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Factors Associated With Nutritional Status of Human Immunodeficiency Virus Infected Children Hawassa, Ethiopia

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ABSTRACT

Undernutrition and Human Immunodeficiency Virus (HIV) infection are closely interlinked worldwide public health problems. The problems are worsening one another subjecting individuals to low quality of life. Studies from different parts of the world reported differing magnitude of low anthropometric status of HIV infected children and identified study setting specific determinants. Evidences are also limited especially in case of children above five years. Thus, this study aimed to assess nutritional status and associated factors among HIV positive 6 months to fourteen years children.

Hospital based cross sectional study was conducted on 455 HIV infected children aged 6months to 14 years. Weight and height/length measurements were taken. Background, dietary and clinical data were collected from caretakers and child's medical record. Z-scores of nutritional status indicators were generated using WHO-Anthro and Anthro plus software. Logistic regression analyses was used to identify factors associated with nutritional status of HIV infected children.

Key words:- *HIV, Infection, Undernutrition, Wasting, Underweight, Stunting, Children.*

INTRODUCTION

Human immunodeficiency virus infection and under nutrition are both highly prevalent in many parts of the world, especially in sub Saharan Africa (Drimie et al., 2006). Nearly 90% of children infected with Human immunodeficiency virus live in this region, and more than three in four (76%) Acquired Immunodeficiency Syndrome deaths in 2007 occurred in Sub-Saharan Africa (SSA) (Olalekan A., 2008).

At international level, numerous studies exist that have generated important information on both malnutrition and Human immunodeficiency virus infection (Drimie *et al.*, 2006).

According to UNAIDS report, about 2.5 million children under the age of 15 were living with HIV infection in 2007 and 330,000 died of AIDS (UNAIDS, 2008). About 420,000 new infections have occurred in the same year among children aged below 15 years. More than 95% of HIV infected infants in Africa acquire the infection from their mothers during pregnancy, at the time of delivery, or postnatal through breastfeeding (UNAIDS 2008).

HIV prevalence in Ethiopia was 1.5 percent & in Southern Nations, Nationalities and Peoples' Region (SNNPR) the HIV infection prevalence was estimated at 0.9 %, (1% in females and 0.6% in males) in 2011 (Ethiopian Demographic and Health Survey; 2011).

Nutritional issues are common in Human Immunodeficiency Virus disease. At some point, almost everyone living with

Human Immunodeficiency Virus will face challenges in maintaining good nutrition. Problems are related to Human Immunodeficiency Virus infection itself, food security and to the effects of anti- retro Virus therapy (ART). Children who are experiencing weight loss need between 50% and 100% more energy every day (Scott D. e*t al., 2006).* Reduced food intake can result from appetite loss, difficulty eating, opportunistic infection, antiretroviral drug adverse effect and/or depression. Poor absorption of nutrients is also common problem among patients with HIV infection that may happen because of interrelated causes: diarrhea, intestinal cell damage. Usually energy requirement of HIV infected individual increases as HIV replicates and opportunistic infections (OIs) coexist. In addition, other metabolic changes happen affecting the way the body uses the nutrients it receives or has stored (Hailemariam *et al*., 2013). Taking this complex nature of the problem in to account, this study aimed to assess nutritional statuses and identify factors associated with nutritional status of HIV infected under-fourteen years old children. It is our strong belief that the results of this study provided valuable information to strengthen nutritional issue in the field of nutrition and Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) care and support, in Human Immunodeficiency Virus positive children who attended HIV/AIDS care and support centers in the study area.

This study adds to the existing knowledge in the theme nutrition and HIV/AIDS. Stakeholders, hospital managers, board administrators and academicians need clear picture about the factors that determine nutritional status of HIV test positive children. Therefore, the study provided useful information on nutritional status of HIV sero-positive children to assist evidence-based decisions to minimize undesired impact of nutritional status, enhance quality of life by strengthen quality of HIV/AIDS care and support service.

