Pediatric Health, Medicine and Therapeutics

Dovepress

open access to scientific and medical research

Open Access Full Text Article

ORIGINAL RESEARCH

Magnitude and Associated Factors of Undernutrition Among Children Aged 6–59 Months in Ethiopian Orphanage Centres

This article was published in the following Dove Press journal:
Pediatric Health, Medicine and Therapeutics

Haimanot Teferi[1]
Tesfalem Teshome[2]

[1]Department of Medical Laboratory, Addis Ababa City Administration Health Bureau, Bole Dil-frie Health Center, Addis Ababa, Ethiopia; [2]Department of Public Health St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia

Background: Children without parental care are at high risk for under-nutrition. Ethiopia counts as one of the largest populations of orphans in the world. However, there is no information about the nutritional status of children in Ethiopian orphanage centers. Thus, we aimed to assess magnitude and associated factors of undernutrition among children aged 6–59 months in Ethiopian orphanage centres.

Methods: Institution-based descriptive and analytical cross-sectional study was conducted on 227 children aged 6–59 months in selected orphanage centers of Addis Ababa, Ethiopia from July to August 2019. A simple random sampling technique was used to select the study participants. Interviewer administered structured pretested questionnaire, document review and anthropometric measurements were used to collect the data. Epi info version 7.2.1.0 and SPSS version 23.0 were used for data entry and analysis respectively. Anthropometric indices were generated using the WHO Anthro software version 3.2.2. A cut-off point below -2 standard deviation used to determine under-nutrition (stunting, underweight, and wasting). All variables with p-value < 0.25 in the bivariable analysis were considered for further multivariable binary logistic regression analysis. The level of statistical significance was declared at a p-value <0.05.

Results: The prevalence of wasting, underweight, and stunting were 4.4%, 12.3%, and 34.8%, respectively. Being a double orphaned child [AOR= 2.9 (1.201, 7.167)] and lack of vitamin A supplement in the last six months (AOR=1.9 (1.049, 3.799) were significant predictors of stunting and illness in the last two weeks before the survey [AOR= 4.9 (1.345, 1.865)] was a significant predictor of wasting.

Conclusion: The prevalence of stunting was high when compared with WHO's classification. Being a double orphaned, lack of vitamin A supplement, and illness in the last two weeks were associated with undernutrition. Therefore, intensified efforts to increase rates of vitamin A supplementation and as well as other disease prevention measures should be strengthened by the orphanage administrators and the health authorities.

Keywords: under-nutrition, under-five orphan and vulnerable children, Addis Ababa, Ethiopia

Backgrounds

Undernutrition is defined as the outcome of insufficient food intake (hunger) and repeated infectious diseases.[1] It is the fundamental cause of deaths in childhood, which is directly or indirectly attributed to 3.1 million (45%) deaths in the world.[2,3] Its consequences are severe and have irreversible and long-lasting implications.[4] Institutionalized children are potentially at greater risk of malnutrition.[5] A study

Correspondence: Haimanot Teferi
Department of Medical Laboratory, Addis Ababa City Administration Health Bureau, Bole Dil-frie Health Center, Addis Ababa, Ethiopia
Tel +251 947357456
Email haimanottz@gmail.com

submit your manuscript | www.dovepress.com
DovePress
http://doi.org/10.2147/PHMT.S289809

conducted in Romania on institutionalized children has found substantial delays in cognitive development, growth, and social competence among young children who were raised in the institution.[6]

The number of children who are left orphaned in the world due to the loss of parents has increased in recent years. United Nations Children's Fund reported that there were nearly a 140 million orphaned children and adolescents living in a world where more than one-third (36%) of them live in the Sub Saharan region. As a result, communities and families have been facing a growing challenge of providing care to vulnerable children.[7,8] Many orphanages in Sub-Saharan Africa rely on donations where they are often used as a commercial entity to attract funds and may be sent out to beg or perform on behalf of centers. In some cases, children are kept unhealthy conditions to appeal to donors and volunteers.[9]

Ethiopia, one of the Sub-Saharan African countries with a high number of orphans. The country is also the 5th in the world's top ten countries in the orphan population and the second in Africa next to Nigeria (12 million). In Ethiopia, there are an estimated 5.4 million orphans as a result of the death of one or both parents, with around 15% of these believed to have been orphaned as a result of HIV/AIDS.[10] The most commonly noted reasons for children being placed in orphanages were parental HIV and AIDS status or other chronic illness and poverty.[9] The development of new childcare institutions has been increasing over the past several years and an estimated total of 87 child care institutions located in seven main regions of Ethiopia.[11] According to the report of the Ethiopian Children and Youth Affairs Office, inadequate funding to support programs designed for the children, shortage of trained personnel, lack of psychosocial service, and lack of long-term strategic planning were some of the problems faced by the orphanage centers.[12] Furthermore, the challenges which may worsen the situation of vulnerability of these children to undernutrition include; loss of parental care and other aggravating factors such as high child to caregiver ratios, poor hygiene, inadequate amounts and diversity of foods served, and non-individualized care.[13]

