

Prevalence and Associated Factors of Acute Malnutrition Among 6-59 Month Children in Adi-Harush and Hitsats Refugee Camps in Tigray Region Northern Ethiopia, 2017

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Abstract: Background: Wasting is characterized by low weight for height and it is common in developing countries. Wasted children have lower resistance to infection, impaired learning ability and reduce economic productivity. Objective: The aim of this study was to assess the prevalence and associated factors of acute malnutrition among children aged 6-59 months in Adi-harush and Hitsats Eritrean refugee camps. Methods: A community-based cross-sectional study was conducted from March 1 to April 15/2017, at Adi-Harush and Hitsats Refugee Camps. A total of 471 subjects were selected using the multi-stage sampling technique and Pre-tested and structured questionnaire was used to collect data. Multivariable logistic regression analysis was fitted to identify factors associated with acute malnutrition. Adjusted Odds Ratio (AOR) with the corresponding 95% Confidence Interval (CI) was used to show the strength of associations and variables with p-values of <0.05 were considered as statistically significant. Results: The finding of this study revealed that 37%, 21.6% and 11% of children were stunted, underweight and wasted respectively. Child age 48-57 months (AOR= 0.12, 95%CI: 0.03-0.39), frequency of feeding less than 3 times a day (AOR= 1.95, 95%CI: 1.001-3.8) and not exclusive breast feeding (AOR= 2.51, 95%CI: 1.17-5.40) were significantly associated with wasting. Conclusion: The prevalence of wasting (11%) in the study area is very high. Frequency of feeding, exclusive breast-feeding and child age were significantly associated with wasting. Improve community health education for pregnant and lactating mothers and giving exclusive breast feeding for the children's are one of the prevention mechanisms for child wasting.

Keywords: Acute Malnutrition, Ethiopia, Under Five Children, Adi-harush and Hitsats

1. Introduction

Maternal and child under nutrition contributes to more than one-third of child deaths, more than 10% of the total global disease burden and is the single largest contributor to child mortality [1, 2]. Acute malnutrition (wasting) is one of the three main types of under nutrition affecting potentially

all categories of the population, especially vulnerable groups such as children under five, pregnant and lactating women, and people living with a disease or chronic illness [3].

Wasting (low weight-for-height) is a measure of acute under nutrition that represents the failure to receive adequate nutrition in the period immediately before the survey. Children are most vulnerable to malnutrition in developing countries because of low dietary intakes, lack of appropriate

care, and inequitable distribution of food within the households [4]. Displacement also affects food security, especially in the initial stages before assistance can be provided [5].

Even though under-nutrition remains a major public health problem in developing countries, it is more apparent in refugee populations who are displaced from war town areas to neighboring countries [6]. The weight-for-height indexes measure body mass in relation to body height or length and describe current nutritional status. Children whose Z-score is below minus two standard deviations (-2 SD) from the median of the reference population are considered as thin (wasted) or acutely undernourished [7, 8].

Globally in 2016, wasting continued to threaten the lives of an estimated 7.7 per cent children under 5 and 52 million children under five in the world today are facing a struggle between life and death due to a condition that is preventable. These 52 million mainly living in sub-Saharan Africa and the developing regions of Asia and they are at risk of dying from a mix of hunger and disease that has caused them to develop acute malnutrition [3, 8].

Excluding those from the West Bank and Gaza, the number of refugees in 2014 was 14.4 million or 6 percent of the international migrants in 2013. About 86 percent of the refugees are hosted by developing countries [9].

According to EDHS (Ethiopian Demographic Health Survey) 2016, 38% of children under age 5 in Ethiopia are stunted or too short for their age, 18% severely stunted, 10% are wasted or too thin for their height, including 3% who are severely wasted. Also 24% of the children are underweight or too thin for their age, with 7% severely underweight [8].

