

1 **Nutritional status among orphans and vulnerable children aged 6 to 59**
2 **months in Addis Ababa, Ethiopia: A community-based cross-sectional study**

3 Nina Berr¹, Yemisrach Nigatu², Nebiyu Dereje^{3*}

4 1 Department of Medicine, Myungsung Medical College/Myungsung Christian Medical
5 Center, Addis Ababa, Ethiopia

6 Email nina.berr@yahoo.de

7 2 Department of Public Health, Myungsung Medical College/Myungsung Christian
8 Medical Center, Addis Ababa, Ethiopia

9 Email yemisrachmmc@gmail.com

10 3 Department of Public Health, Myungsung Medical College/Myungsung Christian
11 Medical Center, Addis Ababa, Ethiopia

12 Email neba.jahovy@gmail.com

13

14 * Corresponding author:

15 Nebiyu Dereje

16 Addis Ababa, P.O.Box 14972, Ethiopia

17 Phone Number: +251978788638

18 Email: neba.jahovy@gmail.com

19 **Abstract**

20 **Background:** Childhood malnutrition is a global problem contributing to more than a third of
21 under-five mortality. Orphans and vulnerable children (OVC) fare worse than children living
22 with their parents. However, the nutritional and healthcare needs of OVC are under-
23 recognized in Ethiopia.

24 **Methods:** A community-based cross sectional study was conducted among OVC aged 6 to 59
25 months. Multi-stage sampling technique was applied to select the households and eligible
26 children included in the study (n=584). An interviewer-administered questionnaire and
27 anthropometric measurements were carried out. The proportions of stunting, wasting and
28 underweight were determined based on the WHO Z-score cut-off. Multivariable binary
29 logistic regression analysis was performed to identify factors associated with stunting.

30 **Results:** The prevalence of stunting, wasting and underweight were 35.1% (95% CI; 31.3% -
31 39.1%), 4.7% (95% CI; 3.2% - 6.7%) and 12.0% (95% CI; 9.6% - 14.9%), respectively.
32 Stunting was significantly associated with initiation of complementary feeding after 12
33 months of age (AOR = 3.61; 95% CI 1.16 - 14.11), household food insecurity (AOR = 1.90;
34 95% CI 1.10 - 3.17), unplanned pregnancy (AOR = 1.90; 95% CI 1.03 - 3.42), age \geq 2 years
35 (AOR = 1.80; 95% CI 1.25 - 2.67), caretaker's age \leq 25 years (AOR = 1.50; 95% CI 1.03 -
36 2.16) and employment of the caretaker (AOR = 1.50; 95% CI 1.03 - 2.26).

37 **Conclusion:** The prevalence of all forms of malnutrition among OVC was significantly
38 higher than the national estimate. Most importantly, this study uncovers that the positive
39 health statistics which point towards decreases in under nutrition as evidenced by consecutive
40 Ethiopian Demographic and Health Surveys (EDHS) data do not accurately reflect the
41 condition of the many underprivileged children living in the society. These findings of the

42 study underscore the need for interventions to enhance household food security and
43 caretaker's awareness on child feeding particularly addressing the OVC.

44 **Key words:** HIV/AIDS, stunting, wasting, underweight, orphans, vulnerable children

45

46 **Introduction**

47 Malnutrition among children is a global problem hindering individuals and entire nations
48 from achieving their full potential [1-3]. Globally more than a third of under-five deaths are
49 linked to under nutrition [4]. The attribution of HIV/AIDS for the child mal-nutrition is
50 enormous [1-3].

51 Ethiopia has managed to achieve the targets set by Millennium Development Goals (MDG 4),
52 namely reducing by two thirds the under-five mortality rate between 1990 and 2015 three
53 years prior to the deadline [5, 6]. Moreover, Ethiopia has reduced the prevalence of
54 malnutrition under five markedly over the years and is committed to reducing malnutrition
55 further through the National Nutrition Strategy Programmes [7]. Nutrition is also firmly
56 embedded as a priority in the country's Health Sector Transformation Plan [8]. For instance,
57 the prevalence of stunting, the predominant form of under nutrition, has been reduced to
58 25.4% in urban areas and only 14.6% in the capital Addis Ababa according to EDHS 2016
59 [7]. However, these figures are likely to rest on statistics which obscure the poverties endured
60 by poorer urban children and the OVC, as Ethiopia is located in Sub-Saharan Africa, where
61 the prevalence of HIV/AIDS and OVC are substantial [3, 4, 9]. Studies have shown that when
62 child health statistics are unravelled, it is evident that even where services are nearby, children
63 growing up in poor urban settings fare as badly as or worse than children living in rural
64 poverty in terms of under nutrition and under-five mortality [4, 10].

