Treatment outcome of severe acute malnutrition in children with and without HIV infection: A Historical cohort study in South-West Ethiopia.

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Abstract

Background: *Studies on the **t**reatment outcome of severe acute malnutrition in HIV/AIDS pediatric patients are scarce.*

Objective: *To compare the treatment outcome of severe acute malnutrition among human immunodefficiency virus (HIV) infected and uninfected children who were treated in Jimma University Specialized Hospital (JUSH) Pediatric Nutritional Rehabilitation Unit.*

Methods and Materials: *A historical cohort study was conducted in JUSH Pediatric ward on two hundred and fifteen children who were treated for severe acute malnutrition from January 2005 to December 2007. Data was analyzed with SPSS version 16, EPI info Version 3.1 and WHO Anthro software. Simple descriptive, univariate and multivariate analysis was done during the analysis.*

Results: *Among the 215 severely malnourished children 25 (11.6 %) were HIV infected. Half (48%) of children in each group were males and the mean age was 36 months for both groups. The rate of weight gain was 13.5 and 13.7grams/Kg/day for HIV infected and uninfected children, respectively. The recovery rate was 68% and 86.6% , and mortality was 16% and 2.6% in HIV infected and uninfected children but it was not statistically significant (P= 0.143, CI 95%).*

Conclusion: *Recovery rate and the rate of weight gain of HIV infected severely malnourished children is not significantly different from those with no HIV when they are treated according to the national protocol for the treatment of severe acute malnutrition. Different protocol is not required for treatment of severe acute malnutrition in children with* HIV/AIDS.

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Introduction

Severe acute malnutrition is the most important nutritional disease in developing countries because of its high prevalence and its relationship with child mortality rates, impaired physical growth, and inadequate social and economic development (2). Case fatality from malnutrition has remained 20-30% with the highest levels being 50-60% among those with edematous malnutrition (3). A likely cause of this continuing high mortality is faulty case management (3). For example a survey of 79 treatment centers has shown that over 50% of the institutions failed to provide the ideal recommended ranges of both protein and energy.

Children with HIV/AIDS are likely to present with severe malnutrition. However, there is a wide knowledge gap regarding the role of nutrition on disease progression in HIV/AIDS patients. Scientific evidence is limited whether it is necessary to modify management protocols of severely malnourished children with HIV and for dietary management of complications of HIV/AIDS like diarrhea and tuberculosis (MOHref). Several authors reported a prevalence of HIV among children treated for severe acute malnutrition in a range of 16-40%(8, 9,10) and in some countries as high as half of the children(11). In sub-

Saharan Africa, a high proportion of severely malnourished children admitted to nutritional rehabilitation units are now also HIV positive, particularly those with marasmus (8).

In central nutrition rehabilitation unit in southern Malawi the case fatality rate was significantly higher for HIV-seropositive children using WHO treatment protocol (9). A prevalence of HIV-1 was 36.7% among 450 severely malnourished children in a study from Uganda, mortality was also high (43.5%) in the same study among HIV infected children. (10).

To the best knowledge of authors there is hardly any study on the prevalence of HIV/AIDS in malnourished children and its impact on treatment in Ethiopia. A retrospective analysis in Gondar hospital showed HIV prevalence of 52.3%,. In this study treatment outcome didn't differ

between uninfected and infected children (3)

Results of various studies elsewhere are inconsistent with regard to the outcome of nutritional therapy for severe acute malnutrition in those with HIV infection when compared with uninfected ones(12, 13, 14 & 15). Therefore, this study was designed to compare the response to nutritional therapy, using the national protocol for the treatment of severe acute malnutrition of HIV infected and uninfected children

Methods And materials

This is a prospective cohort study conducted among children admitted to Jimma University Specialized Hospital pediatrics nutritional rehabilitation ward from Jan 2005 to Dec 2007. The nutritional rehabilitation unit was established starting from Jan 2004, since then it is serving as a nutritional rehabilitation referral center for the surrounding five health center OTP sites. The ward is run by pediatricians teaching in the university and nurses who were given special training on the management of severe acute malnutrition. The nutritional treatment was based on the national guideline for the treatment of children with severe acute malnutrition (40). Using this protocol admitted children are treated in three phases, i.e. Phase I, transition phase and phase II. During phase I treatment they are given therapeutic feeding with F-75, amoxicillin, vitamin A, folic acid and if there are complications at presentations they will be treated during this phase. When the child shows clinical improvement he/she will be transferred to transition phase where diet is F-100 but with the same number of feeds per day and similar volume as F-75. After about 48-96hrs of treatment in the transition phase the child will start phase II treatment. During this phase the child will be provided with F100 therapeutic feeding with increasing amount of calories. In addition the child will be dewormed, vaccination will be updated and education will be provided to the care taker. Monitoring was with a spread sheet specially prepared to monitor treatment response of severely malnourished child. Recovered children were discharged when the discharge criteria are full filled or the attending physician decided to discharge based on his/her clinical judgment. Antiretroviral treatment was started in all children with retroviral infection after rescussitative treatments in phase I.