Wasting does not only cause high mortality and morbidity, but also leads to physical and mental impairment in children. The health and physical consequences of prolonged states of malnourishment among children are delays in physical growth, drops in intellectual quotients, poor cognitive ability, decreased economic productivity, reduced reproductive performance, poor school performance and achievement, greater behavioral problems, deficient social skills, and susceptibility to diseases [10-18]. Although different programs and strategy have been launched as intervention for alleviating the acute malnutrition (wasting) of under five age children in Ethiopia, the 10% rate of the prevalence noted in 2011 remained the same until the 2016 EDHS. Therefore, the main aim of this study was to assess the prevalence and associated factors of acute malnutrition among children below five years of age in Adi-harush and Hitsats refugee camps in Tigray Region, north Ethiopia [8, 21].

2. Methods

2.1. Study Setting and Design

A multi-stage cross-sectional study was conducted on mother-child pair in Adi-harush and Hitsats refugee camps from March to April, 2017. There are four Eritrean refugee camps in the Western Zone of Tigray Regional State located

1055-1166 km from Addis Ababa and 290-391 km from Mekele town. The total refugee populations are 48,000 with 52% male. There were 1881 under 5 children in the two selected refugee camps. At the moment, one health center was serving a camp of each refugee.

2.2. Study Participants and Sampling Procedure

All children's who were 6-59 months of age and had lived at four refugee camps for at least 01 months were included in the study, while children whose mothers were too ill to communicate verbally and children with physical impairments were excluded.

The sample size was calculated by using the single population proportion formula with the assumptions of a 95% confidence interval, 5% margin of error, 24.6% prevalence of acute malnutrition [22], 10% non-response rate and 1.5 design effect was anticipated to obtain the final sample size of 471.

A multi-stage stratified sampling followed by a systematic random sampling technique was employed to reach the study subjects and 2 refugee camps (Adi-harush and Hitsats) were selected using lottery method. The number of study participants was allocated to each refugee camp in proportion to population size using the food ration registration as a sampling frame. Infant-mother pairs were selected by using the systematic random sampling technique after giving codes to each house-hold which had 6- 59 month children. The first participant was selected using the lottery method and continued by selecting every k^{th} mother until our sample size was attained.

2.3. Data Collection Procedure and Management

A structured questionnaire and anthropometric measurement for nutritional status were used to collect the data and the questionnaires were addressed through the face to face interview technique. The questionnaire was initially prepared in English and translated into the local language, Tigrigna. The standardized anthropometry measuring scale was used to assess the physical growth and nutritional status of the children; measurements of height and weight were taken for all children. The measurement of weight was done with the Salter scale and beam balance with specified age categories. During the measurement, the children wore minimum/light clothes, took shoes and the reading was to the nearest 0.1kg. Recumbent length measurement was taken for children under two years of age, while for children above two years stature was measured in a standing position. During height measurement, the children's were at Frankfurt position and at least five places were touched (occipital, shoulders, buttock, calf and, heels) the standing stadiometer.

Six diploma and two BSc graduate nurses who are proficient in the local language were assigned for data collection and supervision respectively. Two day intensive training was given to both parties on matters relating to the aims of the questionnaire and the techniques of interview. Data validity and reliability was maintained through close

supervisions by the principal investigators and trained supervisors. To minimize systematic errors, height and weight of children were taken twice by the same person and the average value of the measures was taken for final analysis. The collected data were reviewed and checked for completeness and consistency.

2.4. Statistical Analysis

The collected data was coded and entered in to EPI INFO version 7 and exported to SPSS version 20.0 for further analysis. Anthro nutritional software was used to measure and determine the indices of the anthropometric data with Z score. Descriptive statistics, such as frequencies, proportions and cross-tabs were used to present data. Both bi-variable and multivariable binary logistic regression analysis were performed. In the bi-variable analysis, variables with p-value of < 0.2 were considered into the final model and Adjusted Odds Ratio (AOR) with 95% Confidence Interval (CI) was used to show the presence and strength of association. Finally, p-value of less than 0.05 in the multivariable logistic regression model was used to identify variables significantly associated with acute malnutrition.

3. Results

3.1. Socio Demographic and Economic Characteristics

Of the whole, 471 mothers-child pairs participated with a 100% response rate. Most of the participants (92.6%) were Orthodox Christians and 95.5% of them were Tigrians. Regarding marital status, 58.6% of the mothers were married. The mean age of mothers was 26 years (SD + 5.5), and the children were 30.8 months old (SD + 13.8). More than half of (58%) the mothers were attended grades 1-8 while 47.5% of the husbands were grade 9 and above. The majorities (92.6%) of the mothers were house wives and 76.6% of the husbands did not have any jobs (Table 1).