65 An orphan or vulnerable child is a child who is at high risk of lacking adequate care and
66 protection due to parental death, disease, disaster or acute poverty. The term orphan can be
67 further defined as a child whose mother (maternal orphan), father (paternal orphan) or both
68 (double orphan) have died [3, 11]. Researchers have long been intrigued by the question
69 whether orphans and vulnerable children (OVC) living in the community suffer more
70 malnutrition than non-orphans. The current literature on this matter shows conflicting results.

71 Studies in various countries across the African continent including Kenya, the United
72 Republic of Tanzania and Zimbabwe have shown that OVC are more malnourished than their
73 counterparts. Particularly the proportion of stunting and underweight was markedly higher
74 and OVC had overall poorer health outcomes [10, 12, 13]. On the other hand, many studies
75 suggest otherwise including an analysis of national survey data in Sub-Saharan Africa on
76 under-five children in 40 countries, which found no differences in the nutritional status of
77 orphans and non-orphans [14]. Therefore, the question of whether orphans are more
78 malnourished than non-orphans remains unclear and seems to differ from one society to the
79 other. Up to this day, there are only few studies in Ethiopia that look at the nutritional status
80 of less fortunate children such as OVC and no such studies have been conducted in the capital
81 city of Addis Ababa where the prevalence of HIV/AIDS and OVC is substantial. Hence, it is
82 the aim of this study to bridge the gap by assessing the nutritional status and associated
83 factors of OVC living in Addis Ababa city, Ethiopia.

84 **Methods**

85 **Study setting, Design and Population**

86 A community-based cross sectional study was conducted from May 01 – 31, 2019 in Addis
87 Ketema Sub-city, one of the ten sub-cities of Addis Ababa. It is a densely populated sub-city
88 consisting of ten districts covering an area of only 8.64 km² with a total population estimated
89 at 320,000 as of 2017. The total number of orphaned children due to HIV and other causes
90 was 20,655 in 2017 in the sub-city. All OVC aged 6 to 59 months who had been living in the
91 study area for a period of at least 6 months were eligible for inclusion and only the youngest
92 child was selected per household. OVC who were severely ill or disabled were excluded due
93 to the difficulty of obtaining accurate measurements. Also, OVC who were not found in three
94 appointed interviews were excluded from the study and replaced by the next eligible OVC.

95 Furthermore, children whose caretakers have a hearing difficulty preventing them from being
96 interviewed were excluded.

97 **Sampling Procedures**

98 Sample size for the prevalence of stunting, wasting and under nutrition was determined by a
99 single population proportion formula by taking prevalence of stunting (35.1%), the most
100 common form of malnutrition which was taken from a study done among OVC in Hawassa
101 town in 2016 [15], $Z_{\alpha/2} = 1.96$, 5% margin of error, 10% non-response rate and 1.5 design
102 effect. The calculated sample size was 584. The sample size for the analytical component
103 (factors associated with stunting) was determined by a two population proportion formula by
104 taking 80% power, 95% confidence interval (CI), 5% margin of error, proportion of stunting
105 among literate care givers and proportion of stunting among illiterate care givers from the
106 study conducted in Gondar [16]. The sample size calculated from this formula was 190. Thus,
107 we took the largest possible sample size ($n = 584$) in our study.

108 A multi-stage sampling technique was employed to recruit study participants. In the first
109 stage, out of the ten districts, three of them were selected randomly. Then, the total sample
110 size was distributed to each district proportionally to the total households of the district.
111 Social workers living in the community who are collaborating closely with the sub-city
112 identified the households at risk wherein OVC reside in their respective villages of the
113 selected districts. In order to facilitate the data collection, one social worker accompanied
114 each data collector to the OVC households until the sample size was completed. In
115 households with more than one child aged 6 to 59 months, only the youngest OVC was
116 selected. Many of the households received financial support as part of the safety net program.
117 However, none of the children received any form of nutritional support.

118

119 **Data Collection Procedure**

120 Data were collected by using structured questionnaire (supplementary material attached) and
121 anthropometric measurements performed by the data collecting team with identical scales,
122 measuring boards and MUAC tapes. The questionnaire was adapted from various sources
123 including UNICEF [15, 17]. It has several contents including socio-demographic
124 characteristics, housing and sanitation, feeding practices and dietary diversity, morbidity
125 variables and household food insecurity. It was initially prepared in English and translated
126 into Amharic language for data collection.