Screening for retroviral infection was provided through provider initiated

counselling and testing starting from Jan 2006 where children whose parents agreed on the counselling were tested as part of a routine patient care. Before Jan 2006 HIV testing was undertaken based on clinical suspicion by the attending physician. 385 children were not screened because of late introduction of the opt out testing procedure and episodic shortage of testing kits after the initiation. HIV test was done using determine HIV1/2 for antibody test and GeneAmp97 for PCR.

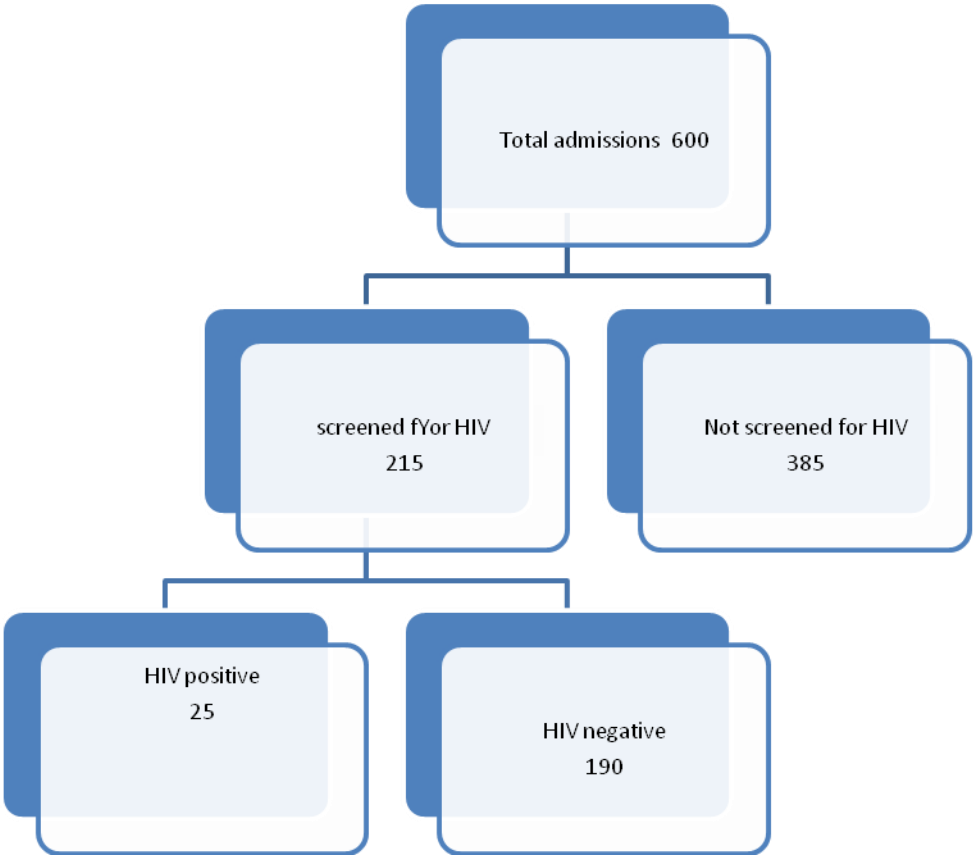

Figure 1. Flow diagram showing patient selection

Data were collected using a format prepared for the study. Data collectors were residents working their pediatrics postgraduate study.

Data were entered in to computer using SPSS for widows version 16. Analysis was done using SPSS for windows version 16, EPI info version 3.1 and WHO Anthro software2005. Simple descriptive and bivariate analysis was done. The criterion for statistical significance was set at 0.05.

Ethical clearance was obtained from Jimma University medical faculty ethical review board. Data collection did not use patient name and ID number. Patient chart was not made accessible to any staff

except those collecting the data and chart was returned back immediately after finishing the data collection.

