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# Magnitude and factors associated with under nutrition among children on art in east Wollega zone, western Ethiopia, 2022

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## Abstract

**Background**: Under nutrition is defined as a pathological state resulting from insufficient food intake and repeated infectious diseases. Under nutrition is a global problem and the biggest threat to human life and economic progress. It is the main cause of child morbidity and mortality especially in sub-Saharan Africa including Ethiopia. The severity of the problem is even worse when children are infected with human immunodeficiency virus. Despite the significance of the problem, there were limited studies conducted in the study area.

**Objective:** To assess the magnitude and factor associated with under nutrition among children on ART in East Wollega zone,2022

**Methods**; Institutional based cross-sectional study design was employed to assess the magnitude and associated factors of under nutrition among under fifteen years children who are on ART at public health facility of East Wollega Zone,2022

**Result:** In this study the magnitude of malnutrition (WFH<-2 Z-score) was 36.8% with 95% CI (32.1, 41.8). Having acute disease two weeks before the survey (AOR=5.82, 95%CI:2.86,11.84), CD4 level (AOR= 1.85, 95%CI:1.06, 3.25), not treating water at home (AOR=3.30,95%CI:1.8, 6.05), follow up duration (AOR= 1.97, 95%CI: 1.11, 3.49), food insecurity (AOR=3.55, 95%CI: 2.03,6.19), and latrine unavailability (AOR=2.73, 95%CI: 1.39, 5.36) were statistically significant predictors of Under nutrition among children on antiretroviral therapy (ART) follow up.

**Conclusion and recommendation:** The prevalence of Under nutrition among children living with HIV/AIDS was found to be high. Having acute disease two weeks before the survey, CD4 level, not treating water at home, follow up duration, food insecurity, and latrine unavailability were found to be strongly associated with under nutrition among children on ART follow up. Hence, the public health care facilities should treat acute diseases early, timely measuring of their CD4 levels, providing health education on household water treatment, latrine utilization and feeding practices, and conduct continuous follow-up.

**Keywords:** Magnitude; Risk factors; Under nutrition; Feeding practices

## 1 Introduction

Under nutrition is defined as a pathological state resulting from insufficient food intake and repeated infectious diseases. This includes underweight, stunting, wasting, and micro nutrient deficiency (1). According to the United Nations Children Fund (UNICEF), under nutrition is the outcome of insufficient food intake and recurrent infectious diseases (2). Under nutrition is a group of disorders that includes stunting, wasting and underweight (3). There is strong evidence that under nutrition is associated with faltered growth, delayed mental development, and reduced intellectual ability. They can also no longer sustain natural bodily capacities, such as resisting infections and improving from disease

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(4). Under nutrition is estimated to contribute to more than 20million childhood morbidity and mortality (5). Weight loss and under nutrition are common in people living with HIV/AIDS, likely accelerating disease progression, increasing morbidity and reducing survival (6). HIV and under nutrition are common comorbidities in low and middle income countries (7.) An African study demonstrated a prevalence of malnutrition among HIV-infected children of 42%(8)

In 2012, 3.3 million children were living with Human Immunodeficiency Virus (HIV) worldwide, with more than 90% in sub-Saharan Africa (9). Regardless of HIV, sub-Saharan Africa is also the region of the world the most seriously affected by malnutrition, 21 % of children under 5 years are underweight, 39 % are stunted, and 9 % are wasted (10).. Malnutrition is the underlying cause of death among 35 % of children aged <15 years (11) .and could lead to irreversible damages such as cognitive impairment, chronic diseases and growth failure (12). Therefore, malnutrition is a major problem for children and especially for HIV-infected children since it creates a vicious circle with HIV infection. (13) HIV-related opportunistic infections such as persistent diarrhea or oral and esophageal candidiasis have a negative impact on nutritional status among children (14). HIV infection can also indirectly affect the child's nutritional status, when it has an impact on the child's social environment. In some contexts, when HIV concerns the most productive members of the family, the household economic capacities and the agricultural production are reduced, leading to a situation of food insecurity (15). Furthermore, poor weaning practices among HIV-infected mothers can also have an impact on the child's nutritional status (16).

