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ORIGINAL ARTICLE

MALNUTRITION AMONG HIV-POSITIVE CHILDREN AT TWO REFERRAL HOSPITALS IN NORTHWEST ETHIOPIA

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ABSTRACT

Background
Malnutrition and HIV/AIDS, both common problems in Ethiopia, are closely interlinked disorders. There are few studies describing the prevalence and determinants of malnutrition among children with HIV/AIDS in Ethiopia. This study aimed to determine the prevalence and associated factors of malnutrition among HIV-positive children.

Methods
An institution based cross-sectional study was conducted on 301 HIV positive children aged 6 months to 14 years at the Pediatric ART clinics of Felege Hiwot and Gondar referral hospitals, northwest Ethiopia. Weight and height/length measurements were taken following standard procedures. Data were collected from caregivers using a structured questionnaire. Logistic regression analyses were used to determine the effect of different factors on malnutrition

Results
The overall prevalence of malnutrition (using the mid-upper arm circumference) was 42.9%, with 10.3% severe malnutrition. Among under-five children, 41.7% were underweight, 65% stunted, and 5.8% wasted. Malnutrition was significantly associated with the age of the child (OR=4.10 for underweight and OR=1.85 for stunting), absence of dietary counseling (OR=3.78), presence of eating problems (OR=2.14), family monthly income (OR=3.08), late HIV diagnosis (OR=4.03), and duration of follow-up at ART clinics (OR=3.33).

Conclusion
There is a high burden of malnutrition among children living with HIV/AIDS. The age of the child, duration of follow-up at HIV clinic, absence of dietary counseling, presence of eating problems, late HIV diagnosis, and low monthly income were significantly associated with malnutrition. We recommend nutritional management and dietary counseling to improve the nutritional status of HIV-positive children during HIV/AIDS care and treatment.

***Key Words**: Malnutrition, HIV/AIDS, ART.*

BACKGROUND

Malnutrition and HIV/AIDS are closely interlinked disorders; both disorders can contribute to severe immune suppression (1). HIV/AIDS and malnutrition are both highly prevalent in many parts of the world, especially in sub-Saharan Africa. Their effects are interrelated and exacerbate one another in a vicious cycle. Both can independently cause progressive damage to the immune system and increase susceptibility to infection, morbidity and mortality through opportunistic infections (2). When these conditions are concurrent, their effect on the immune system is synergistic and the interaction between HIV infection and malnutrition leads to growth failure and stunting in children (1).

Children of HIV-infected mothers are at great risk for malnutrition, growth failure and mortality, either as a result of their own HIV infection or because of the deteriorating he3alth of one or more of their care providers (3). Children orphaned by AIDS are more likely to suffer from serious nutritional and health problems, as well as emotional stress (3). In addition, HIV-positive infants are at increased risk of low birth weight and early growth faltering. Frequent untreated

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Critical interventions for children with HIV-positive mothers include nutritional assessment, infant nutritional counseling and support, periodic vitamin A supplementation, provision of suitable replacement foods as appropriate and regular growth monitoring (4).

HIV/AIDS treatment needs an integrated management for nutritional problems, including initial assessment of nutritional status and follow-up. HIV/AIDS and nutritional problems in Ethiopia are of large magnitude and need further studies for better awareness of nutritional status and determinants of malnutrition in children living with HIV/AIDS. Hence, the purpose of this study was to determine the level of malnutrition and factors impacting malnutrition among HIV-positive children.

METHODS

An institution based cross-sectional study was conducted in the pediatric anti-retroviral treatment (ART) clinics of the University of Gondar and Felege Hiwot referral hospitals located in Gondar and Bahir Dar towns, respectively. Data were collected between April 30 and June 15, 2009. A sample size of 303 was calculated assuming a 50% prevalence rate of malnutrition (given no previous baseline proportion), a 5% margin of error and a 10% non-response rate at a 95% confidence level. All eligible children were included consecutively in the forty-five days of data collection. Children whose HIV positive status was confirmed and following at the ART clinic were included. Data were collected using a combination of a structured questionnaire and anthropometric measurements such as height/length, weight and mid upper arm circumference (MUAC). Data collectors were nurses regularly working at the ART clinics (who used to collect most of the study variables regularly for clinical surveillance and diagnosis).