In Ethiopia, parents and communities may see orphanages as a solution during difficult circumstances.[11] However, the majority of children in orphanages are nutritionally challenged because of many factors including the fact that they have never been breastfed or exclusively breastfed, low rates of vaccination, and basic hygiene. Therefore, the children get stuck in a cycle of undernutrition and infection, which adversely affects their health, development, and increases the risk of mortality. The value of adequate nutrition, safeguarding health, and make a great investment in their health during childhood is crucial for optimizing both physical and mental development.

Ethiopia is one of the world's worst places and where the huge orphan population lives in a very difficult situation.[9] Nationally, these segments of the population received very little programmatic and research attention in Ethiopia and there is no study conducted to assess the nutritional status of institutionalized orphaned and vulnerable children in Addis Ababa, even at the national level. Therefore, the aim of this study was to assessing undernutrition and its associated risk factors among institutionalized orphaned and vulnerable children in Addis Ababa, Ethiopia.

Methods

Study Design, Setting, and Population

An institution-based descriptive and analytical cross-sectional study was conducted from July/2019 to August/2019 in Addis Ababa, Ethiopia. According to the 2019 population projection of Ethiopia, Addis Ababa has a total population of 4,592,000, of which male and female accounted for 2,297,378 and 2,294,623 respectively.[14] It is the Capital City of Ethiopia and the headquarter of the African Union. In Addis Ababa, there were a total of 33 orphanages centers from which 31 were non-government and 2 were governmental orphanages with an estimated 2800 children (<18 years) of which 1600 were male and the remaining were 1200 female. From total orphanage centers, 13 orphanage centers have been providing care for 445 children aged 6–59 months.[11] Institutionalized orphan and vulnerable children (OVC) aged 6–59 months in selected orphanages were eligible to study populations. Children who were sick at the time of data collection and those with physical disabilities that pose difficulty during anthropometric measurements were excluded.

Sample Size Determination and Sampling Procedure

The sample size was calculated using the formula for the single population proportion formula. Based on the prevalence rate of stunting among orphan children (45.7%) in Northern Ethiopia,[15] with 95% confidence level,5%

margin of error, 10% non-response rate, and the application of finite population correction formula, the final required sample size was227 children aged 6–59 months in orphanages centers. From the thirteen orphanages with children 6–59-months age in Addis Ababa, five orphanages (KebebeTsehay, Care for children, Kidanemehert, Selam children, and Sele Enat) were selected by using the lottery method, and the sample size was allocated proportionally to the selected orphanage based on their size of the study population. A simple random sampling technique was used to select participants from each of the centers using the record of the center as a sample frame.

Data Collection

The data were collected using structured interviewer-administered questionnaires, document review, and anthropometric measurements (height and weight). The questionnaire was adapted from different related studies.[15–17] It was originally prepared in English and then translated into Amharic language (local language) and then back-translated to English to ensure consistency. Information obtained included Socio-demographic factors of children, Orphan status (single orphan, double orphan), duration of stay of children in the orphanage, immunization status, Vitamin A supplement, and morbidity status of the children. The child health cards, birth certificates, and other available documents were used to ensure recording the actual age of the child and other relevant information including the date of entry to the orphanage, to verify if the child joined other institutions before coming to the current orphanage centers was looked. Children were considered to have received all basic vaccinations when they have received a vaccination against tuberculosis (also known as BCG), DPT-HepB-Hib (also called pentavalent) vaccine, vaccines against polio, and vaccination against measles According to the guidelines developed by WHO.[18] Illness in the last two weeks was assessed from the record whether a child would have symptoms of cough, diarrhea, and fever. If the child would have one of these symptoms, he/she was considered as ill in the last two weeks before the time of the interview.