Thus, malnutrition is a common complication among HIV-infected children. Low weight-for-age has been reported in up to 50 % of untreated HIV-infected children in resource-limited settings (17). Among children with severe malnutrition, mortality risk is three times higher in HIV-infected children than in non-HIV-infected children (18).However, the burden of malnutrition remains difficult to quantify in HIV-infected people, most of all in children (19). Therefore, assessing magnitude and factor associated with under nutrition among children in less than fifteen years who are on ART at public health institutions is the main objective of the study.

## 2 Methods and Materials

### 2.1 Study area

This study was conducted in all Public Health Facilities providing chronic HIV care (ART) found in East Wollega,2022. East Wollega Zone is one of the 22 Zones in Oromia national regional state and is located western to Addis Ababa(the nations capital) at 330 KM. It has an area of 14,255 square kilometers with estimated population of 1,531,380 (one million five hundred thirty-one thousand three hundred eighty) as projected from 2007/2008 national census. The economy of the people is based on subsistence farming and livestock rearing. There are 5 hospitals and 63 health centers owned by government in the zone currently. There are five hospitals and 19 health centers providing chronic HIV care(ART) services in the Zone.

### 2.2 Study design

Institutional based cross-sectional study was employed to assess the magnitude and associated factors of under nutrition among children in under fifteen years who are on ART at public health facilities in East Wollega Zone, Western Ethiopia.

Study period

From September 2022

### 2.3 Source of population

All HIV positive children under fifteen years of age who are enrolled in HIV care and treatment centers in East Wollega Zone public health facilities.

### 2.4 Study population

All sampled under fifteen years children on ART in in all ART sites public health facilities in the Zone were taken the study population.

### 2.5 Inclusion criteria

All HIV infected children <15years of age who have follow up in East Wollega Zone Hospital and health center pediatrics ART clinic.

### 2.6 Exclusion criteria

Those caregivers who were not interested to give information were excluded.

### 2.7 Sample size determination

The sample size for this study was calculated using a formula for estimation of single population

proportion with the assumption of 95% confidence level, 4% margin of error and by taking 43%% prevalence of undernutrition from previous study conducted in Thailand.

$$n = \frac{z^2 p\ q}{d^2}$$

Where
n = Sample size
z = the value corresponding to a 95% level of significance = 1.96
p =prevalence of undernutrition taken from study conducted in Thailand

P=0.276

q = (1 - p) = (1- 0.276)

d = absolute precision (5%)

Therefore, the sample size (n) is = (1.96)2 X (0.43) X (0.0.57) = 346

0.04 X 0.04

By adding 10% none response rate, the final sample size will be = 380.

### 2.8 Sampling Technique and procedure

All 5 hospitals and 19 health centers providing pediatric ART was included in the study. All children <15 years of age on ART who fulfills the inclusion criteria were included in the study during the study period. Then, 166 children <15 years of age on ART from five hospitals and 204 from 19 health centers providing ART were taken as the study participants.

### 2.9 Operational definition

Under-nutrition: In this study under-nutrition was defined as children with the nutritional assessment indices of weight for height z-score < −2SD of the median value of WHO growth reference.

Stunted children: was defined as if the height for age (HAZ) index found to be below -2SD WHO growth reference 2007 of the median of the standard curve

Severe stunting: was defined as if the height for age (HAZ) index found to be below -3SD WHO growth reference 2007 of the median of the standard curve.

- **Food Security.** Means when all respondents say “no” for all affirmative household food access scale of occurrence questions measured in terms of 9 items for at least four weeks (4) duration.
- **Food Insecure.** Individuals were labeled to be food insecure if they answer “Yes” to all affirmative household food access scale of occurrence questions measured in terms of 9 items for at least four weeks (4) duration. This can be labeled as mild, moderate, and severe food insecurity tertian classification method.
- **Mild Food Insecurity**. When all respondents responded rarely (1) for frequency questions with a value interval between 1-9 inclusively.

- **Moderate Food Insecurity**. When all respondents responded sometimes (2) for frequency questions with a value interval between 10-18 inclusively.
- **Severe Food Insecurity**. When all respondents responded often (3) for frequency questions with a value of 27 (3X9 = 27).