All children were weighed and measured once while wearing light-weight clothing. Children aged less than 2 years of age were laid horizontally and weighed using children`s scale with a precision of 0.05 kg. Their lengths were measured while stretched in a recumbent position using a measuring tape with a precision of 0.01m. Children aged 2-14 years were weighed standing unassisted and barefooted on a digital weight scale with a precision of 0.1kg, and their height was measured using a stadiometer with a precision of 0.01m. Height was measured with subjects standing straight on a smoothly flat horizontal surface with their heels together, eyes straight forward, and touching the standing board at the heels, buttocks, and the back of the head.

Weight measuring scales were checked and adjusted at zero level between each measurement, and height/length was measured following the standard steps for all infants and children studied. Ten children at each site were measured twice (by the two data collectors independently) on the first day of data collection to determine the consistency of measurements after which measurements were taken only once for subsequent children. In addition, questions were checked for completeness before data entry, and approximately five percent of the completed questions were cross checked by the supervisor.

A one day intensive training was provided for data collectors and questionnaire was pretested on 18 children. Data collection comprised of four parts: socio-demographics, caregiver-related factors, anthropometric measurements, and medical and related factors of the study children.

The nutritional status of the study children was as-

sessed using the standard indicators of weight-for-age (WFA), height-for-age (HFA), weight-for-height (WFH) and mid-upper arm circumference (MUAC). To determine malnutrition, the National Center for Health Statistics (NCHS)/World Health Organization (WHO) reference standards (5) taking –2SD as the cut-off point indicating malnutrition (between -2SD and -3SD for moderate malnutrition and less than -3SD for severe malnutrition) for under-five children and the National MUAC classification chart for HIV positive children (6) were used to categorize nutritional status.

Age in months, weight in kilograms, height/length in centimeters and sex were entered into Epi Info ™ version 2002 nutrition program (www.cdc.gov/EpiInfo/) for anthropometric calculation of WFA, HFA and WFH and their z-scores using the NCHS/WHO reference data (5) incorporated in Epi Info software. These were then entered into SPSS version 15.0 statistical package for windows (SPSS, Inc., USA) for analysis.

The prevalence of malnutrition was determined using the indicators WFA, HFA, WFH and MUAC. Bivariate and multivariate logistic regression analyses were conducted to determine the effect of factor(s) on malnutrition and to control possible confounders. Those factors with p-value of $\leq$0.2 on the univariate analysis were entered in the multivariate analysis. Associations were shown using the Odds Ratio (OR) and its 95% confidence interval (CI). Probability values $\leq$ 0.05 were considered statistically significant.

Ethical clearance was obtained from the University of Gondar Research and Publications Office (RPO) and permissions from the medical directors' offices of the hospitals. Informed consent was obtained from the guardians of all children in the study. Code numbers of children identified as severely malnourished were given to the clinicians working in the pediatric ART clinics of the hospitals for nutritional counseling and treatment.

Table 1. *Socio-Demographic characteristics of HIV positive children at two referral hospitals, northwest Ethiopia*

Characteristic		Number	Percent
Sex	Male	155	51.5
	Female	146	48.5
Age	<24 months	20	6.6
	24-59 months	83	27.6
	5-9 years	124	41.2
	10-14 years	74	24.6
Residence	Urban	282	93.7
	Rural	19	6.3
Birth order of children	1st born	126	41.9
	2nd born	89	29.6
	3rd born	43	14.3
	≥4th born	43	14.3
Ethnic Group	Amhara	290	96.3
	Others	11	2.7
Religion	Orthodox	277	92
	Muslim	17	5.6
	Others	7	2.4
Parental status	Both alive	166	55.1
	Mother died	37	12.3
	Father died	44	14.6
	Both died	37	12.3
	Separated/Divorced	17	5.6
Child living with	Parent(s)	256	85.0
	Sister /brother	10	3.4
	Aunt /uncle	15	5.0
	Grand parent(s)	9	3.0
	Orphan Centers /NGOs	11	3.7

Medical and Related Problems of HIV-positive Infants and Children

The median age at first HIV diagnosis was 5 years. Two hundred fifteen (71.5%) children were tested through Voluntary Counseling and Testing (VCT) and Provider Initiated Testing and Counseling (PITC).

Forty-five (15%) children reported eating problem, with the most frequent being loss of appetite (91.1%). More than two thirds (67.4%) of the children were in the advanced stages of the disease (WHO stage III or IV) (Table 2).

About 83% of the children had history of major opportunistic infections (OIs). The most common was pneumonia (42.5%), followed by skin infections (31.6%) (mostly fungal), and tuberculosis (23.9%). Only 48 (15.9%) of the children had sicknesses in the two weeks preceding data collection.