Results

Ninety seven (51.1%) were females and 131(69.0%) were under five years of age among HIV uninfected children, where as 12 (48.0%) and 19(76.0%) were females and under five years of age among the HIV infected children. About 7 %(13) of HIV uninfected children were below 6 months of age but there was no infant below 6 months among the infected children. The mean age was 43 months (SD = 32.7) and 38.44(SD = 29.8) in HIV uninfected and infected children respectively (Table 1).

Eighteen (72%) of HIV infected children were having WHO stage III pediatric AIDS and the remaining 7(28%) had Stage IV disease. The predominant type of malnutrition among HIV infected children was severe wasting 16(64%); whereas edematous type of severe acute malnutrition was the predominant 133(70%) type among uninfected children(Table 2), however a significant number 9 (36%) of HIV infected children had edematous severe acute malnutrition. Thirteen (53.5%) of HIV infected children had a weight-for length/height Z-score less than -3 and the remaining lie between -2 and -3 Z-score values while 35% of HIV uninfected children lie below -3 Z score value and 5% of them lie between +1 and +3 Z score values on the WHO weight-for-height z-score curve(Fig 1 A and IB).

The mean rate of weight gain was 13.52 g/day/Kg and 13.67g/day/Kg among HIV infected and uninfected children respectively. The respective mean length of stay on treatment was 24.5 and 18.5 days. Both rate of weight gain and length of stay on treatment are normally distributed. The recovery rate was 18(72%) & 165(86.6%) and the mortality was 4(16%) & 14(7.4%) among HIV infected and uninfected children respectively. There were no non-responders among HIV infected children whereas it was 2.1% among the uninfected children. The defaulter rate was 3 (12%) and 2.6% respectively.

Anemia (PCV < 33%), lymphopenia (<1200/mm3) and thrombocytopenia (platelet <150,000/mm3) was seen in 7 (28%) & 48%, 1(4%) & 4.7% and in 3(12%) & 10% of HIV infected and uninfected children respectively (Table 3).

Forward Logistic regression model revealed that platelet count less than 150000cells/mm3 is associated with increased risk of death from severe malnutrition among HIV uninfected children when the type of malnutrition,

age, and other hematologic status are kept constant.

Discussion

This study reviewed the treatment outcome of severe acute malnutrition of children who were treated in Jimma University Specialized Hospital Pediatric Nutritional Rehabilitation Unit in relation to their HIV infection status.

Most of the children in this study were under five years of age (both HIV negative and positive children) however there are no children below 6 months in children who are positive to HIV. This might indicate growth is affected in children with HIV/AIDs with increasing age which is also demonstrated in another study (16) although the sample size of HIV infected children is too small for such a conclusion. Another possibility is that infants might not have been seen by a health professional before the illness for which they were admitted for. The prevalence of HIV among severely malnourished children in this study is 8% which is very much lower (14-40%) than findings of other studies (17). This could be because of a general trend in decreasing prevalence of HIV in Ethiopia (18).

Predominance of non-edematous malnutrition in HIV infected children in this study is also similarly described by various authors (8, 20, 21, and 22).

The mortality of HIV infected severely malnourished children in this study is 16% and it is not statistically different from their HIV negative counterparts (P = 0.154). A prospective cohort study measuring mortality during nutritional rehabilitation of HIV-infected and uninfected children was carried out at two Ministry of Health and one Christian Health Association of Malawi NRUs in Lilongwe district, central Malawii(14). Treatment of both groups in this study was based on malawi national guideline on treatment of severe acute malnutrition in children which was designed based on WHO 2003 guideline and HIV infected children were

significantly more likely to die than HIV-uninfected children [35.4% (28/79) vs. 10.4% (39/375), $P < 0.001$; relative risk (RR) = 3.41, 95% CI 2.24—5.20] (20). One reason for the higher mortality in the malawian study is that there was no pediatric antiretroviral treatment during the study which in contrast is being provided in this study. Another case control study in the tropical metabolism r\esearch unit in Jamaica also described increased mortality among HIV infected severely malnourished children($P < 0.0001$) using a protocol more or less similar to this

study although it doesn't mention about antiretroviral treatment(15).