### 2.10 Data collection instrument and procedure

Questionnaires are prepared for data collection after thorough review of different literature from journals and different publication prepared by WHO, UNICEF in English and then translated to Afaan Oromo and translated back to English by other person to check the consistency. Data were collected using face-to-face interviews and a medical record of each client was reviewed. The data were collected by 21 BSc nurses and supervised by five ART focal person.

A digital scale (Seca, Germany) was used to measure weight to the nearest 0.1 kg, with study participants wearing light clothes and no shoes. Height was measured with a portable stadiometer to the nearest 0.1 cm while 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 back of the head. And length measuring by board Weight and height /length were converted to a height for-age Z-score (HAZ) and a B MI-for-age Z-score (BAZ) according to WHO growth standard values using the WHO Anthro for children under five and WHO Anthro plus for children over five years.

Children were categorized as stunted or wasted when their Z-score was less than negative two (<-2). Addition to Weight and height /length mid-upper arm circumference used for children less than five years.

### 2.11 Data Quality assurance

#### *2.11.1 Data quality control*

Data collectors and supervisors were trained on how to conduct interviews, and take anthropometric measurements for one day by principal investigator. The principal investigator and supervisors were conducted close follow-up and frequent checks on the interview process to ensure the completeness and consistency of the information gathered. The functionality of digital weight scales was checked using known weights every morning before data collection began and before every weight measurement; the data collectors were assured as the scale read exactly at zero. Pretest on 10% of the samples was conducted at the nearest hospitals which is not included in the study.

### 2.12 Data processing and analysis

First the data were cleaned and entered into Epi Info version 7 and exported to SPSS version 23 for analysis. Anthropometric measurements were calculated using the WHO Anthro for children under five years and Anthro plus for children 5-15 years old. Descriptive statistics, bivariable and multivariable logistic regression analysis was employed. Bivariable analyses was done to explore potential variable associated with malnutrition while multivariable logistic regression analyses were carried out to control for potential confounders. Only those variables showing statistical significance at $P$ <0.25 during bivariate analyses were entered into the multivariate regression model. Odds ratio with 95% CI was reported. A P-value <0.05 was taken as the statistically significant.

### 2.13 Ethical consideration

Ethical clearance was obtained from Wollega University ethical review board and letter of permission was taken from each of the selected health facilities administrative bodies. Verbal consent was obtained from the mother's or care givers after explaining to them the objectives of the study, procedures and as all information collected on each individual was kept confidential. Participants were informed about privacy and the right not to participate on the study without any consequences. Children who are diagnosed with malnutrition are linked to pediatrics out patient department.

### 2.14 Dissemination of the result

First, the result of this study will be presented for Wollega University scientific community and then submitted to Wollega University Institute of Health Science department of Public Health. Besides, the copies of the thesis will be given to East Wollega Zonal Health Office and each facility where the study was conducted. Finally, it will be presented on different scientific workshops and published on international reputable journals.

### 2.15 Study Variables

*2.15.1 Dependent variables*

Under nutrition

*2.15.2 Independent Variables*

Socioeconomic and demographic variables of the parents/care giver: Age, Sex of head of household, Marital status, Ethnicity, Religion, Family size, Income, Educational status, occupational status

Child characteristics: Age, sex, with whom the child live

- **Maternal characteristics:** Family size, Education of care giver, Maternal HIV status
- **Medical and related problem of children:** Eating problem, difficulty of swallowing morbidly status TB, diarrhea and ARI, Duration of follow up, WHO clinical stage.

## 3 Result

### 3.1 Socio-demographic characteristics of Caregiver and HIV/AIDS positive children on ART

Follow up at East Wollega Zone Public health facility providing ART follow-up. A total of 380 study participants involved in this study yielding the response rate of 100 %. The ages of children range from 2 to 15 years with a mean age of 12.04 and standard deviation (SD) of ± 2.606. Majority of the respondents were urban residents 253(66.6%). More than half of the children were females 222(58.4%). Regarding the heads of household, about two-thirds 253(66.6%) of the heads of households were males. More than one-third, 254(66.8 %) children parents were alive. Majority of them were orthodox 193950.8%) in religion and Oromo 260 (68.4 %) in ethnicity (Table 1).

