Journal of Health, Medicine and Nursing
ISSN 2422-8419 An International Peer-reviewed Journal
Vol.24, 2016

Predictors of Acute Malnutrition Among 6 - 23 Months Children in Hidhebu Abote Woreda, Oromia, Ethiopia

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ABSTRACT

Introduction: Malnutrition is major public-health problem throughout the developing world and is an underlying factor in over 50% of the 10–11 million children under 5 years of age who die each year. Although the prevalence of malnutrition is generally high in Ethiopia, there were no enough documented predictors. Therefore; this study was undertaken to identify predictors of acute malnutrition among 6 - 23 months in HidhebuAbote Woreda, Oromiya Regional State, Ethiopia. **Methods**: Community based unmatched case-control study design was utilized. Children of 6-23 months in the Woreda were screened by weight for height and 288 children (144 cases and 144 controls) were selected by simple random sampling technique. **Results:** The mean age of the cases and controls were 13.38 (± 4.68) and 14.41 (± 5.44) month respectively. There were more males in the cases 68 (47.5%) than in the controls 58 (40.5%). Cases with malnutrition were more likely to: have mothers who did not graduate as model by the health extension program (AOR= 7.246), have spring and /or river as source of drinking water (AOR= 5.349), initiate breastfeeding late (AOR= 4.248), not exclusively breastfed(AOR= 4.586), not given colostrums(AOR=2.706), be bottle fed (AOR=3.111) and have illness during the last two weeks before the survey (AOR=4.136) compared to controls.**Conclusion:** Finally this study identified that distal, intermediate and proximal factors associated with Acute Malnutrition among 6 - 23 months Children in the study area. Therefore, those factors associated with Acute Malnutrition would be emphatically considered during development of child health and Nutritional programs by police makers in collaboration with others responsible bodies. Federal ministry of health would be better to give greater emphases to address under two years child Nutritional status to improve through health education by using mass media and community mobilization in more comprehensive manner by integrated to health extension program of model family graduation package about child nutritional and optimal child feeding practices based on the final guideline and improving water and sanitation including home based treatment of water using 'Wuha' Agar.
Key words: Acute Malnutrition 6 - 23 Months Children Hidhebu Abote Woreda

INTRODUCTION

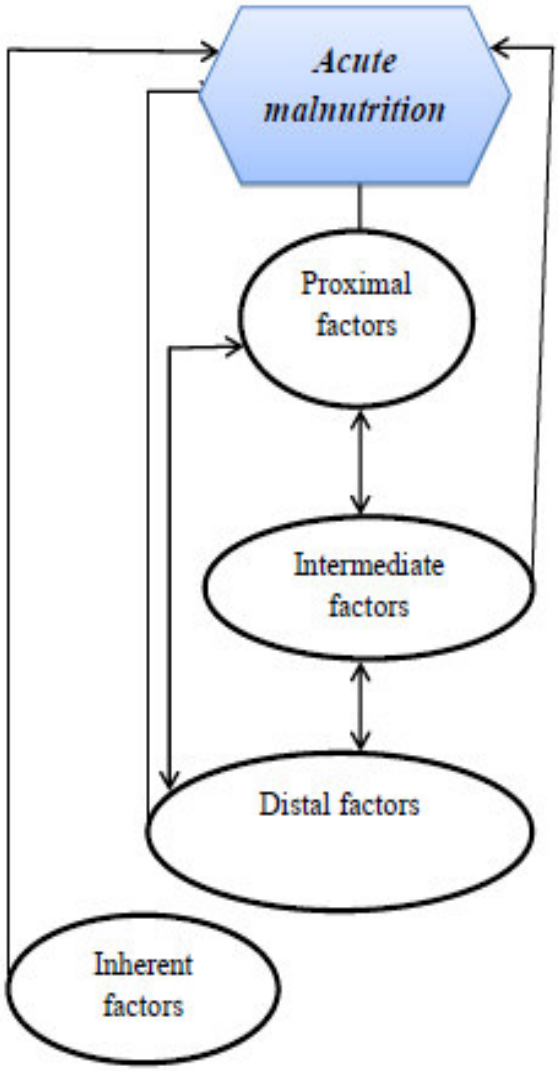
An adequate supply of nutrients is needed to maintain all the functions of the human body and daily activities at maximum efficiency, thus ensuring healthy living. Health and nutrition are closely linked, therefore; to ensure proper development and life quality they must be adequate from early childhood [1]. Especially, adequate nutrition during infancy and early childhood is essential to ensure the growth, health, and development of children to their full potential [2].