The mean rate of weight gain of HIV infected children with severe malnutrition is comparable to
those of HIV negative children and there is no difference between the means of rate of weight gain of HIV infected and uninfected children using independent T test for comparison of means(-5.74, 5.92; P=0.97, CI=95%) whether equal variance is assumed or not. On the other hand length of stay on treatment is significantly longer among HIV infected children from that of non-infected children using independent T test for comparison of means when equal variance is assumed(-11.72, -.27; (P=0.04: CI 95%) but this difference disappears when equal variance is not assumed(-12.9, 0.97; p= 0.89: CI 95%). The discrepancy in length of stay on treatment despite having comparable rate of weight gain is due to more severe waisting in HIV infected children at presentation when compared with uninfected children so that HIV infected children have to stay longer to fulfill the discharge criteria.

The mean rate of weight gain with respect to type of malnutrition is 16g/kg/day and 15g/kg/day for edematous and non edematous children. Other papers also showed similar minimal differences(22, 23).

Severe acute malnutrition was associated with lower hematological values in both groups of children. In contrast to the evidences in other studies (8) this lower hematological value is not worsened by the presence of HIV infection in this study.

The defaulter rate was higher in HIV infected children, however in both groups of children the recovery rate, death rate, defaulter rate and the rate of weight gain is acceptable according to the national guideline on the treatment of severe acute malnutrition.

Conclusion

This study demonstrated that overall the outcome for treatment of severe acute malnutrition in HIV infected children and uninfected is comparable when standard treatment is offered using the National Protocol. The outcome is further improved when HAART is initiated after patients are stabilized. We recommend standard nutritional treatment should be part of care and treatment of HIV infected children. Further studies need to be carried out on specific diagnosis and early treatment of opportunistic infections which can reduce hospital stay and death in HIV infected children. The significance of

thrombocytopenia as a determinant of nutritional therapy has to be investigated.

Table 1 Demographic characteristic of severely malnourished children with and without HIV infection, April 2008. n=215

Variable	HIV status		
	Uninfected	infected	Total
Sex	No (%)	No (%)	No (%)
Male	93(48.9)	13(52.0)	106(49.3)
Female	97(51.1)	12(48.0)	109(50.7)
Total	190(100)	25(100.0)	215(100)
Age (month)	No (%)	No (%)	No (%)
0-5	13(6.8)	0(0)	13
6-11	16(8.4)	5(20.0)	21
12-23	24(12.6)	4(16.0)	28
24-35	33(17.4)	3(12.0)	36
36-47	22(11.6)	4(16.0)	26
48-59	23(12.1)	3(12.0)	26
60-119	51(26.8)	6(24.0)	57
120+	8(4.2)	0(0)	8
Total	190(100)	25(100)	215(100)

Table 2 Type of malnutrition and clinical HIV disease of children with severe acute malnutrition, April 2008. N = 215

Variable	HIV status		
	Uninfected	Infected	
Type of malnutrition (n = 215)	No (%)	No (%)	No (%)
Edematous	132(69.5)	7(28.0)	139(64)
Non edematous	51(26.8)	16(64.0)	67(31.2)
Mixed	7(3.7)	2(8.0)	9(4.2)
Total	190(100)	25(100.0)	215(100)
WHO clinical staging (n = 25)	No (%)	N0 (%)	No (%)
Stage III		17(68.0)	17(68)
Stage IV		8(32)	8(32)
Total		25(100)	25(100)

Table 3. The treatment outcome of severely malnourished with and without HIV who were treated in JUSH pediatric NRU, April 2008. N = 215

Treatment outcome	HIV Uninfected No (%)	HIV infected No (%)	Total No (%)
Recovered	165(86.8)	17(68)	182(84.7)
Died	14(7.4)	4(16)	18 (8.4)
Defaulter	5(2.6)	3(12)	8 (3.7)
Non responder	4(2.1)	0(0)	4(1.8)
Unknown*	2(1.1)	1(4)	3(1.4)
Total	190(100)	25(100)	215(100)

* Status on exit unknown

Table 4 Hematologic profiles of severely malnourished children with and without HIV, April 2008

Hematologic test(n= 135)	HIV status		
	Uninfected	**infected**	**Total**
Hematocrit(n=130)	No (%)	No (%)	No (%)
< 33%	92 (73.6)	7(70)	99(73.3)
≥33%	33(26.4)	3(30)	36(26.7)
Total	125(100)	10(100)	135(100)
WBC count(n=130)			
<4000 or>11000	11 (9.5)	2(14.3)	13(10)
4000-11000	105 (90.5)	12(85.7)	117(90)
Total	116 (100)	14(100)	130(100)
Lymphocyte count(n=106)			
<1200	9 (9.6)	1(8.3)	10(9.4)
≥1200	85(90.4)	11(91.7)	96(90.6)
Total	94 (100)	12(100)	106(100)
Neutrophils count(n=106)			
<1500	11 (11.7)	3(25)	14(13.2)
≥1500	83 (89.3)	9(75)	92(86.8)
Total	94 (100)	12(100)	106(100)
Platelet count(n=119)			
<150000	19 (17.9)	3(23)	22(18.5)
≥150000	87 (82.1)	10(77)	97(81.5)
Total	106 (100)	13(100)	119(100)