Table 1. Socio-demographic characteristics in Adi -harush and Hitsats Eritrean refugee camps in Tigray region north Ethiopia 2017.

Variable	Frequency	Percentage%
Religion		
Orthodox	436	92.6
Others	35	7.4
Marital status		
Married	276	58.6
Separated	169	35.9
Others	26	5.5
Educational status of mother		
Un able to read and write	102	21.6
1-8 grade	273	58
>9 grade and above	96	20.3
Educational status of fathers		
Un able to read and write	47	10
1-8 grade	200	42.5
9-12 grade	224	47.5
Occupation of mothers		
House wife	436	92.6

Variable	Frequency	Percentage%
Others	35	7.4
Occupation of husband		
Private and daily worker	108	23
No work and Student	361	76.6
Occupation of husband		
Private and daily worker	108	23
No work and Student	361	76.6
Monthly income of the family		
Ration only	262	55.6
<500	53	11.3
500-1000	124	26.3
>1000	32	6.8
Male	239	50.7
Female	232	49.3

3.2. Maternal and Child Care Practice

Regarding ANC follow ups, 74.9% of the mothers made 4 and more follow ups, 86.6% mother was made birth preparedness and 69.9% delivered at HC's (institutional delivery). During pregnancy, 61.4% of the mothers received extra food and all types of family planning utilization coverage were only 36.5%. Majority of the mothers (87.5%) were exclusively breast feed their children. Vitamin A and de-worming supplementations coverage were 90 and 69% respectively. Regarding health status, 10% of the children were ill with diarrhea and 16.6% with ARI in the last two weeks (Table 2).

Table 2. Maternal and child caring practice in Adi-harussh and Hitsats Eritrean refugee camps in Tigray region North Ethiopia 2017.

Variable name	Freq	Percentage (%)
Age of child		
6-11 months	39	8.3
12-23 months	106	22.5
24-35 months	134	28.5
36-47 months	101	21.4
48-59 months	90	19.3
Extra food receiving during pregnancy		
Yes	289	61.4
No	182	38.6
Number of PNC follow ups		
No seen	128	27.2
1-3 times	236	50.1
>=4 times	107	22.5
Vitamin A supplementation		
Yes	424	90
No	47	10
MUAC of mothers		
<23 cm	151	32
>23 cm	320	67.9
Ill with diarrhea in the last two weeks		
Yes	47	10
No	424	90
ANC follow up times		
< One times ANC follow up	14	3
2-3 times ANC follow up	104	22.1
>=4 times ANC follow up	353	74.9

Variable name	Freq	Percentage (%)
Birth preparedness		
Yes	408	86.6
No	134	23
Birth place		
Health facility	329	69.9
Home	142	30
Complimentary feeding counseling		
Yes	411	87.3
No	60	12.7
Family planning utilization		
Yes	172	36.5
No	299	63.5
Exclusive breast feeding practice		
Yes	412	87.5
No	59	12.5
Ill with ARI		
Yes	78	16.6
No	393	83.4

3.3. Environmental Factor

Based on our findings, 38% used less than 20L, 37% use 20-50 L/day and the remaining 25% use more than 50 L/day/cap of water. Latrine utilization coverage, hand washing practice after using latrine, after handling waste, and before feeding were 91%, 92, 76 and 91% respectively (Table 3).

Table 4. Nutritional status of male and female category 6-59 month children in Adi-harush and Hitsats Eritrea refugee camp in Tigray region north Ethiopia in 2017.

s.no	Nutritional status	Male		Female		Total	
		N (239)	%	N (232)	%	N (471)	%
1	Wasting (WHZ)	33	13.8%	19	8.2%	52	11%
	Moderate	26	10.8%	15	6.5%	41	8.7%
	Sever	7	3%	4	1.7%	11	2.3%
2	Under weight (WAZ)	57	23.8%	45	19%	102	21.6%
3	Stunting (HAZ)	86	35.9%	88	37.9%	174	37%

When examined from the point of view of age category, the wasting was highest (26%) among the 6-11 months of age groups and lowest (8%) among children aged over 36 months. On the other hand, the prevalence of underweight was highest (26%) among the 36-47 months of age groups

Table 3. Environmental related factors in Adi-harush and Hitsats refugee camp in Tigray region north Ethiopia 2017.