**Table 1** Socio-demographic characteristics of Caregiver and HIV/AIDS children on ART follow up in East Wollega Zone Public healthcare facilities, 2022

| Variable | Response categories | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Sex | Male | 158 | 41.6 |
| | Female | 222 | 58.4 |
| Residence | Urban | 253 | 66.6 |
| | Rural | 127 | 33.4 |
| Head of Household | Male | 253 | 66.6 |
| | Female | 127 | 33.4 |
| Family Size | >= 4 | 125 | 32.9 |
| | < 4 | 255 | 67.1 |
| Educational Status of Care giver | Formal Education | 345 | 90.8 |
| | No Formal education | 18 | 4.7 |
| | Unable to read and write | 17 | 4.5 |
| Marital status of care giver | Married | 277 | 72.9 |
| | Widowed | 34 | 8.9 |
| | Divorce | 43 | 11.3 |
| | Single | 26 | 6.8 |
| Ethnicity | Oromo | 260 | 68.4 |
| | Amara | 111 | 29.2 |

| | | | |
|---|---|---|---|
| | Tigire | 8 | 2.1 |
| Religion | Waqefata | 11 | 2.9 |
| | Orthodox | 193 | 50.8 |
| | Protestant | 30 | 7.9 |
| | Muslim | 144 | 37.9 |
| | other | 2 | 0.5 |
| Parental Current status | Both alive | 254 | 66.8 |
| | Mother died | 53 | 13.9 |
| | Father Died | 21 | 5.5 |
| | Both died | 52 | 13.7 |
| Birth order | 1st born | 148 | 38.9 |
| | 2nd born | 157 | 41.3 |
| | 3rd born | 68 | 17.9 |
| | >= 4th born | 7 | 1.8 |

### 3.2 Nutritional, and health-related characteristics

From a total of 380 children, 170(44.7%) of them received counselling regarding the dietary. About one-third 136 (35.8%) of them treats water for drinking. From total children, 270(71.1%) of them had good level of dietary diversity. This study revealed that 246 (64.7%) of children were from households with food insecurity. Nearly two third of them, 239(62.9%) gets food frequency of less than three per a day. Majority 334(87.9%) of the parents of the child had the latrine but only 60.3 % of them have hand washing facility near the latrine(Table 2).

**Table 2** Nutritional and health-related characteristics among HIV/AIDS Children on follow-up at East Wollega Zone Public health facility providing ART follow-up, West Ethiopia ,2022

| **Variable** | **Categories** | **Frequency(n)** | **Percentage (%)** |
|---|---|---|---|
| Wasting | Yes | 140 | 36.8 |
| | No | 240 | 63.2 |
| Stunting | Yes | 115 | 30.3 |
| | No | 265 | 69.7 |
| Received dietary counselling | yes | 170 | 44.7 |
| | No | 210 | 55.3 |
| Presence of therapeutic food | Yes | 118 | 31.1 |
| | No | 262 | 68.9 |
| Treating water | yes | 136 | 35.8 |
| | No | 244 | 64.2 |
| Level of dietary diversity | Poor | 110 | 28.9 |
| | Good | 270 | 71.1 |
| Level of food security | Food secure | 134 | 35.3 |
| | Food insecure | 246 | 64.7 |
| Food frequency | 3 and above | 239 | 62.9 |

| | | | |
|---|---|---|---|
| | less than 3 | 141 | 37.1 |
| Latrine Availability | No | 46 | 12.1 |
| | Yes | 334 | 87.9 |
| Hand Washing after toilet | No | 151 | 39.7 |
| | Yes | 229 | 60.3 |

### 3.3 Clinical related characteristics of HIV/AIDS Children

More than half 222 (58.4%) of the children were in the categories of ≥500 CD4 count. From a total of 380 children, about 122 (32.1%) of them had history of opportunistic infection. About 16.6 % of them had history of eating problem two-weeks before the survey. A total of 78 (20.5%) of the children had history of acute disease two-weeks before the survey. From which diarrheal disease 62(16.3%) is the leading. More than two-third 245(64.5%) of them have been ART follow up for more than five years. Majority of the children 338(88.9%) had good adherence to ART drug (Table 3).