The height/length was measured in centimeters using a portable height/length board (UNICEF-length/height board) with the nearest 0.1-centimeter accuracy. A movable piece on the board serves as the footboard when measuring the length, or the headboard when measuring height. Standing height was measured for children 24 months or older. During height measurement, children's head positioned in the way that eyes were looking straight ahead in the Frankfurt plane (head, shoulder, buttocks, knee, and heels touch the vertical board). If the child's age were younger than 24 months, the measuring board was used to measure the child's recumbent length where the child's legs were holds down with one hand and the footboard moved with the other hand. Gentle pressure was applied to the knees to straighten the legs as far as they can go without causing injury. The height/length readings were taken twice and a mean of the two was computed to get the child's length/height.

Weight was measured by digital weight scale Seca (Serial number 5874096165856, Model 874 1021658. Seca gmbh and co kg, 22089 Hamburg, Germany) with precision to the nearest 0.1 kg within the light cloth (underwear, t-shirt only) and took off their shoe. If the child's age is younger than 24 months, who did not stand still or those who jumped; tared weighing (re-set to zero with the person just weighed still on it) was used. Therefore, the caregiver can stand on the scale, be weighed, and the scale tared. The children's weight was measured twice and the mean of the two weights was computed. Two diploma nurses who had previous data collection experiences with the assistant of a caregiver of children who were recruited from each of the selected centers were used for collecting the data.

The one-day training was given to data collectors focusing on the objectives of the study, administration of the structured questionnaire, document review, anthropometric measurements, and ethical considerations. Technical error of measurement (TEM) was computed to assess for Intra and inter-observer errors of measurement of weight and height during training. For this, the principal investigator took two weight and height measurements of ten children and let the data collectors took the measurements of all ten children twice. Then, the data were entered and computed by ENA SMART version 2011 software to standardize anthropometric measurements. For those having poor accuracy, retraining was given. Right after the training, a pre-test was conducted on 5% of the sample size in an orphanage center that was not included in the actual study. Calibration of weight scale was also done by ensuring that the scale pointers were at zero before measurements will be taken. During data collection, the principal investigator undertook close supervision and review the completed questionnaire daily. The results of the study were reported back to the orphanages and to the management of the Center for appropriate action.

Statistical Analysis

The data were entered into Epi info version 7.2.10 computer program. Then, it was exported to SPSS windows version 23 for analysis. Data cleaning (missing values and outliers) and assumption checking were performed before proceeding to the actual analyses. The magnitude of stunting, wasting, and underweight was determined by exporting age, sex, height, and the weight of the child to WHO Anthro software version 3.2.2 and height for- age Z score (HAZ), weight-for-height (WHZ), and weight for -age Z score (WAZ) were calculated. Children with a Z score of below (<-2) for HAZ, WHZ, and WAZ from the median of the reference population were considered as stunted, wasted, and underweight, respectively. The outcome variable was recorded to dichotomous outcomes: stunting, underweight, and wasting were coded as "1" and "0" otherwise. Descriptive statistics such as frequencies, percentages, and mean ± SD was used to describe the data. Bivariable logistic regression analysis was done to explore the crude association between different predictor variables and undernutrition. To control for possible confounding factors and to identify factors that were independently associated with undernutrition, multivariable binary logistic regression analysis was performed for those variables with a p-value of less than 0.25 in the bivariable analysis. The Hosmer–Lemeshow test was used to check goodness of model fitting. The Adjusted Odds Ratio (AOR) with 95% confidence intervals was used to notify the strength of association and P-values of <0.05 was used to declare the statistical significance in the multivariable analysis.

Result

A total of 227 OVC were included in the study with a response rate of 100%. More than one third 83 (36.6%) of the children were in the age category of 36–47 months. Of the total, 150 (66.1%) children were males and the rest were females. The mean (SD) age of the children in the orphanage was 36 (SD ± 12) months. Seventy-nine (34.8%) of the OVC children had stayed in the orphanages for a period of between 12 and 23 months while those who had stayed for 24 to 35 months were 67 (29.5%). A small percentage of 14 (6.2%) had stayed for ≥36 months. The mean (SD) duration of stay in the orphanage was 19.3 (SD ± 10.2) months. One hundred eighty-six (81.9%) of the children were double orphans and the rest were either maternal or paternal orphans [Table 1].