127 Data collection was facilitated by nurses and facilitators who were social workers familiar
128 with the OVC in selected households. Fieldworkers were given training by the principal
129 investigator on the objectives and methodology of the study, the contents of the questionnaire,
130 the confidentiality of responses, the use of instruments and standard procedure of
131 anthropometric measurement.

132 Height was measured in standing position for children ≥ 2 years and length was measured in
133 recumbent position in children < 2 years. The child was barefooted and free of head wear. For
134 measuring height the child was helped onto the baseboard with feet slightly apart. The back of
135 the head, shoulder blades, buttocks, calves and heels were touching the vertical board. The
136 assistant held the child's knees and ankles. With the child's chin held between thumb and
137 forefinger and eyes facing directly forward, the interviewer pulled the headboard down to rest
138 firmly on top of the child's and read to the nearest completed 0.1cm [18, 19]. For measuring
139 length the child was placed on its back. The assistant standing opposite the tape held the
140 child's head against the headboard. The child's eyes were looking straight up. The interviewer
141 standing on the side of the measuring tape held down the child's knees with the left hand and
142 moved the footboard with the right hand flat against the soles. The measurement was read and
143 recorded to the nearest completed 0.1cm [19].

144 Weight was measured with the child lightly dressed on a standard scale and recorded to the
145 nearest 0.1 kg. For children <2 years of age, the caretaker was first weighed alone and again
146 holding the undressed child. The difference between the two readings equalled the weight of
147 the child. The scale was calibrated immediately before each session [19].

148 MUAC is the circumference of the undressed left upper-arm measured at the mid-point
149 between the shoulder tip and elbow in children with a height >65cm. The interviewers bent
150 the arm of the child at the elbow and identified and marked the olecranon and acromion
151 processes as well as the midpoint between the two landmarks with a pen. Then, the arm was
152 straightened and hung down the side of the body. The tape was placed around the arm at the
153 marked mid-point at correct tape tension and the circumference was read to the nearest 0.1cm
154 and repeated twice to ensure accuracy. Colour coding indicates nutritional status [19].

155 **Ethical Considerations**

156 Ethical clearance was obtained from the Institutional Review Board (IRB) of Myungsung
157 Medical College. The participants were informed about the objective of the study and written
158 informed consent was gained from the caretakers. Illiterate caretakers were asked to sign the
159 consent form after it was read to them by the interviewer. Moreover, the participants were at
160 no risk of serious harm and had the right to decline participation or withdraw at any time
161 during the interview. Caretakers of acutely malnourished children were urged to seek health
162 care in a nearby facility. The information collected in the study will be treated confidentially
163 and anonymity guaranteed by the principal investigator.

164 **Data Management and Analysis**

165 Age was documented in completed months. If the caretaker was unsure of the child's day of
166 birth, the 15th day of the month was used and if the month of birth was unknown the midpoint
167 of the year was used [15]. Food security was assessed using the Household Food Insecurity

168 Access Scale (HFIAS) specifically adapted by the USAID Food and Nutrition Technical
169 Assistance (FANTA) project for use in developing countries as a measure of the degree of
170 food insecurity in the household in the past four weeks. Households were considered food-
171 secure if they scored less than 17 and food-insecure if they scored ≥ 17 points [17]. Dietary
172 Diversity Scores were calculated by adding the number of food groups consumed in the
173 household over the 24-hour recall period and graded as low (≤ 3) and high (≥ 4) based on the
174 WHO designation of minimum dietary diversity if four or more food groups consumed in the
175 last 24 hours [15]. The prevalence of malnutrition was assessed by calculating the percentages
176 of children who are stunted, wasted or underweight using ENA SMART based on the WHO -
177 2 Z-score cut-off and summarized by percentage and the respective 95% confidence interval.
178 Bivariate and multi-variable binary logistic regression analyses were carried out to identify
179 factors associated with stunting. Those variables with p -value < 0.25 in the bivariate analysis
180 were considered for further multi-variable analysis and p -values of less than 0.05 were taken
181 as a cut-off point for determining the significant association of independent variables with
182 stunting. Odds ratio (OR) with 95% confidence interval was calculated to determine the
183 strength of associations. All methods were carried out in accordance with relevant guidelines
184 and regulations.

185 **Results**

186 **Socio-demographic Characteristics**

187 The response rate of the study was 98.6%. Majority of the participants (52.9%) were female
188 and ranged from 12 - 23 months in age (27.0%). On average, each household had 4.4
189 members and 1.25 children under the age of five. Among the participants, 13.4% were
190 orphans. Most caretakers were married (69.2%) and close to one third (30.5%) were illiterate
191 (unable to read and write). Over half of the households had a monthly income less than or
192 equalling 1,000 Ethiopian Birr (ETB), below the international poverty line of \$1.90 per day

193 [20]. The majority (87.3%) of households consisted of only a single room as living space
 194 (Table 1).