**Table 3** Clinical related characteristics of HIV/AIDs Children on ART follow-up at East Wollega Zone Public health facility providing, West Ethiopia 2022

| Variables | Response categories | Frequency(n) | Percentage (%) |
|---|---|---|---|
| Current CD4 Level | ≥500 | 222 | 58.4 |
| | <500 | 158 | 41.6 |
| History of opportunistic Infection | No | 258 | 67.9 |
| | Yes | 122 | 32.1 |
| Eating Problem | yes | 63 | 16.6 |
| | No | 317 | 83.4 |
| Acute disease two weeks prior to the survey | Yes | 78 | 20.5 |
| | No | 302 | 79.5 |
| Type of Acute disease | Diarrheal disease | 62 | 16.3 |
| | Pneumonia | 5 | 1.3 |
| | other AFI | 11 | 2.9 |
| Follow up duration | ≤5 year | 135 | 35.5 |
| | >5 years | 245 | 64.5 |
| WHO Clinical Staging | Stage I | 337 | 88.7 |
| | Stage II | 37 | 9.7 |
| | Stage III | 4 | 1.1 |
| | Stage IV | 2 | 0.5 |
| Adherence to a drug | Good | 338 | 88.9 |
| | Poor | 42 | 11.1 |

### 3.4 Factors associated with undernutrition among HIV/AIDs children on ART follow-up

In bivariate logistic regression variables with p-value less than 0.25 were; head of the household, family size, parent current status, eating problem, acute diseases, dietary counselling, CD4 count level, water treatment at home, history of opportunistic infection, follow-up duration, adherence to drug, dietary diversity, food insecurity, food frequency and latrine availability were the candidate variables entered into multivariate logistic regression. (Table 4, and Table 5).

**Table 4** Bivariate logistic regression analysis for factors associated with undernutrition (wasting) among HIV-positive Children who are on ART follow-up East Wollega Zone Public health facility, Western Ethiopia, 2022

| Variable | Category | Undernutrition | | COR | 95%CI | P-value |
|---|---|---|---|---|---|---|
| | | Yes | No | | | |
| Sex of the child | Male | 60 | 98 | 1.09 | 0.71, 1.66 | 0.867 |
| | Female | 80 | 142 | 1 | | |
| Residence | Urban | 114 | 189 | 1.18 | 0.70, 2.00 | 0.531 |
| | Rural | 26 | 51 | 1 | | |
| Head of household | Male | 83 | 170 | 1 | | |
| | Female | 57 | 70 | 1.67 | 1.08, 2.58 | 0.022* |
| Family Size | >= 4 Family | 57 | 68 | 1.67 | 1.08, 2.58 | 0.014* |
| | <4 Family | 83 | 172 | 1 | | |
| Educational status of care giver | Formal Education | 128 | 217 | 1 | | |
| | No formal Education | 6 | 12 | 0.85 | 0.31, 2.31 | 0.75 |
| | Unable to read and write | 6 | 11 | 0.93 | 0.33, 2.56 | 0.88 |
| Monthly income | ≥1000ETB | 34 | 67 | 1 | | |
| | < 1000 ETB | 106 | 173 | 1.21 | 0.75, 1.95 | 0.44 |
| Parent current status | Both alive | 84 | 170 | 1 | | |
| | Mother died | 22 | 31 | 1.44 | 0.78, 2.63 | 0.241* |
| | Father Died | 9 | 12 | 1.52 | 0.62, 3.74 | 0.365 |
| | Both died | 25 | 27 | 1.87 | 1.03, 3.43 | 0.041* |
| Eating Problem | Yes | 35 | 28 | 2.52 | 1.46, 4.37 | 0.00* |
| | No | 105 | 212 | 1 | | |
| Acute diseases | Yes | 57 | 21 | 7.16 | 4.09, 12.54 | 0.00* |
| | No | 83 | 219 | 1 | | |
| Dietary Counselling | yes | 52 | 118 | 1 | | |
| | No | 88 | 122 | 1.64 | 1.07, 2.51 | 0.027* |
| Current CD4 level | ≥500 | 71 | 151 | 1 | | |
| | <500 | 69 | 89 | 1.65 | 1.08, 2.52 | 0.02* |
| Hand washing | use water only | 77 | 125 | 1 | | |
| | water and soup | 6 | 17 | 0.57 | 0.22, 1.52 | 0.262* |
| Water treatment | yes | 32 | 104 | 1 | | |
| | No | 108 | 136 | 2.58 | 1.61, 4.13 | 0.00* |
| History of opportunistic infection | No | 82 | 176 | 1 | | |
| | YES | 58 | 64 | 1.95 | 1.25, 3.03 | 0.003* |
| Follow up duration | ≤5 year | 59 | 76 | 1.57 | 1.02, 2.42 | 0.04* |
| | >5 years | 81 | 164 | 1 | | 1 |
| Adherence to the drug | good | 116 | 222 | | | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Poor | 24 | 18 | 2.55 | 1.33, 4.89 | 0.005* |
| Dietary diversity | Poor | 50 | 60 | 1.67 | 1.06, 2.62 | 0.027* |
| | Good | 90 | 180 | 1 | | 1 |
| Food security | Insecure | 63 | 183 | 3.92 | 2.51, 6.13 | 0.00* |
| | Secure | 77 | 57 | 1 | | 1 |
| Food frequency category | less than 3 | 64 | 77 | 1.78 | 1.16, 2.74 | 0.008* |
| | 3 and above | 76 | 163 | 1 | | 1 |
| Latrine aavailability | No | 15 | 31 | 2.89 | 1.71, 4.87 | 0.001* |
| | Yes | 125 | 209 | | | 1 |
| Wash your hands | No | 56 | 95 | 1.02 | 0.67, 1.56 | 0.936 |
| | Yes | 84 | 145 | 1 | | 1 |