Table 1 Socio-Demographic Characteristics of Under-Five Orphan and Vulnerable Children Aged 6–59 Months in Selected Orphanage Centers of Addis Ababa, Ethiopia, May/2020

Variables (n=227)	Frequency	Percent
Age in month (mean ±SD)= (36 ± 12)		
6–11 12–23 24–35 36–47 48–59	8 17 74 83 45	3.5 7.5 32.6 36.6 19.8
Sex		
Female Male	77 150	33.9 66.1
Duration of stay in the orphanage (mean ± SD)= (19.3 ± 10.2)		
<12 12–23 24–35 ≥36	67 79 67 14	29.5 34.8 29.5 6.2
Parental living status		
Double orphan At least one parent alive	186 41	81.9 18.1

More than two-thirds of OVC had taken all basic vaccinations 160 (70.5%) and 161 (70.9%) were supplemented with vitamin A in the last six months. In this study, fourth-three (18.9%) of the study children had ill health. From the reported illness; twenty-six (60.5%), eleven (25.6%), and six (13.9%) of the children had diarrhea, cough/common cold, and fever during the past 2 weeks respectively [Table 2]. Prevalence of stunting, wasting, and underweight among study participants was 34.8%,4.4%, and12.3%respective [Figure 1].

In the bivariable analysis: sex, illnesses in the last two weeks before data collection, duration of stay in the orphanage, and immunization status were associated with wasting. However, in the multivariable logistic regression analysis; illness before two weeks of this survey was found to be an independent predictor for wasting [Table 3]. Among the variables entered into bivariable logistic regression analysis: sex, diarrhea in the last two weeks of the survey, parent living status, Vitamin A supplement, duration of stay in the orphanage, and age were associated with underweight. However, there were no factors associated with underweight in multivariable logistic regression analysis [Table 4]. Age, sex, Vitamin A supplement, and parent living status were

Table 2 Illness and Immunization Status of Orphan and Vulnerable Children Aged 6–59 Months in Selected Orphanage Centers of Addis Ababa, Ethiopia, May/2020

Variables (n=227)	Frequency	Percent
Receiving all the basic vaccines?		
Yes	160	70.5
No	67	29.5
Vitamin A Supplement in the last six months		
No	66	29.1
Yes	161	70.9
Illness in the last two weeks		
No	184	81.1
Yes	43	18.9
Diarrhea		
No	17	39.5
Yes	26	60.5
Cough/common cold		
No	32	74.4
Yes	11	25.6
Fever		
No	37	86.1
Yes	6	13.9

associated with stunting in the bivariable analysis. But children being double orphaned, and children who did not take Vitamin A supplement were significantly associated with stunting in the multivariable logistic regression model [Table 5].

Discussion

This study has assessed the prevalence of under-nutrition and associated factors among the orphan and vulnerable children aged 6–59 months in the selected orphanage of Ethiopia. The study shows that the prevalence of wasting, underweight, and stunting was 4.4%, 12.3%and 34.8%, respectively. The prevalence of stunting in this study was a high public health problem according to the WHO's classification for public health significance. This is because young children living in orphanages are especially vulnerable to undernutrition because of their exposure to conditions such as poverty and lack of or limited breast-feeding. Additionally, the rates of wasting and underweight, as defined by the WHO, were categorized as "Acceptable" and "medium prevalence," respectively.[19]

The prevalence of wasting is 4.4% which is more or less consistent with the study in Kenya (3.7%), Ghana orphanages (5.3%), and Hawassa town (7.5%).[17,20,21] However, it was lower compared to the prevalence of wasting in Gondar town (9.9%), Gambella (19%), India (15.71%), Kazakhstan (22.1%), and Nigeria (18%).[15,16,22–24] This probably due to the difference in the study area, in culture, and child feeding habits. The odds of wasting among OVC who had the illness before 2 weeks were 4.9 times an increased risk than OVC who did not have an illness. This due to illness may result in lower