195 Table 1. Socio-demographic characteristics of the study participants in Addis Ketema sub-
 196 city, Addis Ababa, Ethiopia

Variables	Frequency	Percentage
Age of the child (n = 575)		
6 – 11 months	63	11.0
12 – 23 months	155	27.0
24 – 35 months	130	22.6
36 – 47 months	130	22.6
48 – 59 months	97	16.9
Sex of the child (n = 561)		
Male	264	47.1
Female	297	59.2
Orphanage status (n = 573)		
Non-orphan	495	86.4
Paternal orphan	62	10.8
Maternal orphan	11	1.9
Double orphan	6	0.9
Number of household members (n = 570)		
<5	354	62.1
≥5	216	37.9
Number of household members under age 5 years (n = 565)		
<2	441	78.1
≥2	124	21.9
Relationship of caretaker with the child (n = 569)		
Parent	531	93.3
Grand parent	26	4.6
Other	12	2.1
Age of caretaker (n = 558)		
≤20 years	42	7.5
21 – 30 years	352	63.1
31 – 40 years	134	24.0
>40 years	30	5.4
Sex of caretaker (n = 571)		
Male	37	6.5
Female	534	93.5
Educational status of caretaker (n = 573)		
Unable to read and write	175	30.5
Able to read and write (no formal education)	29	5.1
Primary education	242	42.2
Secondary education	96	16.8
Above secondary education	31	5.4
Occupation of caretaker (n = 574)		
Housewife	216	37.6
Daily labourer	188	32.8

Unemployed	74	12.9
Other	95	15.8
Marital status of caretaker (n = 571)		
Single	47	8.2
Married	395	69.2
Divorced	85	14.9
Widowed	44	7.7
Family monthly income (ETB) (n = 493)		
≤600	121	24.5
601 – 1650	275	55.8
1651 – 3200	77	15.6
>3200	20	4.0

197

198 **Feeding practices and dietary diversity**

199 Nearly all (92.8%) children were exclusively breastfed during the first six months but only a
200 third (31.0%) were breastfed for the recommended 24 months. Vaccination coverage was
201 practically universal at 98.1% but only around three quarters (73.4%) were said to have
202 received complete vaccination for age or had taken Vitamin A in the last six months (70.9%).
203 Four-fifths (79.2%) of household were considered food secure and 57.2% of children had a
204 minimum dietary diversity while almost half (43.8%) had consumed less than four food
205 groups in the last 24 hours prior to the survey (Table 2).