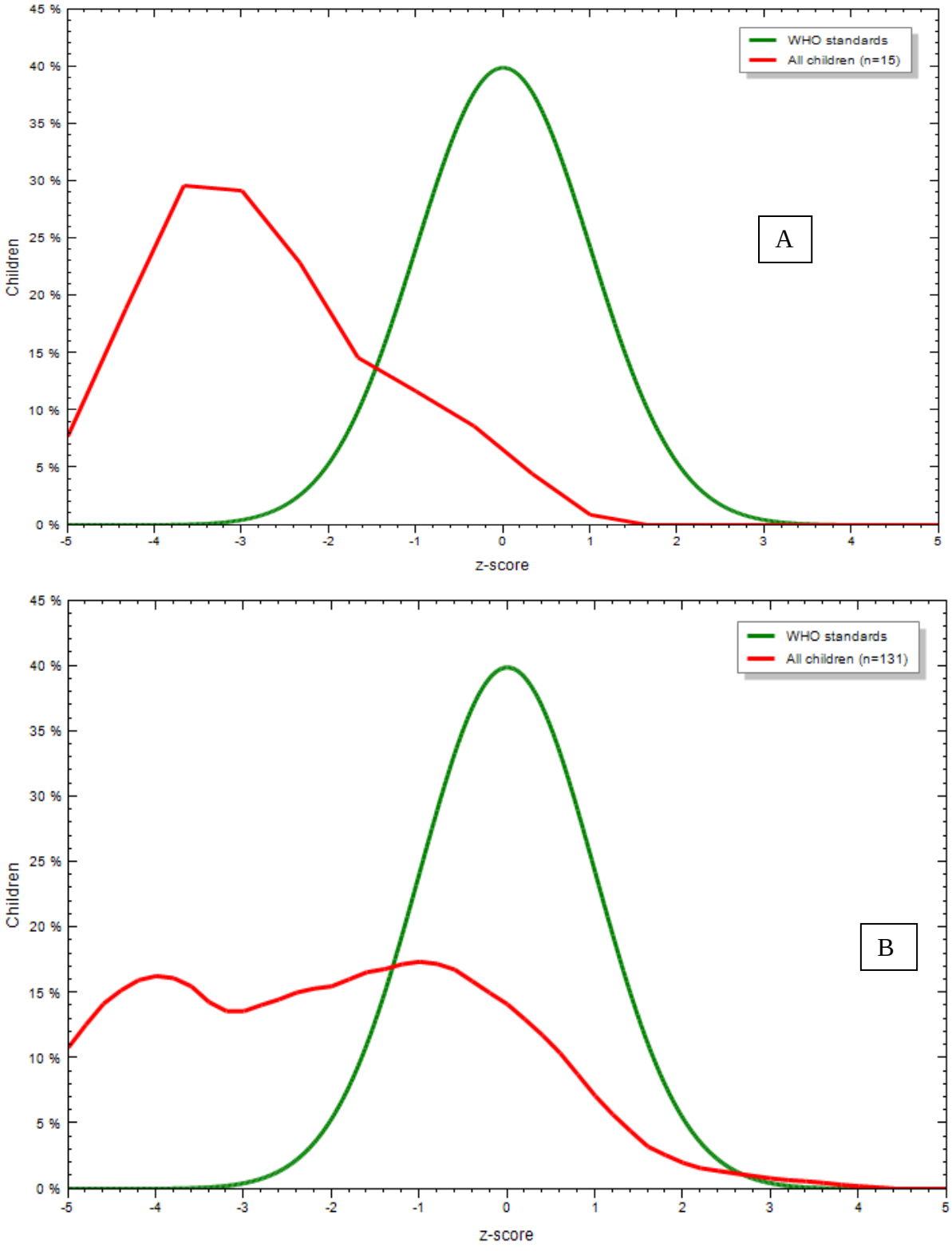

Fig 1. Weight-for-length/height distribution curve of children with severe acute malnutrition HIV uninfected (A) and infected (B), April 2008.

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