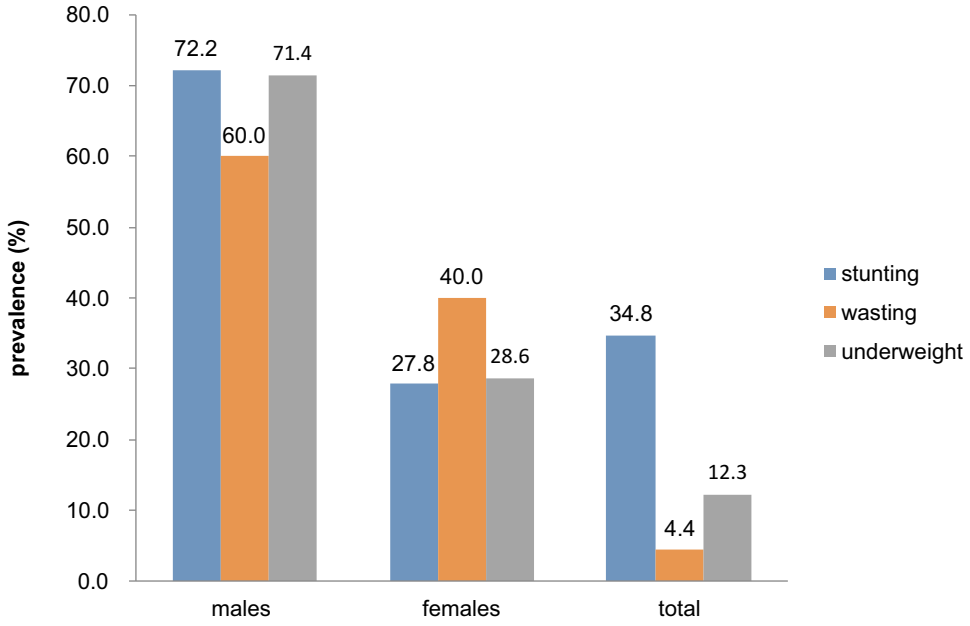

Figure 1 Prevalence of undernutrition among the orphan and vulnerable children by sex in the selected orphanages of Addis Ababa, Ethiopia, May/2020.

Table 3 Multivariable Logistic Regression Analysis Showing Associated Factors for Wasting Among OVC Aged 6–59 Months in a Selected Orphanage of Addis Ababa, Ethiopia, May/2020

Variables	Wasting		COR (95% CI)	AOR (95% CI)
	Yes N (%)	No N (%)		
Sex				
Male	6 (60)	144 (66.4)	1	1
Female	4 (40)	73 (33.6)	1.315 (0.360, 14.807)	1.405 (0.358, 5.513)
Duration stay in the orphanage				
<12	5 (50)	62 (28.5)	1	1
12–23	1 (10)	77 (35.5)	0.166 (0.018, 1.415)*	0.357 (0.063, 2.025)
24–35	2 (20)	65 (30)	0.382 (0.071, 2.040)*	0.457 (0.081, 2.578)
≥36	2 (20)	13 (6)	1.908 (0.333, 10.928)*	0.828 (0.077, 8.833)
Illness in the last two weeks				
No	5 (50)	179 (82.5)	1	1
Yes	5 (50)	38 (17.5)	4.711 (1.299, 17.079)*	4.92 (1.345, 1.865)**
Were the children received all basic vaccines?				
No	1 (10)	66 (30.4)	0.254 (0.032, 2.047)*	0. 161 (0.019, 1.384)
Yes	9 (90)	151 (69.6)	1	1

Notes: Maximum S. E=1.1. *p-value <0.25; **p-value <0.05.
Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio.

appetite, poor digestion, and malabsorption which leads to malnutrition. This finding was similar to the study in the rural community of Hawassa, Mygoma orphanage center, Khartoum, Sudan, and Tangle, district of Bangladesh which showed a significant relationship between occurred disease type and wasting.[20,25,26] In contrary to this, a study by Panpanich in Malawi orphanages and Dagorti division of Kenya which showed no significant relationship between wasting with illness.[27] The reason for the discrepancy might be due to the difference in lifestyle and economic status of the countries.

In this study, the prevalence of stunting was 34.8%. This finding was more or less in line with published data from Nigeria (34%), Hawassa (35.1%), and Kazakhstan (36.7%).[20,22,23] The current finding was lower than the studies done among children in Gondar town, (45.7%).[15] However, it was higher than those findings from Kenya (15.4%), Ghana (17.9%), India (18.6%), and Gambella (10%).[16,17,21,24] These may be varying due to the difference in the study area, sample size, and socioeconomic difference. Regarding orphan status, there was a significant association between children who were being doubled orphaned and stunting. Double orphaned children had a 2.9 times greater risk of stunting in comparison with those who had at least one parent alive. This is because children who lost both their primary caregiver and a father were more likely to be malnourished and short for their age.[28] This study showed that children who did not take Vitamin A supplement in the last six months had a 1.9 times greater risk of stunting in comparison with children who took the recommended dose. The finding of this study was similar to a study carried in Gondar, North Ethiopia.[15] However, studies regarding vitamin A supplementation and growth in developing countries have found inconsistent results. For example, a randomized controlled study among pre-school Indonesian children, found that vitamin A supplementation improved linear growth. Additionally, this effect was higher among children who were not breastfed.[29] This suggests that vitamin A supplementation may be protective against stunting, or may reverse stunting.[29,30] Another study, however, in a randomized controlled trial in Northern Ghana found no significant association between vitamin A supplementation and linear growth of children.[31] This inconsistency was due to the effect of other factors in the environment.