MATERIALS AND METHODS

Study Setting, Design

The study was conducted in a pediatric ART clinic of Hawassa University Referral Hospital, located in Hawassa, Ethiopia. Hawassa is located about 275 kilometers far away from the capital city, Addis Ababa. Health Facility, Referral Hospital, based cross-sectional study design was employed. Data was collected from June1st to August 30th 2014 waiting for clinical care and support follow-up appointment schedule of the hospital for each child.

Sample Size and Sampling Procedure

During the study period, 455 HIV positive under-fifteen children were found on HIV/AIDS care and support follow-up service. Because the number was manageable and small, all under-fifteen years, who were on follow-up service, were included and no sampling technique was used.

Data Collection

Nurses with diploma and above educational qualification was considered for data collection. Investigators gave pre-data collection one-day training on interviewing technique, ethics in data collection and data collection tool to the selected data collectors. Trained data collectors collected data using pre-tested questionnaire. Principal investigator made a strict periodic supervision and checkups during the data collection.

Anthropometric Measurement

The principal investigator (PI) and an assistant took anthropometric measurements (weight and height). The PI used standard anthropometric measurement procedures as Food and Nutrition Technical Assistant Project [FANTA, 2003] recommend it.

Data Analysis

Entire data was checked for completeness, coded, entered in to SPSS version 20 for window and cleaned.

Anthropometric data were exported from SPSS to WHO Anthro and WHO Anthro Plus and standard Z-scores were generated for nutritional status indicators: Weight-for-length/height (WL/HZ), Length/Height-for-age (LAZ/HAZ) and Weight-for-age (WAZ). Children below-2 standard deviations (−2SD) of the WHO median for WL/HZ, L/HAZ, and WAZ were considered wasted, stunted or underweight respectively.

Ethical Issue

Ethical clearance was obtained from Hawassa University Institutional Review Board Office. All the study participants were informed about the purpose of the study, their right to refuse participation and anonymity of information. The informed consents were obtained from all participants prior to their participation in the study.

RESULTS

Socio-Demographic Characteristics

A total of 455 children on HIV/AIDS care and support follow-up from Hawassa University Referral Hospital were included with a response rate of 420(92.3 %).

More than half of the children 240 (57.1%) were males while 180(42.9%) were females. The mean (+SD) age of children included in the study was 8.9(+ 3.2) years. Result from the survey also showed that majority of the children 393(93.6%) came from urban. Three fourth, 319 (76 %) of the study subjects live with their parent/s. About 265 (63.1%) caretakers were married and living with their spouse and only 299(71.2%)) attended formal education (Table 1).

Table 1: Socio demographic characteristic of HIV infected children attending Pediatrics HIV/AIDS clinic of Hawassa University Referral Hospital and their caretaker, South Ethiopia, 2015 (n=420)

Characteristic		Frequency	Percentage
Sex	Male	240	57.1
	Female	180	42.9
Age in months	<60	33	7.9
	60 to 120	241	57.4
	121 to 168	146	34.8
Residence	Urban	393	93.6
	Rural	27	6.4
Child birth order	1st born	278	66.2
	2nd born	81	19.3
	>3rd born	61	14.5
With whom child lives?	Parent(s)	319	76
	Grandparent(s)	52	12.4
	With other relatives	49	11.6
Family size	>4 family	243	57.9
	< 4family	177	42
Educational status of the caretaker	No formal education	121	28.8
	Formal education	299	71.2
Marital status of the caretaker	Married	265	63.1
	Widowed	108	25.7
	Divorced/separated	31	7.4
	Single	16	3.8

Dietary history and nutrition related profiles

More than three fourth of the care takers/households were with average monthly greater than 500 Ethiopian Birr. Four hundred three (96%) of the children were exclusively breast-fed. About 367 (87.4%) of the HIV positive children were feed less than four food varieties and 381 (90.7%) feed below five times within a day. More than half 287(68.3%) of the children's caretakers reported they did not have dietary counseling. (Table: 2).

