia 53(26.6%), septicaemia 9(24.6%) pulmonary tuberculosis 39 (19.6%), and oral candidiasis35 (17.6). Vesico-vaginal fistula though not very common was seen in 4(2.0%) of positive cases. For the negative children, persistent diarrheoa 35(40.2%), septicaemia 26(29.8%), and malaria 17(19.5%) were the commoner associated co-morbidities. 139 (69.8%) of positive children were discharged, 15(7.5)% left against medical advice (LAMA), while 45 (22.6%) died. Over 85% 40/45 (88.9%) of positive children with SAM that died had multiple co-morbidities when compared to those that survived, 6/139 (4.3%). For the negative children: 2(82.7%) were discharged, 7 (8.0 %) LAMA, and 9(9.2%) died. There was a 2.5 fold increase in mortality among HIV positive children with SAM than in the negative ones (22.6.4% vs. 9.2%; P<0.001; relative risk=1.81, 95% CI 1.04-2.87) (Table 3).

Types of malnutrition based on WHO Disease stage in HIV infected Children

Marasmic HIV positive children had significantly lower CD4 cell count, and higher in number when compared to the other sub types of malnutrition (Table 4).

Discussion

The HIV ser-prevalence of 69.9% in this study was comparable to 71.8% reported by Geissler, and Pool [6]. The findings were also moderately comparable to 48.6% by Prazuck et al. from Zimbabwe [21], and 43% from Malawi [11]. It was however higher than 29.2% reported by Fergusson and Tomkins [7] in a meta-analysis of 17 large studies in sub-Saharan Africa, and much higher than 1.9% previously reported by Akenami et al. [22], from Nigeria in 1997. The high prevalence of HIV infection among 5 years < with SAM in this study could be as a result of high burden of HIV in the country. Nigeria ranks third in the global burden of HIV behind South Africa and India, with a sero-prevalence among pregnant women of 5.8% in 2007, and 3.1% in 2012 [3,4]. Though the national sero-prevalence of HIV is on a downward trend [4], activities to strengthen prevention of mother to child transmission (PMTCT) of HIV infection should be encouraged to prevent transmission of the virus to children since over 90% of HIV in children is from mother to child [4]. Improvement in nutritional/immunological status through support/promotion of EBF practice, discouraging mixed feeding, timely introduction of rich complementary feeding, promotion of childhood immunization, and introduction of school meal will in no immeasurable way assist in their fight against infections, and decrease in HIV transmission. The

Table 2: Types of malnutrition and infant feeding pattern in malnourished under five.

Characteristic	All malnourished child n = 286 (%)	HIV +ve n = 199 (%)	HIV –ve n = 87 (%)	p-value
Type of Malnutrition				
Underweight	51 (17.8)	34 (17.0)	17 (19.5)	0.059
Marasmus	174(60.8)	161 (80.9)	13 (14.9)	0.001
Marasmic-Kwashiorkor	38(13.3)	3 (1.5)	35(40.2)	0.001
Kwashiorkor	23(8.0)	1 (0.5)	22 (25.3)	0.001
Feeding Method				
EBFing < 3 months	23 (8.0)	10(5.2)	13 (14.9)	0.557
EBFing 4-6 months	12 (4.2)	5(2.5)	7 (8.0)	0.357
Predominant B/Feeding	81 (28.3)	33(16.6)	48 (55.2)	0.632
Mixed Feeding	131 (45.8)	115(57.8)	16 (18.4)	0.001
Artificial Feeding	39 (13.6)	36(18.1)	3(3.4)	0.018
C/ Feeding				
Before 6 months.	170 (59.4)	107 (53.8)	53 (60.9)	0.337
After 6 months	116 (40.6)	92 (46.2)	34 (39.1)	0.506
Type of C/feeding				
Fortified pap	51(17.8)	30 (15.1)	21 (24.1)	0.741
Plain Pap	128 (44.8)	87 (43.7)	41 (47.2)	0.522
Family Diet	71 (24.8)	47 (23.6)	24 (27.6)	0.452
Infant Cereal	36 (12.6)	35 (17.6)	1 (1.1)	0.067

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Table 3: Co-morbidities and outcome in children with severe acute malnutrition under five children.

	HIV positive n=199 (%)	HIV negative n= 87 (%)	Total N= 286(%)	P-values
o-morbidities				
Pulmonary Tuberculosis	39(19.6)	6(6.9)	43(15.3)	0.006
Bronchopneumonia	53(26.6)	8(9.1)	54(18.9)	0.004
Diarrhoea	58(29.1)	35(40.2)	90(31.5)	0.012
Septicaemia	49(24.6)	26(29.8)	75(26.2)	0.728
Vaginal Fistula	4(2.0)	0(0.0)	2(0.7)	0.002
Malaria	29(14.5)	17(19.5)	49(17.1)	0.456
Oral Thrush	35(17.6)	3(3.4)	50(17.5)	0.056
0thers	12(6.0)	13(14.9)	28(9.8)	0.223
Outcome				
Discharge	139(69.8)	72 (82.7)	211 (73.8)	0.012
LAMA	15 (7.5.)	7 (8.0)	22 (7.7)	0.232
Died	45 (22.6)	8 (9.2)	(18.5)	0.001

Table 4: Distribution of types of malnutrition based on WHO Disease stage in HIV infected Children.