The prevalence of underweight in OVC was 12.3% in this study. It was found to be more or less consistent with Nigeria (19%), Kenya (8.6%), Hawassa (8.9%), and Gambella (12.4%).[16,17,20,23] However, higher prevalence

Table 4 Multivariable Logistic Regression Analysis Showing Associated Factors for Underweight Among OVC Aged 6–59 Months in Selected Orphanage Centers of Addis Ababa, Ethiopia, May/2020

Variables	Underweight		COR (95% CI)	AOR (95% CI)
	Yes N (%)	No N (%)		
Sex				
Male	19 (67.9)	131 (65.8)	1	1
Female	9 (32.1)	68 (34.2)	0.913 (0.395, 2.125)	0.998 (0.398, 2.501)
Age (month)				
6–11	4 (14.3)	4 (2)	4.625 (0.950, 22.513)*	2.124 (0.291, 15.519)
12–23	3 (10.7)	14 (7)	0.991 (0.230, 4.278)*	0.821 (0.136, 4.954)
24–35	6 (21.4)	68 (34.2)	0.408 (0.132, 1.265)*	0.462 (0.134, 1.596)
36–47	7 (25)	76 (38.2)	0.426 (0.144, 1.264)*	0.436 (0.137, 1.389)
48–59	8 (28.6)	37 (18.6)	1	1
Vitamin A supplement				
No	13 (46.4)	53 (26.6)	2.387 (1.066, 5.348)*	1.767 (0.663, 4.711)
Yes	15 (53.6)	146 (73.4)	1	1
Parent living status				
Double orphan	27 (96.4)	158 (79.4)	6.792 (0.896, 51.502)*	3.341 (0.901, 37.254)
At least one parent alive	1 (3.6)	41 (20.6)	1	1
Diarrhea				
No	20 (71.4)	182 (91.5)	4.282 (1.642, 11.171)*	2.246 (0.640, 7.878)
Yes	8 (28.6)	17 (8.5)	1	1
Duration of stay in the orphanage				
<12	11 (39.3)	56 (28.1)	1	1
12–23	9 (32.1)	69 (34.7)	0.664 (0.257, 1.715)*	0.984 (0.303, 3.191)
24–35	5 (17.9)	62 (31.2)	0.411 (0.134, 1.255)*	0.461 (0.115, 1.848)
≥36	3 (10.7)	12 (6)	1.273 (0.307, 5.269)*	0.850 (0.135, 5.344)

Notes: Maximum S. E=1.09. *p-value <0.25.
Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio.

rates of underweight compared to the present findings were reported from Gondar (27.8%), Almighty, Kazakhstan (31.5%), and India (22.86%).[15,22,24] This might be due to the nature of the study setting and socio-economic difference.

Conclusion

The study revealed that the prevalence of undernutrition (stunting) was a high public health problem according to the WHO's classification for public health significance. According to the analysis of independent variables with the outcome variables, being a double orphaned child and lack of vitamin A supplement were independent predictors for increasing stunting. Additionally, illness in the last two weeks before the survey was significantly associated with wasting.

Recommendation

The health authority and the orphanage administrator should work to decrease the proportion of undernutrition through strengthened efforts to increase rates of vitamin A supplementation, and as well as other disease prevention measures should be implemented. Since this study assessed the nutritional status of OVC quantitatively and further qualitative studies should be conducted to triangulate the findings.

Limitation of the Study

Due to the cross-sectional nature of the study establishing cause–effect relation could be difficult.

Predictors that are known to affect the nutritional status of OVC such as dietary intake and other specific nutrient

Table 5 Multivariable Logistic Regression Analysis Showing Associated Factors for Stunting Among OVC Aged 6–59 Months in Selected Orphanage Centers of Addis Ababa, Ethiopia, May/2020

Variables	Stunting		COR (95% CI)	AOR (95% CI)
	Yes N (%)	No N (%)		
Age (month)				
6–11	5 (6.3)	3 (2)	2.281 (0.485, 10.732)*	1.435 (0.284, 7.258)
12–23	8 (10.1)	9 (6.1)	1.216 (0.396, 3.732)	1.005 (0.298, 3.390)
24–35	23 (29.1)	51 (34.5)	0.617 (0.286, 1.332)	0.593 (0.265, 1.235)
36–47	24 (30.4)	59 (39.9)	0.557 (0.261, 1.188)*	0.580 (0.265, 1.267)
48–59	19 (24.1)	26 (17.5)	1	1
Sex				
Female	22 (27.8)	55 (37.2)	0.653 (0.360, 1.182)*	0.685 (0.367, 1.279)
Male	57 (72.2)	93 (62.8)	1	1
Vitamin A supplement				
No	32 (40.5)	34 (23)	2.283 (1.265, 4.119)*	1.996 (1.049, 3.799)**
Yes	47 (59.5)	114 (77)	1	1
Parent living status				
Double orphan	72 (91.1)	114 (77)	3.068 (1.291, 7.288)*	2.934 (1.201, 7.167)**
At least one parent alive	7 (8.9)	34 (23)	1	1

Notes: Maximum S. E=0.827. *p-value <0.25; **p-value <0.05.
Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio.

deficiencies, such as zinc deficiency were not assessed in this study.