Table 2: Nutrition related profiles of HIV positive children attending pediatrics HIV/AIDS clinic of Hawassa University Referral Hospital, South Ethiopia, 2015 (n=420)

Characteristic		Frequency	Percentage
Did caretaker receive dietary counseling before?	Yes	133	31.6
	No	287	68.3
Did/is the child fed/feeding breast?	Yes	403	96
	No	17	4
Average monthly income of the family	<500ETB	39	9.3
	>500ETB	381	90.7
24 hour recall Dietary diversity score of the child	<4 Variety	367	87.4
	>4 Variety	53	12.6
Child feeding frequency	> 5 Meal/day	39	9.3
	< 5 Meal/day	381	90.7

ETB = Ethiopian Birr

Medical and related problems

Among the included, 285 (67%) children have been on follow-up for more than five years and only 135 (32%) have been on follow-up for less than five years duration. Forty-three (10.2%) of children had sicknesses in the past two weeks preceding data collection. Most of the children 353(84%) had no eating difficulties. Majority of the children, 291 (69.3%) were with advanced stages of AIDS (stage 3 or 4) (Table 3).

Table 3: Frequency and percentage distribution of health problems among children attending pediatrics HIV/AIDS clinic of Hawassa University Referral Hospital, South Ethiopia, 2015(n=420)

Type of Health Problem		Frequency	Percentage
Eating problem	Yes	67	16
	No	353	84
Type of eating problems	Loss of appetite	57	13.6
	Swallowing difficulty	11	2.6
	Vomiting	8	1.9
Current acute disease 2week prior to data collection	Yes	43	10.2
	No	377	89.8
Type of acute disease	Gastroenteritis	10	2.4
	Pneumonia	16	3.8
	Other AFI	16	3.8
Duration of Follow-up at the ART clinics	less than two year	31	7.4
	2 to 5 years	104	24.8
	>5 years	285	67.9
WHO Clinical Stage	Stage I	76	18.1
	Stage II	53	12.6
	Stage III	273	65.0
	Stage IV	18	4.3

AFI=Acute Febrile Illness

Nutritional Status

There was no over nourished child and edematous (Kwashiorkor or Marasmickwash) form undernutrition was not observed among the studied children. About 253 (60.2%) children were stunted, 173(41.2%) of children were underweight and 90 (21.4%) children were wasted (Figure 2).

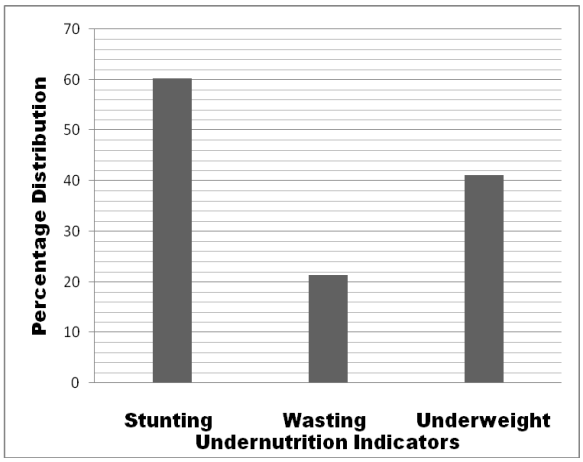

Figure1: Percentage distribution of undernutrition among HIV positive children attending HIV/AIDS clinic of Hawassa University Referral Hospital, 2015

Factors Associated with Nutritional Statuses

Factors associated with wasting

After adjusting for other factors, wasting as measured by weight for height (WHZ) and body mass index for age (BMIFA) was significantly associated with residential area of the children, absence of dietary counseling to the care giver and presence of acute disease two week prior to the survey. Children living in rural area were about 2 times more at risk of becoming wasted than children live in urban area (AOR=2.38; 95%CI 1.01, 5.64).