However; if the children do not get the necessary nutrients, such as body builders, energy foods and protective nutrients they become malnutrition [3].

Malnutrition is one of the major causes of mortality and morbidity in the children [4]. It is a major public-health problem throughout the developing world and is an underlying factor in over 50% of under 5 years of age who die each year of preventable causes [5]. Particularly children under 2 are the most vulnerable of all to malnutrition. The first two years of life are critical for optimal growth, development and to reduce the long-term risk [6].According to a 2012 UNICEF projected report over 4 million children in nine countries of the Sahel region is suffering from acute malnutrition which includes 1.1 million children face life-threatening SAM and 3 million children will suffer from MAM[7]. The UNICEF report of 2011 indicated that urgent life-saving actions are needed to prevent the deaths of an estimated 480,000 severely malnourished and 1.6 million children are moderately malnourished in drought affected countries like Kenya, Somalia, Ethiopia, and Djibouti. In Ethiopia 312,740 children are severely malnourished. Ethiopia demographic health survey (EDHS) 2005 also reported that the prevalence of wasting is 9.6% and EDHS 2011 indicated that in Oromiya region 10% of the children were wasted [8, 9].

Malnutrition is the largest single underlying cause of death worldwide and is associated with over a third of all childhood deaths. Over 8 million preventable deaths are estimated to occur annually among children and infants in developing countries; the majority is associated with malnutrition [10]. As malnutrition is an important public health problem, to over this problem preventive program have an immense job. To reduce the

magnitude of malnutrition and child mortality; identifying contributing factors is the crucial thing which makes things easy for health personnel to address the problem; and coordinate, harmonize, scale up and sustain current nutrition interventions with a greater focus on community based interventions through prevention and control strategies. Even though in Ethiopia the past progress to prevent malnutrition has been substantial, there were a few studies conducted to identify contributing factors of acute malnutrition among children of under-two years of age. Therefore; this study is needed to identify contributing factors for acute malnutrition among 6 -23 months in the study area. The findings of the study will help to inform public health policy, to attain the already set goals in the country, to set proper priority and interventions. To conceptualize this study conceptual hierarchical framework of the determinants of nutritional status was used. According to this model the complex hierarchical interrelationships between different variables and risk factors of malnutrition are categorized into 3 groups: distal, intermediate and proximal factors [11].



Proximal factors
Feeding and child health status:
- ✓time of breastfeeding initiation
- ✓duration of breast-feeding
- ✓Time for introducing complementary feeding
- ✓Child morbidity status
- ✓Breast feeding frequency
- ✓ feeding frequency

Intermediate factors
Environmental, maternal and health delivery:
- ✓presence of a latrine
- ✓source of water
- ✓household size/family size
- ✓housing condition
- ✓Mother's age at first birth
- ✓Number of under five children
- ✓child birth order
- ✓child immunization
- ✓distance from health center
- ✓family planning service
- ✓ANC visit
- ✓Place of delivery

Distal factors
Household socio-demographic:
- ✓ religion
- ✓ ethnicity
- ✓ mother's education level
- ✓ father's education level
- ✓ Household Wealth
- ✓ household food insecurity

Inherent factors
- ✓ age
- ✓ sex

METHODS AND MATERIALS

The study was conducted in HidhebuAbote Woreda which is found in North Shoa, Oromiya Regional State. The Woreda town Ejere is located at 39kmfrom zonal town Fitche and 139km from Addis Ababa. Community based unmatched case-control study design was employed to identify predictors of acute malnutrition among children of 6-24 months. The sample size was determined using two population proportion formulas by considering the proportion of duration of breastfeeding($\leq$ 12 months) of 6 – 23months children among the cases 51% and the controls34.7% (main exposure variable) which is estimated from other study [12]. Considering 10% non-response rate the total sample size was288 children, 144 cases and 144 controls were included.