Under or over-reporting of the children's age could also be considered given the situation of the children. However, we reviewed different documents to ensure documenting the actual age of the children.

Abbreviations

AIDS, Acquired Immune Deficiency Syndrome; AOR, Adjusted Odds Ratio; BCG, Bacille Calmette Guerin; CI, Confidence Interval; COR, Crude Odds Ratio; CSA, Central Statistics Agency; DPT, Diphtheria, Pertussis, And Tetanus; EDHS, Ethiopian Demographic and Health Survey; EMDHS, Ethiopian Mini Demographic and Health Survey; HAZ, Height for Age Z-score; HepB, Hepatitis B; Hib, Haemophilus influenzae type B; HIV, Human Immune Virus; NGO, Non-Government Organization; OC, Orphan Children; OVC, Orphans and Vulnerable Children; SD, Standard Deviation; SPSS, Statistical Package for the Social Science; SPHMMC, St Paul's Hospital Millennium Medical College; UNICEF, United Nation International Children's Emergency Fund; WAZ, Weight for Age z-score; WHZ, Weight for Height Z-Score; WHO, World Health Organization.

Ethics Approval and Consent to Participate

The study was conducted in accordance with the Declaration of Helsinki, and Ethical clearance was obtained from St Paul's hospital millennium medical college (SPHMMC) institutional review board. A formal letter of permission was sent to Addis Ababa city administration department of women's and children's affairs and the respected registered orphanages' administrator. The interviewers were ensured that the orphanage administrators understand the purpose of the study, study procedures, and benefit before Written informed consent was obtained. Each orphanage was informed that they have a full right to participate or decline from participating in the study. The participant's confidentiality was assured that all information collected was treated confidentially by avoiding their name and other personally-identifying information.

Acknowledgments

We are thankful to the department of public health of St Paul's hospital millennium medical college (SPHMMC), Addis Ababa women and children's affairs office, the

orphanage's administrations, and their staff for their cooperation.

Finally, our heartfelt thanks go to Dil-frie health center for provision of the necessary instrument for the conduct of the study.

Funding

There is no funding to report.

Disclosure

The authors report no conflicts of interest for this work.