Lower risk of being wasted was associated with attendance of dietary counseling session of caregivers. In children whose care givers were given dietary counseling were at lower risk of wasting as compared to those who were not counseled by health professional at ART clinic (AOR=0.09; 95% CI 0.35, 0.23). Presence of acute disease increased the risk of wasting by two times in HIV positive children (AOR=1.70; 95%CI 1.01, 2.86) (Table 6).

Table 4: Factors Associated with Wasting Statuses of HIV Infected Children Attending Pediatrics ART Clinic of Hawassa University Referral Hospital, South Ethiopia

Predictor variable	Wasting Status		COR	AOR, 95%CI	P-value
	Yes	No			
Residence					
Rural	11	16	2.5(1.21,5.24)	2.38(1.01,5.64)	0.01**
Urban(Ref)	79	314	1.00	1.00	
Presence of disease/s two weeks prior to the survey					
Yes	22	68	2.84(2.21,6.66)	1.70(1.01,2.86)	0.001**
No(REF)	21	309	1.00	1.00	
WHO HIV/AIDS clinical stages					
Advanced stage	19	110	0.88(0.61,1.27)	0.82(0.47,1.42)	0.47
Early stage(REF)	65	226	1.00	1.00	
Care taker attended dietary counseling session					
Yes	5	128	0.33(0.18,0.58)	0.09(0.35,0.23)	0.001**
No(REF)	79	208	1.00	1.00	
Child meal pattern per 24hr					
>5Meal	8	31	1.05(0.99,1.12)	1.99(0,72,5.52)	0.18
<5Meal(REF)	82	299	1.00	1.00	
Food variety per 24 hrs					
>4Varity	12	41	0.99(0.90,1.08)	0.89(0.42,1.91)	0.77
<4Varity(REF)	78	289	1.00	1.00	
Average monthly income of the family					
<500ETB	12	27	1.63(0.86,3.08)	1.65(0.75,3.65)	0.21
>500ETB(REF)	78	303	1.00	1.00	

*** Statistically significant at (p-value <0.001), **statistically significant at (p<0.01) *statistically significant at (p<0.05) Ref=Reference category, ETB=Ethiopian Birr.

Factors associated with underweight

From multivariate analysis, less than 11 year children`s Underweight as measured by weight for age Z-score (WAZ) was significantly associated with their meal pattern, WHO HIV/AIDS clinical stage, food variety, average monthly income of the caregivers and caregiver dietary counseling before the survey by health professional.

The odds of being underweight in children whose caregivers income were not more than 500 ETB was about five times higher compared with children whose caregivers income was more than 500 ETB (AOR=4.97;95%CI 2.24, 11.05). Advanced WHO HIV/AIDS clinical stage of the child was significantly associated with underweight. The odds of underweight for advanced clinical stage (stage 3 and stage 4) of HIV/AIDS was about 2 times higher than early stage (stage 1 and 2) (AOR=2.33; 95% CI 1.47, 3.67).

Children who consumed meal less than five times by the past 24 hours prior to the survey were seven time at higher risk of becoming underweight (AOR=7.49;95% CI 2.48,22.65). Eating more diversified food decrease the risk of underweight (AOR=0.46, 95% CI 0.23, 0.95)

The risk of underweight among children whose caregivers attended dietary

counseling session was significantly lower as compared to those who didn't (AOR = 0.46;95CI 0.29,0.75) (Table 7).