All children in the age range of 6-23 months in the Woreda were screened for acute malnutrition by weight for length and then classified into cases and controls. Total 288 children which included 144 cases from total cases (501) and 144 controls from total controls (4351) were selected by simple random sampling technique (computer generated random numbers). In case when there is more than one child in the age range of 6-23 months in a household, younger child was selected to consider maternal factors and incase for twins the first born children were selected.

Structured questionnaire which contains socio demographic characteristics, mother and child related factors, environmental factors, household food security and anthropometrical measurement were utilized. The questionnaire was adapted from different literatures and published studies and then modified to local context. The questionnaire was prepared originally in English and translated to Afan Oromo, and then retranslated back to English for checking consistencies. The edited final Afan Oromo version was used for in the actual interview and for anthropometric measurement MUAC tapes, height/length board and Salter spring scale were used.

Ten health extension workers (HEWs) were selected to make a screen for acute malnutrition, take anthropometric measurement (weight, height/length) and conduct interview. Three Health office experts were assigned to supervise the data collectors. Both the interviewers and supervisors were trained on the objectives and methodology of the research, data collection and interviewing approach, anthropometric measurement, confidentiality, data recording and collection techniques by going questionnaire through question by question.

Face-to-face interview and anthropometric measurement were employed. The measurement was taken at kebeles' health post and interview data were collected at each selected household by health extension workers. MUAC was measured on the left mid upper arm to the nearest 0.1cm and the result was recorded for children. The interview was conducted with mothers of the children/care givers to fill the questionnaire. Child weight was measured using a Salter spring scale to the nearest of 0.1 kg with minimum clothing and no shoes. Child length was measured in a lying position with wooden board at the nearest of 0.1 cm.

The quality of data was checked at three different stages. . First, each data collector should have to check the collected data before leaving the house and submitting to her supervisor. Secondly, after receiving the data collectors, each supervisor had the responsibility to check for missed or inappropriate recorded data and if found he gave back the questionnaire to the data collector for re-checking and corrections. In addition, supervisors have the responsibility to re-interview at least 5 percent of the data collected in their areas. . Thirdly the data were checked during data entry and if problems were found the forms were sent back to data collectors for further checking. The investigators also made random cross checking on the re-interviews made by supervisors and check data collectors on actual collection time at field level.

Sick and severely malnourished children were referred to nearby health facilities. Malnourished children's mothers were advised on how feed the child and others were congratulated for good care for her children. Cooking demonstration of one day was provided for all mothers at five primary care unit of the Woreda after data collection by coordination of Woreda health office.

The data were checked for completeness and consistency and then it was coded, entered and stored into the computer using Epidata 3.1 software. Anthropometric measurement data (Z-scores of weight for height/length) was calculated by using software WHO Anthro. 2007version3.2.2. Data were exported to SPSS 16.0 statistical package program for analysis. The distribution of the variables was explored and data cleaning was performed to identify outliers/inconsistence, errors and missing values. Descriptive statistics were computed to get summary values.

Variables found statistically significant under bivariate analysis at a p value less than 0.05 were identified and the candidate variables were entered into multivariate logistic regression analysis to the see independent effect of the variable on the outcome variable and Odds ratio (OR) with 95% confidence interval (CI) for each variables of interest was reported and p value less than 0.05 was considered as statistically significant for all the independent variables in the model.

Operational Definitions

Acute malnutrition: child whose weight for length is less than -2 SD of the median WHO reference

Complementary foods: are foods which are required by the child, after six months of age, in addition to sustained breastfeeding.

Diarrhea: a child with loose stools for three or more times in a day and a sign of dehydration

Extended family: parents, children, and relatives, the family as a unit embracing parents and children together with grandparents, aunts, uncles, cousins, and sometimes more distant relatives

Fever: a child with elevated body temperature than usual

Family size: refers the total number of people living in a house during the study period.

Illiterate: unable to read and write

Illumination of living house: Good: if any pencil written thing is visible, fair: if pencil written does not visible but the pen is visible and poor: if any pen written thing is invisible by being in the center of a house

Malnutrition: refers to under nutrition or deficiency in protein-energy nutrition (PEM). Throughout the

document it is meant under nutrition.