References

1. UNICEF. Progress for children: a report card on nutrition. Unicef. 1–33; 2006. Available from: http://www.unicef.org/publications/files/Progress_for_Children-No._7_Lo-Res_082008.pdf. Accessed March 4, 2021.
2. Hoseini BL, Moghadam ZE, Saeidi M, Askarieh MR, Khademi G. Child malnutrition at different world regions in (1990–2013. *Int J Pediatr*. 2015;3:921–932.
3. Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*. 2013;382:427–451. doi:10.1016/S0140-6736(13)60937-X
4. Caulfield LE, de Onis M, Blössner M, Black RE. Undernutrition as an underlying cause of child deaths associated with diarrhea, pneumonia, malaria, and measles. *Am J Clin Nutr*. 2004;80:193–198. doi:10.1093/ajcn/80.1.193
5. Gudina A, Nega J, Tariku A. The situation of orphans and vulnerable children in selected Woredas and towns in Jimma Zone. *Int J Sociol Anthropol*. 2014;6:246–256. doi:10.5897/IJSA2014.0554
6. Smyke AT, Koga SF, Johnson DE, et al. The caregiving context in institution-reared and family-reared infants and toddlers in Romania. *J Child Psychol Psychiatry Allied Discip*. 2007;48:210–218. doi:10.1111/j.1469-7610.2006.01694.x
7. Unicef. Africa's orphaned and vulnerable generations: children affected by AIDS. Unicef; 2006.
8. Bezerra LMD. Global report on human settlements 2009: planning sustainable cities, edited by United Nations Human Settlement Programme, UK and United States, Earthscan 2009, 336 pp., US $58.00 (paperback), ISBN 9781844078998. *Urban Res Pract*. 2010;3:229–230. doi:10.1080/17535069.2010.481379
9. Zehra Kavak H. Report on World's Orphans. iHH Humanit. *Soc Res Cent*. 2014;1–48.
10. World without orphans. A global movement for every child to grow up in a nurturing permanent family, and to know their heavenly father; 2016.
11. Family Health International. Improving care options for children in ethiopia through understanding institutional child care and factors driving institutionalization. (FHI 360); 2010.
12. Chernet T Overview of services for orphans and vulnerable children in Ethiopia. Report version of presentation at national workshop. Kigali, Rwanda; 2001.
13. Vaida N. Nutritional status of children living in orphanages in district Budgam, J and K. *Int J Humanit Soc Sci Invent*. 2013;2:36–41.
14. Statistical C 2007 Population and housing census of Ethiopia administrative report central statistical authority Addis Ababa; 2012. Available from: https://populationstat.com/ethiopia/addis-ababa. Accessed March 4, 2021.
15. Gultie T. Nutritional status and associated factors among orphan children below the age of five years in Gondar City, Ethiopia. *J Food Nutr Sci*. 2014;2:179.
16. Egata G, Mesfin F, Feleke S. The prevalence of undernutrition and associated factors among orphan children aged 6–59 months in Gambella Town. Southwest, Ethiopia; 2018.
17. Months C, County K, Bakari MB, Ng M, Peter C. Childcare practices, morbidity status and nutrition status of preschool children (24–59 Months) living in orphanages in Kwale County, Kenya. *Int J Heal Sci Res*. 2017;7:263–275.
18. Institute E; public health & ICF. *Mini Demographic and Health Survey: Key Indictors. Handbook of Federal Countries*; 2019.
19. World Health Organization. Interpretation guide. *Nutr Landacape Inf Syst*. 1;2010. doi:10.1159/000362780
20. Bisrat G, Kulkarni U, Mariam YG. Assessment of the nutritional status and associated factors of orphans and vulnerable preschool children on care and support from nongovernmental organizations in Hawassa Town. *Glob J Med Res*. 2016;16.
21. Ali Z, Abu N, Ankamah IA, et al. Nutritional status and dietary diversity of orphan and non – orphan children under five years: a comparative study in the Brong Ahafo region of Ghana. *BMC Nutr*. 2018;4:32. doi:10.1186/s40795-018-0240-0
22. Hearst MO, Himes JH, Johnson DE, et al. Growth, nutritional, and developmental status of young children living in orphanages in Kazakhstan. *Infant Ment Health J*. 2014;35:94–101. doi:10.1002/imhj.21430
23. Obiakor -okeke P, Nnadi C. Nutritional status, care giving and feeding practices of infant and pre-school children (0–5 years) in motherless babies homes in Owerri Metropolis. *J Biol*. 2014;4:190–198.
24. Kamath SM, Venkatappa KG, Sparshadeep E. Impact of nutritional status on cognition in institutionalized orphans: a pilot study. *JCDR*. 2017:1–4. doi:10.7860/JCDR/2017/22181.9383
25. Madumita BP, Mondal R. Assessment of nutritional status of a Government Girls Orphanage in Tangail District of Bangladesh. *SMU Med J*. 2017;2006–2015.
26. Gabbad AA, El Hassain NA. Malnutrition among infant children in Mygoma Orphanage Centre; Khartoum; Sudan. *Int J Sci Res*. 2014;3:198–200.
27. Mwaniki EW, Makokha AN, Muttunga JN. Nutrition status and associated morbidity risk factors among orphanage and non-orphanage children in selected Public Primary Schools within Dagoretti, Nairobi, Kenya. *East Afr Med J*. 2014;91:289–297.
28. Unicef. Africa's orphaned and vulnerable generations: children affected by AIDS; 2006.
29. Hadi H, Stoltzfus RJ, Dibley MJ, et al. Vitamin A supplementation selectively improves the linear growth of Indonesian preschool children: results from a randomized controlled trial. *Am J Clin Nutr*. 2000;71:507–513. doi:10.1093/ajcn/71.2.507
30. Sedgh G, Herrera MG, Nestel P, Amin A, Fawzi WW. Community and International Nutrition Dietary Vitamin A intake and nondietary factors are associated with reversal of stunting in children. *J Nutr*. 2000;130:2520–2526. doi:10.1093/jn/130.10.2520
31. Kirkwood BR, Ross DA, Arthur P, et al. Effect of vitamin A supplementation on the growth of young children in northern Ghana. *Am J Clin Nutr*. 1996;63:773–781. doi:10.1093/ajcn/63.5.773