206 Table 2. Feeding practices and dietary diversity among OVC, Addis Ketema Sub-city, Addis
207 Ababa, Ethiopia

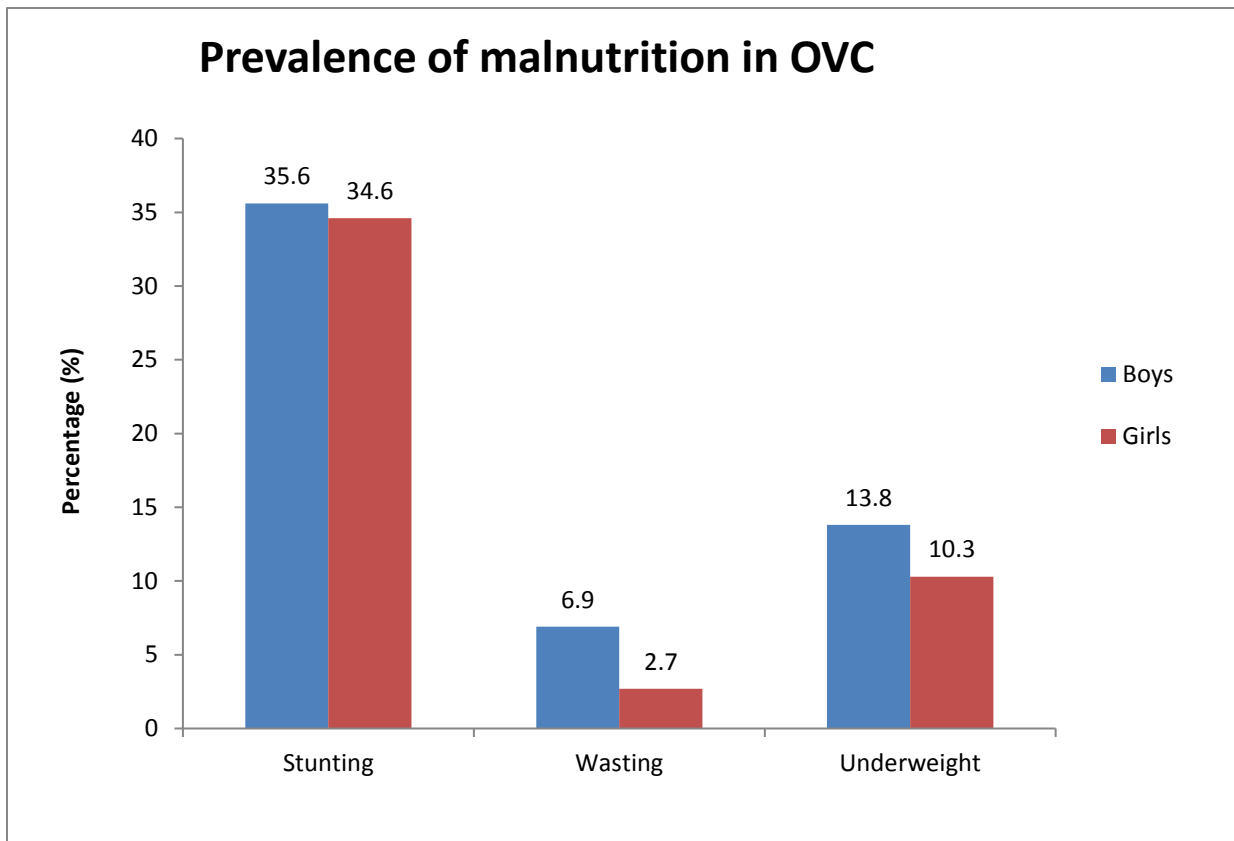
Variables	Frequency	Percentage(%)
Was the child breastfed? (n=573)		
Yes	559	97.6
No	14	2.4
Initiation of breastfeeding (n=555)		
First hour	546	98.4
After first hour	9	1.6
Exclusive breastfeeding (n=553)		
Yes	513	92.8
No	40	7.2
Total duration of breastfeeding in months (n=300)		
<6	28	9.3
6 to 11	34	11.3
12 to 17	46	15.3
18 to 23	25	8.3

≥24	167	55.7
Initiation of complementary feeding (n=557)		
At birth	21	3.8
Birth to 6 months	83	14.9
6 months to 12 months	438	78.6
after 12 months	15	2.8
Type of first complementary food (n=556)		
Formula milk	156	28.0
Cow milk	106	19.1
Porridge	180	32.4
Adult food	114	20.5
Method of complementary feeding(n=556)		
Hand	144	25.9
Cup and spoon	284	51.1
Bottle	128	23.0
Dietary Diversity Score (n=559)		
Low (<4)	239	42.8
High (≥4)	320	57.2

208

209 **Prevalence of stunting, wasting and underweight**

210 The prevalence of stunting, wasting and underweight were 35.1% (95% CI; 31.3% - 39.1%),
211 4.7% (95% CI; 3.2% - 6.7%) and 12.0% (95% CI; 9.6% - 14.9%) respectively in OVC living
212 in Addis Ketema Sub-city, Addis Ababa. The distribution of the mal-nutrition by sex is given
213 in Figure 1.



214

215 Figure 1: Prevalence of malnutrition among OVC in Addis Ketema Sub-city, Addis Ababa,
 216 Ethiopia

217 **Factors associated with stunting**

218 In the bivariate analysis, age of the child, age of the care-taker, occupation of the care-taker,
 219 monthly income, planned pregnancy, maternal antenatal care follow up, breast feeding status,
 220 duration of breast feeding, place of birth, time of initiation of complementary feeding,
 221 household food insecurity were identified as candidate variables for further multi-variable
 222 analysis. However, in the further multi-variable analysis (Table 3), stunting was significantly
 223 associated with initiation of complementary feeding after 12 months of age, household food
 224 insecurity, unplanned pregnancy, age ≥ 2 years, caretaker's age ≤ 25 years and employment of
 225 the caretaker. The odds of stunting among those OVC who initiate complementary feeding
 226 after 12 months of age was four times higher (AOR = 3.57; 95% CI 1.32, 7.62) as compared
 227 to those OVC who initiate complementary feeding within 6 – 12 months of age. The odds of

228 stunting among those OVC with household food insecurity were two times higher (AOR =
 229 1.86; 95% CI 1.10, 3.17) than those OVC with household food security. Similarly, the odds
 230 of stunting was two times higher among OVC age ≤ 23 months and care-taker's age ≤ 25 years
 231 as compared to their counterparts. The odds of stunting was 1.5 times higher (AOR = 1.53;
 232 95% CI 1.03, 2.26) among those OVC whose care-taker was employed as compared to those
 233 OVC whose care-taker was housewife.