Nuclear family: unit of parents with their children, a social unit that consists of a mother, a father and their children

Sever wasting (severe acute malnutrition): child whose weight for length below -3SD of the median WHO reference values.

Ventilation of living house: Good- house with at least two window, fair- house with one window and poor- house without window

Wasting *(*moderate acute malnutrition): child whose weight for length more than -3SD and less than -2 SD of the median WHO reference values.

Z-score or standard deviation unit (SD): is a dimensionless quantity used to describe the difference between the value for an individual and the median value of the reference population for the same age or height, divided by the standard deviation of the reference population.

Household food status: The house-hold head was asked a series of six questions which addressed whether the household ran out of food or did not have enough money to buy food in the last three months. The questions covered whether (1) the respondent worried about running out of food; (2) the household ran out of food; (3) the variety of food for children was reduced; (4) the children did not have enough to eat; (5) the respondent or another adult did not eat enough; and (6) the respondent ever felt hungry but did not eat. The ‘‘Yes’’ responses were coded one and the ‘‘No’’ responses were coded zero, and the responses were summed to produce an index of household food insecurity. An analysis of the index showed that it had internal consistency (Cronbach’s Alpha 0.908). We dichotomized the score to represent food secure (summed score of zero) and food insecure (summed score greater than zero) because the distribution was highly skewed to the right (many zeros). (Adopted from Hadley et al 2008 with internal consistency Cronbach’s Alpha 0.92) [13].

Graduated mothers by health extension program: mothers understood and implemented more than 75% of health extension programs and graduated by health extension workers.

Household economic status: We constructed the index of household socioeconomic status based on house-hold ownership of 22 items. The index includes items such as a functioning radio, television, cooking stove, various furniture items, and farming implements. The index ranges from 0 (not owning any of the items) to 22 (owning all of the items). The distribution of the index was then divided into low and high levels of socioeconomic status. The ‘‘Yes’’ responses were coded one and the ‘‘No’’ responses were coded zero, and the responses were summed to produce an index of household wealth status. We dichotomized the score to represent poor (summed score of zero) and rich (summed score greater than zero) because the distribution was normally distributed. Alternative methods of calculating the wealth index, including the use of factor analysis to differentially weigh each item, produced similar results in logistic regression.

Health extension program: health program consists of four main packages like hygiene and environmental sanitation (building and maintaining healthful house, control of insects, food hygiene and safety measures, personal hygiene, construction usage and maintenance of sanitary latrine, solid and liquid waste management, and water supply safety measures),family health services (adolescent reproductive health, family planning, maternal and child health, nutrition, and vaccination service), disease prevention and control (first aid, HIV/AIDS and tuberculosis prevention and control, and malaria prevention and control) and health education and promotion

RESULTS

Socio-demographic characteristics: a total of 286(143 cases and 143controls) of 6-23 months children were analyzed with a response rate of 99.3%. The mean age of the cases and controls were 13.38 (±4.68) and 14.41 (±5.44) months respectively. Cases were more observed in age category of 12-17months whereas controls were more observed in the age category of 6-11months. There were more males in the cases 68 (47.5%) than in the controls 58 (40.5%).Household food insecurity rate was high in cases 55(38.5%) than in controls 50(34.9%). (Table1)

Table 1: Socio-demographic characteristics of the cases and controls, HidhebuAbote Woreda, February 20 to March 20, 2013

Variables	Cases 143		Controls 143		COR (95%CI)
	number	%	number	%	
Child age					
6-11months	52	36.4	54	37.7	1.242(0.702, 2.195)
12-17months	53	37.0	40	27.9	1.709(0.947, 3.082)
18-23months	38	26.6	49	34.2	1
Sex					
Male	68	47.6	58	40.6	1.329(0.832, 2.122)
Female	75	52.4	85	59.4	1
Marital status of mother					
Married not in union, divorced & widowed	18	12.6	18	12.6	1(0.497, 2.011)
Married in union	125	87.4	125	87.4	1
Maternal education					
Illiterate	114	79.7	113	79	1.044(0.588, 1.851)
Literate	29	20.3	30	21	1
Paternal education					
Illiterate	79	55.2	80	55.9	0.972(0.610, 1.550)
Literate	64	44.8	63	44.1	1
HH food security status					
Food insecure	55	38.5	50	35	1.162(0.718, 1.881)
Food secure	88	61.5	93	65	1
HH wealth status					
Poor	74	51.7	74	51.7	1(0.629, 1.590)
Rich	69	48.3	69	48.3	1
Family decision makers on use of money					
Not both equally	24	16.8	15	10.5	1.721(0.862, 3.437)
Both equally	119	83.2	128	89.5	1