In the multivariable logistic regression, variables such as acute diseases, current CD4 level, water treatment, follow-up duration, food security and latrine availability found to be significantly associated with undernutrition.

**Table 5** Multivariable Logistic regression analysis for factors associated with under nutrition (wasting) among HIV-positive Children who are on ART follow up at East Wollega Zone Public health facility, Western Ethiopia, 2022

| **Variable** | **Category** | **Undernutrition** | | **COR (95% CI)** | **AOR (95%CI)** |
|---|---|---|---|---|---|
| | | **Yes** | **No** | | |
| Head of household | Male | 83 | 170 | 1 | |
| | Female | 57 | 70 | 1.67 (1.08, 2.58) | 1.33(0.72,2.48) |
| Family Size | >= 4 Family | 57 | 68 | 1.67 (1.08, 2.58) | 1.38(0.77,2.46) |
| | <4 Family | 83 | 172 | 1 | |
| Parent current status | Both alive | 84 | 170 | 1 | |
| | Mother died | 22 | 31 | 1.44(0.78, 2.63) | 1.13(0.49, 2.62) |
| | Father Died | 9 | 12 | 1.52(0.62, 3.74) | 0.92(0.30,2.86) |
| | Both died | 25 | 27 | 1.87(1.03, 3.43) | 0.83(0.35,1.98) |
| Eating Problem | Yes | 35 | 28 | 2.52(1.46, 4.37 | 1.96(0.97,3.94) |
| | No | 105 | 212 | 1 | |
| Acute diseases | Yes | 57 | 21 | 7.16(4.09, 12.54) | 5.82(2.86,11.84) * |
| | No | 83 | 219 | 1 | |
| Dietary Counselling | yes | 52 | 118 | 1 | |
| | No | 88 | 122 | 1.64(1.07, 2.51) | 1.41(.78,2.52) |
| Current CD4 level | >=500 | 71 | 151 | 1 | |
| | <500 | 69 | 89 | 1.65(1.08, 2.52) | 1.85(1.06, 3.25) * |
| Water treatment | yes | 32 | 104 | 1 | |
| | No | 108 | 136 | 2.58(1.61, 4.13) | 3.30(1.8, 6.05) * |
| History of OI | No | 82 | 176 | 1 | |
| | Yes | 58 | 64 | 1.95(1.25, 3.03) | 1.59(.90, 2.807) |
| Follow up duration | =<5 year | 59 | 76 | 1.57(1.02, 2.42) | 1.97(1.11, 3.49) * |