Table 2: Medical and other related problems of HIV-positive children at two referral hospitals, northwest Ethiopia

Disease/problem		Number	Percent
Eating problems	Yes	45	15.0
	No	256	85.0
Type of eating problem	Loss of Appetite	41	91.2
	Swallowing Difficulty	2	4.4
	Vomiting	2	4.4
Place of HIV diagnosis	VCT	123	40.9
	PITC/OPD	92	30.6
	Wards/ inpatient	38	12.6
	Referred from other sites	36	12.0
	PMTCT	12	4.0
Current or past OIs	Yes	249	82.7
	No	52	17.3
Type of OI	Pneumonia	128	42.5
	Skin infections	95	31.6
	Tuberculosis	72	23.9
	Gastro enteritis	40	13.3
	Oro-esophageal thrush	35	11.6
	Two or more OIs	121	40.2
Duration of Follow-up at the ART clinics	<6 months	40	13.3
	6-12 months	52	17.3
	12-24 months	99	32.9
	24-36 months	71	23.6
	>36 months	39	13.0
WHO Clinical Stage	Stage I	42	14.0
	Stage II	56	18.6
	Stage III	159	52.8
	Stage IV	44	14.6

Dietary History and Nutrition Related Profiles

Ninety-four (91.3%) of the 103 under-five children were breastfed though only 56 (54.4%) were exclusively breastfed for six months. More than one-third (35.9%) were given mixed feeding and 9 (8.7%) exclusively formula fed. Among the under-five children who were not exclusively breast-fed, only 30 (31.9%) were supplemented at the recommended age of 6 months, and the remaining (68.1%) were supplemented after 6 months of age. About half (52.5%) of the children's caregivers reported they had dietary counseling. Three-fourth of the children (77.1%) were on ART, while the rest did not yet start ART.

Nutritional Status of Children Living with HIV/AIDS

There was no edematous malnutrition, nor was there over nutrition among children with HIV in this study. In the under-five children, the prevalence of underweight, stunting, and wasting were 41.7%, 65%, and 5.8%, respectively (Figure 1). Using the MUAC, those aged 6 months to 14 years, 42.9% were malnourished, with 98 (32.6%) moderate, and 31 (10.3%) severe malnutrition.