Intermediate factors: The number of under five more than one were higher in the families of the cases 85(59.4%) than in the controls 68(47.5%). Mothers who did not graduate as model by health extension program are higher in cases 119(83.2%) than in controls 42(29.4%). Similarly families didn't have latrine at their compound are higher in the cases 48(35.6%) than in controls 20(13.9%). Also, Families used kitchen inside the residential house are higher in cases 63(44%) than controls 29(20.3%). Thirty six (25.2%) cases and sixteen (11.2%) controls family members lived with domestic animals in the same house. Sixty five (45.4%) cases and forty (27.9%) controls' mothers used spring and /or river as a source of drinking water. (Table 2)

Table 2: Intermediate factors of acute malnutrition, HidhebuAbote Woreda, February 20 to March 20, 2013

Variables	**Cases 143**		**Controls 143**		**COR (95%CI)**	**P value**
	number	%	number	%		
Maternal age at first birth <20years						
Yes	111	77.6	9264.3		0.520(0.309, 0.876)*	0.014
No	3222.4		5135.7		1	
Current maternal age						
Less than 20 years	117.7		107.0		1.149(0.465, 2.837)	0.763
20-29 years	9062.9		9465.7		1	
30-40 years	4229.4		3927.3		1.125(0.667, 1.898)	0.659
Number of under 5 children >1						
Yes	8559.4		6847.5		1.616(1.012, 2.581)*	0.044
No	5840.6		7552.5		1	
Family size >4						
Yes	10774.8		9163.4		1.698(1.021, 2.824)*	0.041
No	3625.2		5236.6		1	
Child did not take vaccine						
Yes	107		53.5		2.075(0.691, 6.232)	0.193
No	13393		13896.5		1	
Mother did not attend ANC						
Yes	4934.3		3927.3		1.390(0.839, 2.303)	0.201
No	9465.7		10472.7		1	
No. of ANC visit < 4 times ^^						
Yes	5558.5		3937.5		2.350(1.328, 4.160)*	0.003
No	3941.5		6562.5		1	
Child born place not at HF						