| | | | | | |
|---|---|---|---|---|---|
| | >5 years | 81 | 164 | 1 | |
| Adherence to the drug | good | 116 | 222 | 1 | |
| | Poor | 24 | 18 | 2.55(1.33, 4.89) | 1.58(.69, 3.63) |
| Dietary diversity | Poor | 50 | 60 | 1.67(1.06, 2.62) | 1.14(.63, 2.06) |
| | Good | 90 | 180 | 1 | |
| Food security | Insecure | 63 | 183 | 3.92(2.51, 6.13) | 3.55(2.03,6.19)* |
| | Secure | 77 | 57 | 1 | |
| Food frequency category | less than 3 | 64 | 77 | 1.78(1.16, 2.74) | 1.60(.92, 2.76) |
| | 3 and above | 76 | 163 | 1 | |
| Latrine aavailability | No | 15 | 31 | 2.89(1.71, 4.87) | 2.73(1.39, 5.36) * |
| | Yes | 125 | 209 | 1 | |

## 4 Discussion

This cross-sectional study investigated the magnitude and associated factors of undernutrition among children living with HIV/AIDS who are on follow up at East Wollega Zone Public health facility providing ART follow-up. In this study, the magnitude of malnutrition (WFH<-2 Z-score) was 36.8% with 95% CI (32.1, 41.8). This finding is in line with study conducted in Amhara region referral hospitals (30.3%)(64). However, the finding is lower than study conducted among HIV infected children attending HIV care in Northwest, Ethiopia and South India (65,66). This difference might be attributed to the socio-economic and socio-demographic characteristics of the study participants. Furthermore, the difference might be attributed to the study period in which this study was conducted after early ART initiation is recommended by World Health organization. However, the previous studies were conducted before the adoption of the recent WHO test and treat policy in which HIV infected children-initiated ART late there by it brings change Undernutrition comorbidity

In this study, factors significantly associated with the undernutrition were acute diseases two weeks prior to the study, current CD4 level, water treatment at home, follow up duration, level of food security, and latrine availability.

The finding of this study revealed that children who had acute disease two weeks prior to the data collection were 5.82 more likely to develop malnutrition than those who had not. This is in line with study conducted in Northwest Ethiopia in which those children who had diarrhea two weeks before the survey are three times more likely to be malnourished (65). The possible explanation might be due to loss of fluids and electrolytes, loss of appetite, and decrease in absorption of food in the intestine due to high motility of the intestine during diarrhea episodes (67,68). Those children with recent CD4 level of less than 500 were nearly two times more likely to be malnutrition as compared to those with children with CD4 level of greater than 500. This is due to the fact that children with lower level of CD4 count might be likely with advanced disease stages are more susceptible to develop co-morbid opportunistic infections. Hence, as the disease stage progresses and the child suffers other infections and the amount of additional energy need increases. The amount of additional energy needed increases as the HIV infection progresses and the child suffers other opportunistic infections. Thus, Additional care for opportunistic infections and routine first-line ART may also aggravate the side effects of patients like loss of appetite and poor nutritional status and compromise their resistance to the disease.

In this study, the duration of follow up was found to be significantly associated with malnutrition in which those children who are on ART treatment for less than five years were nearly two times more likely to be undernourished than their counter parts. This finding is in line with study conducted in central Ethiopia, and Tanzania(69,70). This might be due to the fact that immunity and reduces risk of opportunistic infections, diarrhea, and vomiting as a result patient could have better appetite, increase dietary intake, and improve nutritional status.

This study also revealed that undernutrition was found to be strongly associated with house hold food security status. Those children from households with food insecurity were 3.55 times more likely to be undernourished than those children form households with adequate access to food. This is supported with findings from Ethiopia, and Uganda (69,71)

## 5 Conclusion

The prevalence of undernutrition among children living with HIV/AIDS was found to be high. Having acute disease two weeks before the survey, current CD4 level, not treating water at home, follow up duration, food insecurity, and latrine unavailability were found to be strongly associated with undernutrition among children on ART follow up.

## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

'The present research work does not contain any studies performed on animals/humans subjects by any of the authors'.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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