234 Table 3. Factors associated with stunting among OVC in Addis Ketema sub-city, Addis
 235 Ababa, Ethiopia

Variables	Stunting		COR (95% CI)	AOR (95% CI)	P value
	Yes N (%)	No N (%)			
Age of the child					
≤ 23 months	156 (41.7)	62 (31.0)	1.00	1.00	
24 – 59 months	218 (58.3)	138 (69.0)	1.60 (1.12, 2.40)	1.82 (1.25, 2.67)	0.004
Age of the care-taker					
≤ 25 years	114 (30.6)	79 (39.3)	1.47 (1.03, 2.11)	1.49 (1.03, 2.16)	0.026
> 25 years	259 (69.4)	122 (60.7)	1.00	1.00	
Occupation of the care-taker					
Housewife	154 (42.2)	62 (31.2)	1.00	1.00	
Employed	163 (44.7)	111 (55.8)	1.69 (1.16, 2.48)	1.53 (1.03, 2.26)	0.031
Unemployed	48 (13.2)	26 (13.1)	1.35 (0.77, 2.36)	1.35 (0.76, 2.40)	0.293
Time of initiation of the complementary feeding					
Birth to 6 months	74 (20.5)	29 (14.9)	0.70 (0.44, 1.12)	0.68 (0.31, 1.49)	0.353
6 – 12 months	281 (77.8)	157 (80.5)	1.00	1.00	
> 12 months	6 (1.7)	9 (4.6)	3.69 (1.36, 7.68)	3.57 (1.32, 7.62)	0.003
Planned pregnancy					
Yes	324 (88.5)	165 (82.5)	1.00	1.00	
No	42 (11.5)	36 (17.2)	1.68 (1.12, 2.86)	1.87 (1.13, 3.42)	0.032
Household food insecurity					
Secure	304 (81.9)	149 (74.1)	1.00	1.00	
Insecure	67 (18.1)	52 (25.9)	1.58 (1.09, 2.45)	1.86 (1.10, 3.17)	0.015

236

237

238 **Discussion**

239 The present study revealed that under nutrition among OVC less than five years of age is
240 much higher than that was reported by Mini- EDHS 2019 at which the prevalence of stunting,
241 wasting and underweight in Addis Ababa was 13.9%, 2.3% and 4.7%, respectively [21].
242 Although there is an overall decreasing trend of under nutrition among children less than five
243 years of age, the findings of this study revealed that among underprivileged children, the
244 prevalence is still high. At 35.1% and 12.0%, the prevalence of stunting and underweight
245 among OVC in Addis Ketema Sub-city is more than 2.5 times higher than their counterparts
246 living in Addis Ababa. Similarly, the prevalence of wasting (4.7%) is double that of their
247 peers. This discrepancy could reflect that the EDHS might not represent the minority groups
248 such as the OVC and may lead to underestimation of the prevalence of under nutrition in the
249 city. Hence, the finding of this study calls for appropriate interventions and decision making
250 to address the alarmingly high burden of under nutrition in this under-recognized group of
251 children.

252 Although this study shows a high prevalence of stunting among OVC, it did not reveal that
253 orphan-hood itself is significantly associated with stunting in the vulnerable children.
254 Moreover, no significant association has been identified between the type of orphan (double,
255 maternal, paternal) and chronic malnutrition. It should be noted however, that the proportion
256 of orphans (13.4%) was relatively low and a greater percentage of orphans may have
257 produced more results. This is in contrast to a study done in Hawassa and Dilla, Ethiopia,
258 where about a quarter of the participants were orphans. It showed that children whose parents
259 were not alive were more likely to be stunted [15, 22]. Also, a study in Zimbabwe in 2007
260 revealed that maternal and paternal orphans had statistically significantly heightened risks of
261 stunting [10]. On the other hand, the results of a study published in Uganda in 2013 showed
262 that there was no statistical difference in the prevalence of chronic malnutrition between

263 orphans (17.0%) and non-orphans (17.2%) and is thus more consistent with the results of this
264 study [23]. Therefore, this study concludes that while vulnerable children suffer more
265 malnutrition than their care-takers, the lack of a parent is not a contributing factor in the
266 population studied.

267 Consistent with the study conducted in Gondar, Ethiopia, this study revealed that children
268 older than two years had significantly higher odds of stunting [16]. This could be explained
269 by the lower socio-economic status of the care-takers to serve optimal meals for the children
270 once they initiate foods. In the earlier ages, children often get the recommended optimal
271 nutrition from breast feeding [2].