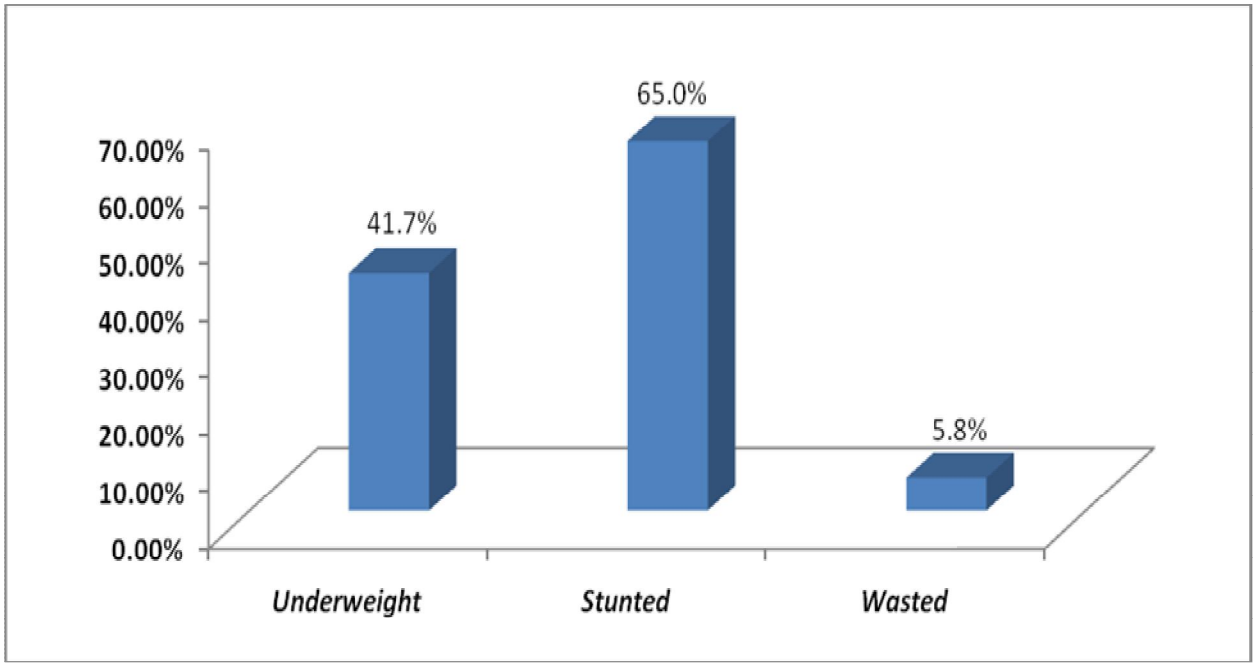

Figure 1: Prevalence of Malnutrition in HIV-positive under-five children at two referral hospitals, northwest Ethiopia.

Factors Associated with Malnutrition

Underweight: From the logistic regression analysis conducted to assess possible relationships between underweight in under-five children and other independent factors, there was a significant association with average monthly family income and absence of dietary counseling to caregivers (Table 3).

Children whose caregivers were not given dietary counseling were having higher risk of becoming underweight (OR=3.78; 95% CI 1.18, 9.41) compared with children whose caregivers were given dietary counseling. Children from families of average monthly income greater than 300 Birr/month were at a significantly lower risk of underweight (OR=3.08; 95% CI 1.14, 8.89) as compared to those from families of monthly income less than 300 Birr/month.

Table 3: Factors associated with malnutrition among HIV positive under five children at two referral hospitals as measured by WFA, Northwest Ethiopia

Predictor variable		Underweight		Total	Crude OR(95%CI)	Adjusted OR(95% CI)
		Yes	No			
Age in months	<24	11	9	20	1.95(0.95,4.17)	1.85(1.10,4.57)**
	24-59	32	51	83	1.00	1.00
Family monthly income	<300 Birr	25	16	41	3.82(1.13,7.80)**	3.08(1.14,8.89)**
	≥300 Birr	18	44	63	1.00	1.00
Dietary counseling	Yes	11	36	47	1.00	1.00
	No	32	24	56	4.36(1.85,10.29)**	3.78(1.41,10.11)**
Family Size	<4	17	21	38	.40(.16, .94)**	.46(.16,1.25)
	>=4	43	22	65	1.00	1.00

Mid Upper Arm Circumference (MUAC): MUAC was used to evaluate factors associated with malnutrition in all children studied. Adjusting for other factors, malnutrition was significantly associated with the age of the child (OR=4.10; 95% CI 1.22, 13.76), duration of follow-up at ART clinics (OR=3.33; 95% CI 1.37,8.11), presence of eating problem, and age at first HIV diagnosis (Table 4). The risk of malnutrition for children aged 10-14 years was four times greater than for those aged less than five years.

The risk of malnutrition for children with less than 6 months of follow-up at ART clinics was 3.33 times greater than for those with 2 years or longer follow-up. Similarly, the risk of malnutrition for children with late HIV diagnosis (at age of 10-14 years) was four times higher when compared to those diagnosed earlier (before two years). Children who had eating problem were about twice likely to be malnourished as compared to those who did not have eating problems (*Table 4*).

Table 4: Factors associated with malnutrition among HIV positive children at two referral hospitals as measured by MUAC, Northwest Ethiopia

Predictor variable		Malnutrition		Total	Crude OR (95%CI)	Adjusted OR (95% CI)
		Yes	No			
Sex	Female	55	91	146	1.51(.95,2.39)	1.30(0.78,2.10)
	Male	74	81	155	1.00	1.00
Age in years	<5	37	66	103	1.00	1.00
	5-10	46	78	124	1.05(.61,1.81)	1.42(0.59,3.41)
	10-14	46	28	74	2.93(1.58,5.44)*	*4.10(1.22,13.76*)*
Follow-up duration (months)	<6	27	13	40	2.89(1.35,6.19)*	*3.33(1.37,8.11)**
	6-12	20	32	52	1.07(0.44,1.70)	1.11(0.50,2.47)
	12-24	36	63	99	1.00(0.55,1.58)	0.93(0.50,1.75)
	≥24	46	64	110	1.00	1.00
Eating problem	No	104	152	256	1.00	1.00
	Yes	25	20	45	1.83(.97,3.5)	2.14(1.40,4.40)*
OI(s)	No	17	35	52	1.00	1.00
	Yes	112	137	249	1.68(0.9, 3.16)	1.69(0.85, 3.35)
Tuberculosis	No	91	138	229	1.00	1.00
	Yes	38	34	72	1.70(1.00, 2.89)	1.31(0.72, 2.39)
Age at 1st HIV diagnosis (years)	<2	23	31	54	1.00	1.00
	2-4	30	65	95	0.62(0.32, 1.24)	0.76(0.36, 1.58)
	5-9	60	70	130	1.16(0.61,2.19)	1.54(0.76, 3.12)
	10-14	16	6	22	3.6(1.22,10.61)*	4.03(1.24,13.04)*