Variable name	Freq	Percentage (%)
Water served per day		
<20 liter	177	37.6
20-50 liters	173	36.7
>50 litter	121	25.7
Latrine utilization coverage		
Yes	430	91.3
No	41	8.7
Hand washing after handling waste		
Yes	356	75.6
No	115	24.4
Hand washing after using latrine		
Yes	433	91.9
No	38	8.1

Prevalence of Malnutrition

The prevalence of malnutrition in the study area was 11% (95%CI: 8.2-13.8%) for wasting, 21% for under weight and 37% for stunting. The prevalence of wasting was higher (13.8%) among male than female children. Unlike wasting and underweight, stunting was slightly higher in female than male children (37.9). Sever stunting was above the WHO standards and remains a critical problem in the area and needs special attention to prevent morbidity and mortality relating to nutritional status (Table 4).

and lowest among children aged 6-11 and 48-59 months. The highest stunting (46%) was observed among the 24-35 months of age groups and the lowest (2.5%) among the 6-11 months of age category (Table 5, Figure 1).

Table 5. Nutritional status of 6-59 month age children in Adi-harush and Hitsats refugee camps in Tigray region North Ethiopia 2017 by age category.

Nutritional status	Age group in months											
	6-11		12-23		24-35		36-47		48-59		Total	
	N (39)	%	N (106)	%	N (134)	%	N (101)	%	N (91)	%	N (471)	%
Wasting (WHZ)	10	26	15	14	12	9	8	8	7	8	52	11
Moderate	8	21	13	12	7	5	7	7	6	6.5	41	8.7
Sever	2	5	2	2	5	3.7	1	1	1	1	11	2.3
Under weight (WAZ)	7	18	19	18	33	24.6	26	26	17	18.6	102	21.6
Stunting (HAZ)	1	2.5	35	33	62	46	41	41	35	38	174	37