272 The strongest association with stunting was found in children in whom complementary
273 feeding was initiated after 12 months of age. This was not demonstrated by other studies.
274 Rather a study done in Hawassa that examined the type of first complementary food, found
275 that children whose first food was porridge were more likely to be stunted as compared to
276 those with milk as their first diet [15].

277 Children from households which were classified as food insecure based on the Household
278 Food Insecurity Access Scale (HFIAS) had nearly doubled odds of being stunted. While the
279 study in Hawassa showed identical trends it was not proven to be statistically significant [15].
280 Another study that was conducted in Kenya in 2010 examined household food security among
281 orphans in the capital Nairobi. While orphans were much more vulnerable to food insecurity
282 than non-orphans, orphans did not display a higher proportion of stunting and thus household
283 food insecurity was not a significant determinant of stunting unlike in this study [13]. This
284 discrepancy might be attributed by the differences in the socio-demographic status between
285 the study participants.

286 Other interesting findings of this study include that children whose principal caretaker was
287 employed as opposed to being a housewife had higher proportions of stunting, while other
288 studies failed to identify such a relationship between caretaker employment and stunting. One
289 likely explanation may be that children whose caretaker was housewife, had longer durations
290 of breastfeeding. Other associated factors of stunting identified in this study include age of
291 caretaker ≤ 25 years and unplanned pregnancy. These findings can be explained by the fact
292 that younger care takers might not be interested in child care or may not have adequate
293 knowledge towards child care.

294 This study is the first study to determine the prevalence of malnutrition among the orphans
295 and vulnerable children in Addis Ababa using a community based design. However, the
296 findings of the study might be affected by the recall and social-desirability bias of the care
297 takers.

298 **Conclusions**

299 The prevalence of stunting, wasting and underweight among the OVC was found to be
300 significantly higher than their counterparts living in the capital city, Addis Ababa. Most
301 importantly, this study uncovers that the positive health statistics which point towards
302 decreases in under nutrition as evidenced by consecutive EDHS data do not accurately reflect
303 the condition of the many underprivileged children living in the society. Therefore, these
304 children and their caretakers will likely benefit from on-going efforts of screening, nutritional
305 interventions and education on feeding practices.

306 **List of Abbreviations**

307	AIDS	Acquired Immunodeficiency Syndrome
308	AOR	Adjusted Odds Ratio

309	CI	Confidence Interval
310	EDHS	Ethiopian Demographic Health Survey
311	ENA	Emergency Nutrition Assessment
312	ETB	Ethiopian Birr
313	FANTA	Food and Nutrition Technical Assistance
314	HFIAS	Household Food Insecurity Access Scale
315	HIV	Human Immunodeficiency Virus
316	MUAC	Mid-Upper Arm Circumference
317	OVC	Orphans and Vulnerable Child
318	UNICEF	United Nations Children’s Fund
319	USAID	United States Agency for International Development
320	WHO	World Health Organization

321 **Declarations**

322 **Ethics approval and consent to participate**

323 Ethical clearance was obtained from the Institutional Review Board (IRB) of Myungung
324 Medical College. The participants were informed about the objective of the study and written
325 informed consent was gained from the caretakers.

326 **Consent for publication**

327 Not applicable

328 **Availability of data and material**

329 Data is available upon reasonable request from the corresponding author.

330 **Competing interests**

331 The authors declare that they have no competing interests.

332 **Funding**

333 Funding of this study was obtained from Myungsung Medical College. The funder had no role
334 in the design, conduct, analysis and interpretation of this study.

335 **Authors Contributions**

336 NB, YN and ND made substantial contributions to conception and design, acquisition of data,
337 analysis and interpretation of data; took part in drafting the article or revising it critically for
338 important intellectual content; agreed to submit to the current journal; gave final approval of
339 the version to be published; and agree to be accountable for all aspects of the work.

340 **Acknowledgements**

341 The study was supported by Myungsung Medical College, Myungsung Christian Medical
342 Center, UNICEF and MSF-Spain. The assistance of the Women and Children's Affairs Office
343 of Addis Ketema Subcity Administration was of utmost importance for the successful
344 conduction of the data collection. Last but not least, gratitude goes out to all the families who
345 participated in this study for their willingness and cooperation.