*Significant at P-value<.05

DISCUSSION

This study found the prevalence rates of 41.7% underweight, 65% stunting and 5.8% wasting. Moreover, the level of malnutrition in all children using the MUAC was 42.9% of which 10.3% were severely malnourished. This indicates greater nutritional deficits in this group compared to overall Ethiopian children below five years of age. According to the 2005 Ethiopian Demographic and Health Survey (EDHS), the prevalence of malnutrition in under-five children was reported to be 38.4% underweight, 46.5% stunted, and 10.5% wasted (7). Wasting of 5.8% among under-five HIV-positive children in this study was less than the 2005 EDHS report. This can be explained by their rural-urban composition and the HIV status differences between these two studies. A 65% prevalence of stunting in this study was higher than the 2005 EDHS values (7) of both the National (46.5%) and the Amhara Region (56.6%) for under-five children of unknown HIV status. This may be due to the associated chronic HIV disease resulting in a form of chronic malnutrition affecting them for a long duration as HIV particularly affects the height for age ratio (8). Only 103 children were in the age group of 6 - 59 months in this study; hence, the variation from the 2005 EDHS values of malnutrition could be explained by the differences in the sample composition.

Wasting represents acute malnutrition in the period immediately preceding the survey as a result of inadequate food intake or a recent episode of illness causing loss of weight. The fact that wasting in HIV-positive under-five children was found to be lower than both the national and regional values can be explained by the absence of such factors just preceding the survey. In addition, unlike HIV-negative children, children included in this study were on medical care and support which might be leading to the early detection and treatment of acute illnesses.

The prevalence of malnutrition in this study is comparable to that of a study done in Uganda which reported a 47% prevalence of underweight in under-five HIV-positive children (9). This study reported a higher prevalence of malnutrition compared to a community-based study on HIV/AIDS orphans in Kenya (29.3% stunted, 13.2% underweight, and 3.4%wasting) (10), but lower than that done as a baseline evaluation of the first 145 HIV-infected children to receive ART in Botswana (59% underweight, 75% stunted) (1). This lower result might be due to the fact that children who receive ART more likely have AIDS and therefore exhibit low body weight and debilitation. The current study included children who are HIV-positive but have not yet progressed to AIDS (85.4% were between stage I and stage III) and are therefore not yet eligible for ART.

The effect of HIV on nutrition begins early in the course of the disease, even before an individual is aware that s/he is infected with the virus (11, 12). However, contrary to the expected trend of decreasing malnutrition with age in the overall population, the level of underweight in children 6-24 months (45%) was lower than those aged 24-59 months (61.1%). This is in agreement with the findings of Joyce K. in Uganda (13) for AIDS orphans and vulnerable children (OVC), which reported a rise in the levels of underweight with the age of the child.

The prevalence of malnutrition of 42.9% in all HIV-positive children included in this study using the MUAC as a proxy measure of nutritional status was higher than that reported by Mitashree and colleagues (12) in preschool children of unknown HIV status in India (32.98%). This difference may be explained in two ways. First, the settings of the studies are different (the Indian study was community-based); second, the current study is on children living with HIV/AIDS. Similar to other studies (14-16), the most significant factors associated with malnutrition were the age of the child, family monthly income, absence of dietary counseling, presence of eating problems, duration of follow-up, and age at first HIV diagnosis.

Conclusion and Recommendations

There is a high prevalence of stunting and underweight in HIV positive children on chronic HIV/ AIDS care and support follow up at the two referral hospitals. Age of the child, duration of follow-up at ART clinics, dietary counseling, age at first HIV diagnosis, and the presence of eating problems were significantly associated factors. Hence, increased attention should be given for dietary counseling of caregivers. Proper feeding habits can help to suppress illness and improve or maintain nutritional status in addition to ART and OI treatment. As early diagnosis of HIV and longer duration of follow-up help to decrease the risk of malnutrition, caregivers should be encouraged to bring their children for screening and follow-up as early as possible.

Competing interests

We authors declare that we have no competing interests.

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