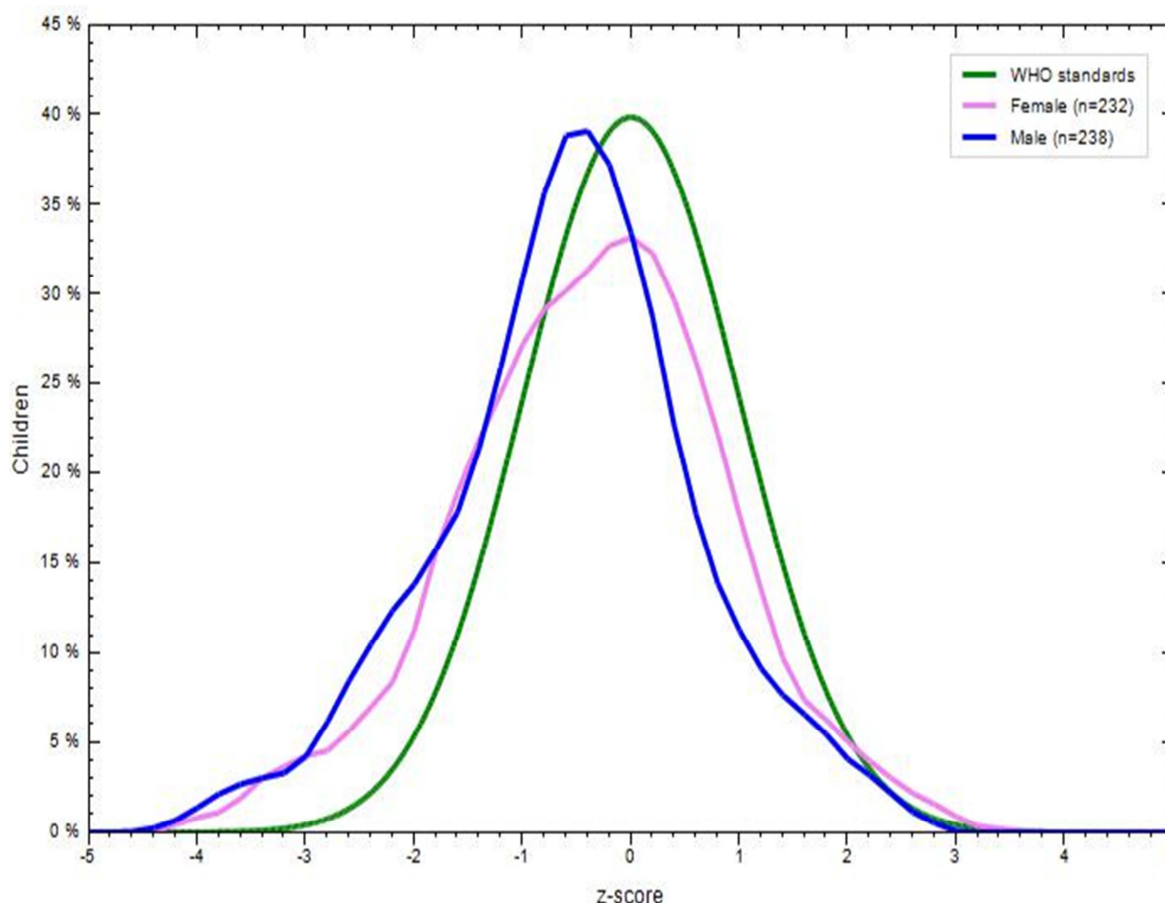


Figure 1. Graphic representation of WHZ based on sex of the children indicates that male children were slightly higher in wasting than female children in Adi-harush and Hitsats refugee camps in 2017. In both sex prevalence of wasting were very high in comparison to WHO standards.

Factors associated with wasting

Both bivariate and multivariate logistic regressions were done; the result of multivariate analysis revealed that, age of child, exclusive breast feeding and feeding frequency were significantly associated with wasting. Children in the age group of 36-47 months were 88% less likely to be wasted than children in the age group of 6-11 months (AOR= 0.12,

95%CI: 0.03-0.39). None exclusively breastfed children were 2.51 times more likely to be wasted than those who were exclusively breast feeding children until 6 months (AOR= 2.51, 95%CI: 1.17-5.40). Children who receive foods less than 3 times per day were 1.95 times more likely to be wasted than their counter parts (AOR = 1.95, 95%CI 1.00-3.80) (Table 2).

Table 6. Factors that had association with wasting by Bivariate and multivariate analysis in Adi-harush and Hitsats Eritrean refugee camps in Tigray region North Ethiopia 2017.

Variables name		Wasted	Not wasted	COR 95%CI	AOR 95%CI	P value
Sex of child	Male	33	206	1.796 (0.989-3.26)	1.155 (0.786-3.054)	0.004
	Female	19	213	1	1	
Child age in months	6-11	10	29	1	1	0.004
	12-23	15	91	0.478 (0.194-1.18)	.29 (0.11-0.82)*	
	24-35	12	122	0.258 (0.112-0.72)	.19 (0.06-0.57)*	
	36-47	8	93	0.249 (0.09-0.69)	.12 (0.03-0.39)*	
Occupational status of husbands	48-59	7	84	0.242 (0.084-0.69)	.12 (0.04-0.42)*	0.004
	Private and daily worker	16	93	1	1	
Exclusive breast feeding practice	Students And no work	36	326	0.642 (0.341-1.208)	0.667 (0.305-1.461)	0.004
	Yes	36	366	1	1	
Frequency of feeding	No	16	53	3.069 (1.593-5.912)	2.51 (1.17-5.40)	0.048
	<=3	26	126	2.33 (1.30-4.16)	1.95 (1.01-3.80)*	
Vitamin A supplementation	>3	26	293	1	1	0.004
	Yes	41	378	1	1	
De-worming supplementation	No	11	41	2.47 (1.181-5.181)	1.776 (0.633-4.983)	0.004
	Yes	28	297	1	1	
	No	18	128	1.59 (0.881,2.88)	0.713 (0.309,1.646)	