346

347

348

349 **References**

- 350 1. Wakhweya A, Dirks R, Yeboah K. Children thrive in families: family centered models
351 of care and support for orphans and other vulnerable children affected by HIV and AIDS.
352 AIDS JLICA. 2008.
- 353 2. Rivers J, Silvestre E, Mason J. Nutritional and Food Security Status of Orphans and
354 Vulnerable Children: Report of a Research Project supported by UNICEF, IFPRI, and WFP.
355 International Food Policy Research Institute from [http://www](http://www.ifpri.org/themes/HIV/hivpubs)
356 asp. 2004.
- 357 3. Mishra VK, Bignami-Van Assche S. Orphans and Vulnerable Children in High HIV-
358 prevalence Countries in Sub-Sahara Africa: Marco International Incorporated; 2008.
- 359 4. Aslam A, Grojec A, Little C, Maloney T, Tamagni J. The State of the World's
360 Children 2014 in Numbers: Every Child Counts. Revealing Disparities, Advancing Children's
361 Rights: ERIC; 2014.
- 362 5. Ruducha J, Mann C, Singh NS, Gemebo TD, Tessema NS, Baschieri A, et al. How
363 Ethiopia achieved millennium development goal 4 through multisectoral interventions: a
364 countdown to 2015 case study. The Lancet Global Health. 2017;5(11):e1142-e51.
- 365 6. Ki-Moon B. The millennium development goals report 2013. United Nations Pubns.
366 2013.
- 367 7. Agency CS. Ethiopian Demographic and Health Survey. Addis Ababa, Ethiopia: 2016.
- 368 8. FMOH E. Health Sector Transformation Plan. HSTP 2015/16-2019/20. August, 2015.
- 369 9. Andrews G, Skinner D, Zuma K. Epidemiology of health and vulnerability among
370 children orphaned and made vulnerable by HIV/AIDS in sub-Saharan Africa. AIDS care.
371 2006;18(3):269-76.
- 372 10. Watts H, Gregson S, Saito S, Lopman B, Beasley M, Monasch R. Poorer health and
373 nutritional outcomes in orphans and vulnerable young children not explained by greater

374 exposure to extreme poverty in Zimbabwe. *Tropical medicine & international health.*
375 2007;12(5):584-93.

376 11. Skinner D. *Defining orphaned and vulnerable children*: HSRC Press; 2004.

377 12. Lindblade KA, Odhiambo F, Rosen DH, DeCock KM. Health and nutritional status of
378 orphans < 6 years old cared for by relatives in western Kenya. *Tropical Medicine &*
379 *International Health.* 2003;8(1):67-72.

380 13. Braitstein P, Ayaya S, Nyandiko WM, Kamanda A, Koech J, Gisore P, et al.
381 Nutritional status of orphaned and separated children and adolescents living in community
382 and institutional environments in Uasin Gishu County, Kenya. *PLoS One.* 2013;8(7):e70054.

383 14. Monasch R, Boerma JT. Orphanhood and childcare patterns in sub-Saharan Africa: an
384 analysis of national surveys from 40 countries. *Aids.* 2004;18:S55-S65.

385 15. Bisrat G, Kulkarni U. Assessment of the nutritional status and associated factors of
386 orphans and vulnerable preschool children on care and support from Nongovernmental
387 Organizations in Hawassa Town, Southern Ethiopia. *Global Journal of Medical Research.*
388 2017;16(2):1-41.

389 16. Gultie T, Sisay E, Sebsibie G. Nutritional status and associated factors among orphan
390 children below the age of five years in Gondar City, Ethiopia. *J Food Nutr Sci.*
391 2014;2(4):179-84.

392 17. Coates J, Swindale A, Bilinsky P. *Household Food Insecurity Access Scale (HFIAS)*
393 *for measurement of food access: indicator guide: version 3.* 2007.

394 18. De Onis M, Onyango AW, Borghi E, Garza C, Yang H, Group WMGRS. Comparison
395 of the World Health Organization (WHO) Child Growth Standards and the National Center
396 for Health Statistics/WHO international growth reference: implications for child health
397 programmes. *Public health nutrition.* 2006;9(7):942-7.

398 19. Organization WH. *Training course on child growth assessment.* Geneva: WHO.
399 2008:p17-25.

- 400 20. Jolliffe D, Prydz EB. Estimating international poverty lines from comparable national
401 thresholds: The World Bank; 2016.
- 402 21. Agency CS. Mini demographic and health survey 2019; Key indicators. Addis Ababa,
403 Ethiopia: 2019.
- 404 22. Wete AT, Zerfu TA, Anbese AT. Magnitude and associated factors of wasting among
405 under five orphans in Dilla town, southern Ethiopia: 2018: a cross-sectional study. *BMC*
406 *nutrition*. 2019;5(1):33.
- 407 23. Moses L. Orphans and Vulnerable Children (OVC) in Uganda: Are orphans more
408 malnourished than non-orphans. *Social Sciences*. 2013;2(2):58-65.
- 409