Type of Malnutrition (Mean CD4 cell count cell/mm3+SD) WHO Disease stage					
	Stage 1	Stage 2	Stage 3	Stage 4	P values
Underweight (183.58+41.32)	4	30	-	-	0.027
Marasmus (54.16+9.32)	-	4	85	72	0.003
Marasmic-Kwashiorkor (75.27+14.32)	-	2	1	-	-
Kwashiorkor (114.58+29.32)	-	-	1	0	-

1.9% previously reported by Akenami et al. from Nigeria in 1997 [22], was carried when sero-prevalence was still very low (1.8%), and at the time when DNA PCR was not in use for the diagnosis of HIV infection in children less than 18months.

There was 2.5 fold increase in mortality in HIV positive children with SAM (22.6.4% vs. 9.2%; P<0.001; relative risk=1.81, 95% CI 1.04-2.87) than in the negative ones in this study. This high mortality rate was also reported in several other studies, 49.5% in southern Malawi [10], 37.8% in Ghana [23], 30.4% from meta-analysis from sub-Saharan Africa [7], and 20% in Niger [24]. The higher mortality rate in HIV positive under five children with SAM in this study when compared to HIV negative ones could be due to the higher prevalence of potentially life-threatening co-morbidities like PTB, bronchopneumonia, septicaemia, diarrhoeal diseases, malaria, and severe wasting which were commoner in positive than in negative children. Other possible reasons could be complicated case management issues like multiple pathology, drug-drug interactions, drug toxicities, micronutrient deficiencies [23] or development of Immune reconstitution syndrome (IRIS) with initiation of ART in positive than negative children. HIV positive children with SAM that died had multiple co-morbidities with complicated case management issues than those that survived. Wasting is recognized as an independent risk factor for mortality in HIV positive children [25]. Lean body mass has been closely associated with, and predictive of, survival in both adults and children who live with HIV, even when they are receiving ART. The present study which showed positive children with SAM having significantly lower weight-for-height Z score (-4.6 Vs -4.1) indicating severe wasting when compared to their negative counterpart could also explain the higher mortality seen in this group of patients as severe wasting has been documented to be an independent risk factor for mortality in positive children.

PITC was introduced by the WHO in 2007 to increasing the uptake of HIV testing, improve access to health care services for people living with HIV, and create new opportunities for HIV presentation [20]. Current WHO guidelines (2012) recommend PITC in clinical settings for all children in countries with an HIV prevalence of ≥ 1% in the general population [26]. Baggaley et al. [20], however reported 9.5% uptake of PITC from inpatients (adults or children) in countries that have adopted the WHO PITC policy. Uptake of VCT has been very low (3.5%) in children in Nigeria [17]. Because of the overlapping of clinical presentation of SAM and HIV infection, the nutrition unit of our department adopted a WHO protocol of screening all HIV children presenting to the department with signs and symptoms suggestive of SAM. It is therefore not surprising that the uptake of PITC was 100% in this study considering the opt out approach in the departmental protocol for children with SAM. This finding was comparable to 100% by Asafo-Agyei et al. [23], from Ghana in 2013, and 98.5% by Madec et al. from Niger [24], all of whom adopted opt out approach for SAM in their various units. In view of the high burden of HIV in children with SAM as observed in this study, efforts should be made to extend PITC services to all children assessing care in the department, hospital and elsewhere in other to identify those asymptomatic HIV infection children at the early stage of the disease for treatment and better outcome. Providing such services for all children assessing care in all levels of health care service delivery points across the nation will not only increase the uptake of HIV testing, but also improving access to health care services for children living with HIV early enough and creating new opportunities for HIV presentation [20].

HIV positive subjects with SAM were significantly more likely to develop marasmus than kwasiokor (80.9% Vs 0.5%, p=0.001) in this study, and in other studies [23,24,27,28]. The higher prevalence of marasmus in positive children may be related to their degree

of immunosuppresion in them, as 94.5% of these children were documented in the present study to be in WHO stage 3 and 4 severe disease signifying marked immunosuppression. Bachou et al. [29], had observed in their study that both positive and negative non-edematous subjects with SAM had significantly lower CD4 cell count than the oedmatous counterpart, and concluded by saying that development of oedma in HIV positive patients requires a certain degree of immunocompetence. Going by his findings [29], it implies that majority of the HIV positive subjects in this study with WHO stage 3 and 4 disease are less inmmunocompetent, a prerequisite in the development of oedma in SAM.

Left against medical advice (LAMA) is not an uncommon practice in resource limited setting. The peculiarity of pediatric cases is that the children are not part of the decision taken on their behalf. In the present study, cases of LAMA was seen in 7.7% of children with SAM, however, no statistically significant was seen in cases of LAMA for positive and negative children (7.5% Vs 8.0%, p= 0.232). The finding was similar to 7.4% earlier reported by Okechukwu [30] in the same centre in 2009, and call for extension of national health insurance scheme (NHIS) to all children in the society in other to minimize this ugly trend that if allowed to persist will contribute substantially to the number of deaths in children.

Conclusion

HIV sero-prevalence was high among children with SAM, mortality and those LAMA was also high. Marasmus was commonest form of SAM in positive children, and PITC and testing even though accepted by all caregivers of children with SAM should be offered to other children at all service delivery points in the department, hospital and other levels of health delivery services for early detection of HIV infection. Some associated co-morbidites could be useful indication for further evaluation for HIV infection in children with SAM.

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