P<0.05

4. Discussion

This study showed that, the prevalence of acute malnutrition (wasting) was 11% (95% CI: 8.2-13.8) in the study setting with its aggravating factors. This finding was similar to that of a study conducted by IOM at the Ethiopian refugee campus (11.9%). Moreover, EDHS 2016 and a study in Guto Gida, Oromia Region, also found a similar prevalence of 10 and 11% respectively [23-25]. The possible reason might be due to the similarity of socio economic status.

The prevalence of wasting noted in our study (11%) was lower than the findings of studies in Dollo Ado (42%), Shimelle District (20%), East Bellesa (16), May-iyni refugee camp (24.6%), and the Eritrean national wasting prevalence (15%) [26-30]. The possible reason might be lack of adequate dietary diversity and in appropriate care of the children.

Likewise, studies conducted in IPD, Northern Uganda, Nepal, Tanzania, and Iran showed a lower prevalence of 6, 7, 6.5 and 8.19% respectively [31-34]. This may be due to, the improvements of hygienic practice; mothers may aware of child caring and program improvements like vitamin A and de-worming supplementation.

In this study, children in the age group of 48-59 months were 88% less likely to be wasted than children in 6-11 months (AOR: 12 95%CI 0.04-0.42). This is because younger children were more susceptible to infections than older children and may be due to the time of adaptation to complimentary feedings or sub optimal feeding practices.

None exclusively breastfed children were 2.51 times more wasted than their counter parts. This result was consistent with that of a study conducted in Saharawi Refugee Camps, Tindouf, Algeria [39]. This is due to, exclusive breast feeding until 6 month of life prevents children from infection and increases breast milk production.

According to this study, findings on feeding frequency indicate that children fed 3 and less times per day were 1.95 more likely to be wasted than those who received more than 3 times per day. This finding is in line with that of a study conducted on refugee children in Namibia [40]. This is because the more they are fed the more energy the children get.

5. Conclusion

This study revealed that wasting prevalence (11%) in the study area was serious. Frequency of feeding children, exclusive breast-feeding and child age were significantly associated with wasting. Improve community health education for pregnant and lactating mothers and giving exclusive breast feeding for the children's is one of the prevention mechanisms for child wasting.

Limitation of the Study

Children born in Eritrea had no immunization cards, and the respondents might have had recall bias in telling the date of birth and age in months of children's.

List of Abbreviations

AM, Acute Malnutrition; CDR, Crude Death Rate; CM, Chronic Malnutrition; DR, Death Rate; EPHS, Eritrean Population Healthy Survey; GAM, Global Acute Malnutrition; IOM, International Organization for Migration; IDP, Internal Displaced People; IYCF, Infant and Young Children Feeding; SAM, Sever Acute Malnutrition; UNICEF, United Nation Children's Fund; WHO, World Health Organization.

Declarations

Ethics approval and consent to participate

Ethical consideration

Before commencement of the study, ethical clearance was obtained from Institutional Ethical Review board of University of Gondar. Formal letter was obtained from Adi-harush and Hitsats refugee camp administrators to get permission. The first page of the questionnaire was providing full information to the study participants regarding the purpose and nature of the research. In addition, informed verbal consent and assent were obtained from each study participant to confirm willingness for participation after explaining the objective of the study. Name, personal identifiers was not including in the study. Participants' data was locked with a key/password to ensure confidentiality. Counseling on adequate nutrition and its importance was given through communicating with health workers staffs on that area for those whose child is malnourished.

Consent to publish

Not applicable

Availability of Data and Materials

Data will be made available upon requesting the primary author

Competing Interests

All the authors do not have any possible conflicts of interest.

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Author's Contribution

Conceived and designed the experiments: BM, HYY, HB and KAG. Performed the experiments: HB. Analyzed the data BM, HYY, HB and KAG: Wrote the paper: BM, HYY, HB and KAG. Approved the proposal with some revisions: BM, HYY, HB and KAG.

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