Table 5: Factors Associated with Underweight Statuses of HIV Infected Children Attending Pediatrics ART Clinic of Hawassa University Referral Hospital, South Ethiopia

Predictor variable	Underweight		COR, 95% CI	AOR, 95%CI	P-value
	Yes	No			
Residence					
Rural	14	13	1.78(0.85,3.71)	0.57(0.24,1.36)	0.2
Urban(Ref)	159	234	1.00	1.00	
Acute disease presence 2week prior to survey					
Yes	20	153	0.97(0.82,1.14)	0.82(0.53,1.26)	0.37
No(REF)	23	224	1.00	1.00	
WHO HIV/AIDS clinical stages					
Advanced stage	171	120	1.75(1.31,2.33)	2.33(1.47,3.67)	<0.001***
Early stage(REF)	2	127	1.00	1.00	
Care taker take dietary counseling					
Yes	169	212	1.14(1.07,1.20)	7.49(2.48,22.65)	<0.001***
No(REF)	4	35	1.00	1.00	
Child meal pattern/frequency per 24hr					
>5Meal	14	39	0.51(0.28,0.91)	2.23(1.02,4.90)	0.04*
<5Meal(REF)	159	208	1.00	1.00	
Food variety consumed per 24 hrs					
>4Varity	31	8	4.14(2.07,8.27)	4.97(2.24,11.05)	<0.001***
<4Varity(REF)	142	239	1.00	1.00	
Average monthly income of the family					
<500ETB	40	153	0.61(0.45,0.84)	0.46(0.29,0.75)	<0.001***
>500ETB(REF)	133	94	1.00	1.00	

*** Statistically significant at (p-value <0.0001),*statistically significant at (p<0.05) Ref=Reference category, ETB=Ethiopian Birr

Factors associated with stunting

Stunting was significantly associated with the average monthly income of the family. The odds of stunting among children from family with less than 500 Ethiopian birr monthly income was about two times higher as compared to children from family with 500 Ethiopian birr and above monthly income (AOR=2.56; 95% CI 1.14, 5.75) (Table 8).

Table 6: Factors Associated with Stunting Statuses of HIV Infected Children Attending Pediatrics ART Clinic of Hawassa University Referral Hospital, South Ethiopia

Predictor variable	Stunting		COR, 95% CI	AOR, 95%CI	P-value
	Yes	No			
Residence					
Rural	16	11	0.95(0.45, 1.99)	1.02(0.46, 2.29)	0.96
Urban(Ref)	237	156	1.00	1.00	
Acute disease presence 2week prior to survey					
Yes	30	224	1.14(0.96, 1.35)	1.25(0.84, 1.88)	0.27
No(REF)	13	153	1.00	1.00	
WHO HIV/AIDS clinical stages					
Advanced stage	168	123	1.26(0.94, 1.71)	1.30(0.84, 2.02)	0.24
Early stage(REF)	85	44	1.00	1.00	
Care taker take dietary counseling					
Yes	84	109	1.12(0.84, 1.50)	1.16(0.75, 1.79)	0.49
No(REF)	170	57	1.00	1.00	
Child meal pattern per 24hr					
>5Meal	232	149	1.03(0.96, 1.09)	1.26(0.64, 2.47	0.49
<5Meal(REF)	21	18	1.00	1.00	
Food variety per 24 hrs					
>4Varity	31	22	0.93(0.56, 1.55)	0.92(0.51,1.66)	0.78
<4Varity(REF)	222	145	1.00	1.00	
Average monthly income of the family					
<500ETB	30	9	2.53(1.19, 5.37)	2.56(1.14, 5.75)	0.02*
>500ETB(REF)	223	158	1.00	1.00	

*statistically significant at (p<0.05) Ref=Reference category, ETB=Ethiopian Birr

DISCUSSION

This study demonstrated different proportion of undernutrition for different age range: 41.2% underweight for less than 11 years children, 60.2% stunting and 21.4% wasting and thinness for children

between 6 months and 14 years. The observed difference was in agreement with finding from Tanzania (Sunguya et al., 2014). Wasting was measured according to their age (4.5% wasting in under five children, measured by WHZ and 16.9% thinness in greater than five years children, measured by BAZ).

Proportion of poor anthropometric statuses in these HIV-positive children was higher as compared to the general population. This indicates greater nutritional deficits in this group compared to overall Ethiopian children below five year of unknown HIV status. According to mini Ethiopian Demographic and health survey, national prevalence of undernutrition among underfive children of unknown HIV status was reported to be 25% underweight, 40% stunted and 9% wasted. Acute malnutrition or Wasting of 21.4% among the studied HIV-positive children was almost two times greater than both the national and regional figure (EDHS, 2014). This difference can be explained by the difference in their rural/urban composition of the samples, the differences in HIV status, sample size & presence of acute illness (FANTA, 2010). Studies done in Ethiopia (Berihun *et al*., 2013) and Southwestern part of Uganda (Joyce and Hanifa, 2006) reported comparable proportion of underweight and stunting. However, the prevalence of Stunting and underweight was lower than study done as a baseline evaluation of the first 145 HIV-infected children to receive Antiretroviral Treatment (ART) in Botswana (59% underweight, 75% stunted) (Anabwani *et al*., 2005). This may be due to that the small sample size & difference in that this study included both children who receive and who do not receive ART.

In present study underweight was significantly associated with advanced HIV clinical stage, average monthly income of the family, absence of dietary counseling, low level of dietary diversity and meal pattern. The association we found between underweight and independent variables is in agreement with result of studies conducted in Kenya (Onyango *et al*.,2009), Uganda (Bukusuba *et al*., 2009), Tanzania (Ali, 2010) and Malaysia (Mohd *et al*., 2011). The studies revealed that advanced clinical stage of HIV, dietary diversity less than four (measured by the number of individual foods consumed in the 24hours prior to the study), meal frequency less than five, low average monthly income of the family and absence of dietary counseling for care taker were significantly associated with poor nutritional status of children. According to (FANTA, 2007) and (WHO, 2006) guideline, low dietary diversity (<4 variety or food groups) and low meal frequency (<5 times in a day) demonstrates poor food accessibility and low micronutrient intake.

In the current study, wasting was significantly associated with presence of acute disease, absence of dietary counseling and residence. In agreement with the finding by E.Kimami-M in South Africa and Anna M Rose in London who revealed that acute malnutrition was higher in HIV positive children with infections, absence of dietary counseling for the family and residence (Kimami *et al*., 2011; Rose *et al*., 2013).

Average monthly income of the family was found associated with stunting. The observed association is equivocal with results from studies conducted in Ethiopia (Berihun *et al*., 2013), Tanzania (Sunguya *et al*., 2011) and Uganda (Ali, 2010).

Low HAZ indicates shortness or stunting of a child. Usually, it is considered as a reflection of overall poor socioeconomic condition of a community (References). Possible explanation for the strong association between stunting and average monthly income of the family is that average monthly income of the family may acts as the proxy indicator of households' economic status.

CONCLUSION

High proportion of study participants reportedly consumed less frequently and less food variety than minimum recommended level. This would likely mean lower macronutrient and micronutrient

intake possibly contributes to the poor life quality of HIV-positive children. More than half of the caregiver of the children reported that they did not attend dietary counseling session.

Magnitude of low anthropometric status (Wasting/thinness, underweight and Stunting) was significantly high among HIV infected children attending ART clinic. Acute form of malnutrition was higher among children from rural residents. Proportion of undernutrition for children under and above five years of age was also different.

Residence, presence of disease/s two weeks prior to the survey and Caretakers' attendance status of dietary counseling session are associated with wasting. Clinical stage of HIV/AIDS, caregivers attendance status of dietary counseling session, children's meal frequency per 24 hour, food variety consumed by the past 24 hour and average monthly income of the family were associated with underweight. Only average monthly income of the family was associated with stunting.

Improving the observed high prevalence of undernutrition needs focused and stakeholders collaborative attention. Dietary counseling, routine nutritional assessment and nutritional support in the form of cash and kind shall be strengthened, monitored and evaluated.

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