Yes	12990.2		12083.9		1.766(0.869, 3.590)	0.116
No	149.8		2316.1		1	
Distance from HC >10 minute						
Yes	12788.8		12285.3		1.366(0.681, 2.741)	0.380
No	1611.2		2114.7		1	
Child didn't take vitamin A						
Yes	2718.9		1812.6		1.616(0.846, 3.089)	0.146
No	116	81.1	125	87.4	1	
Not model by HEP						
Yes	119	83.2	49	34.3	1	
No	24	16.8	94	65.7	9.512(5.443, 16.623)	<0.0001
No Vegetable in garden						
Yes	111	77.6	103	72	1.347(0.788, 2.304)	0.277
No	32	22.4	40	28	1	
No latrine						
Yes	48	33.6	20	14	3.107(1.729, 5.585)*	<0.0001
No	95	66.4	123	86	1	
Not used pit as solid waste disposal						
Yes	50	35	32	22.4	1.865(1.106, 3.144)*	0.019
No	93	65	111	77.6	1	
Used open field for liquid waste						
Yes	59	41.3	40	28	1.809(1.103, 2.965)*	0.019
No	84	58.7	103	72	1	
Cook inside the residential house						
Yes	63	44	29	20.3	3.096(1.832, 5.231)*	<0.0001
No	80	56	114	79.7	1	
Living with Domestic animal						
Yes	36	25.2	16	11.2	2.671(1.404, 5.078)*	0.003
No	107	74.8	127	88.8	1	
Drinking water not pipe						
Yes	65	45.4	40	28	2.146(1.312, 3.508)*	0.002
No	78	54.6	103	72	1	
Season of child birth						
Kiremte/Winter	33	23.1	39	27.3	0.719(0.397, 1.304)	0.278
MehirAutumn	43	30.1	31	21.7	1.179(0.651, 2.135)	0.587
Bega/Summer	60	42	51	35.7	1	
Belge/Spring	7	4.8	22	15.3	0.270(0.107, 0.685)*	0.006
Distance from drink water >10 min						
Yes	55	38.5	42	29.4	1.503(0.918, 2.461)	0.105
No	88	61.5	101	70.6	1	
Water consumption < 20 lpcpd^						
Yes	140	98	135	94.4	2.765(0.718, 10.644)	0.139
No	3	2	8	5.6	1	
Child feeding < 4 times/day						
Yes	70	48.9	66	46.1	1.140(0.710, 1.829)	0.588
No	67	51.1	72	53.9	1	
No or did not use bed net						
Yes	44	30.8	54	37.8	0.733(0.449, 1.196)	0.213
No	99	69.2	89	62.2	1	
No vegetable at garden						
Yes	111	77.6	103	72	1.347(0.788, 2.304)	0.277
No	32	22.4	40	28	1	
Types of residential house						
Thatched	99	69.2	103	72	0.874(0.525, 1.454)	0.604
Corrugated iron sheet	44	30.8	40	28	1	
Housing ventilation						
Good	46	32.2	42	29.4	1	
Fair	14	9.8	15	10.5	0.852(0.368, 1.974)	0.709
Poor	83	58	89	60.1	0.881(0.526, 1.476)	0.631

* Significant at p value less than 0.05^ lpcpd- liter per capita per day^^ 94 cases, 104 controls

Proximal factors: Ninety four (65.7%) cases and thirty five (24.5%) controls were lately initiated for breastfeeding after birth. There were 74(51.7%) cases deprived of colostrums when compared to the controls 19(13.3%).Large proportion of cases (41.9%) were introduced to liquid / solid foods too early as compared to the controls (20.3%)and bottle feeding was provided for larger proportion of cases (40.1%) compared to controls (9.8%). There were 83 (58%) cases and 38(26.6%) controls ill in the last two weeks.Similarly,64(44.7%)of cases and 38 (26.6%) controls were provided pre-lacteal feeds.(Table 3)

Table 3: proximal factors of acute malnutrition, HidhebuAbote Woreda, February 20 to March 20, 2013

Variables	Cases 143	Controls143	COR (95%CI)	P value
	number %	number %		
Late child initiated for breastfed				
Yes	9465.7	3524.5	5.920(3.539,9.901)*	<0.0001
No	4934.3	10875.5	1	
Child deprive colostrums				
Yes	74 51.7	19 13.3	6.999(3.904,12.54)*	<0.0001
No	69 48.3	124 86.7	1	
Lack of exclusive breast-feeding ~				
Yes	6043.7	2921	2.929(1.723, 4.979)*	<0.0001
No	7756.3	10979	1	
Breastfed less than 8 times in the last 24 hrs				
Yes	5135.7	96.3	8.254(3.873,17.590)*	<0.0001
No	9264.3	13493.7	1	
Gestational age				
Less than 9 Months	107	74.9	1.860(0.664, 5.210)	0.238
At 9 months	8055.9	6746.8	1.554(0.959, 2.520)	0.074
Greater than 9 Months	5337.1	6948.2	1	
The perceived size of the child at birth				
Small	5941.3	5337.1	1.193(0.741, 1.919)	0.467
Average and above	8458.7	9062.9	1	
Bottle-fed				
Yes	6344.1	149.8	7.256(3.816,13.80*	<0.0001
No	8055.9	12990.2	1	
Child ill in the last two weeks				
Yes	8358	3826.6	3.822(2.323, 6.289)*	<0.0001
No	6042	10573.4	1	
Pre-lacteal feed given				
Yes	6444.8	3826.6	2.239(1.363,3.677)*	<0.0001
No	7955.2	10573.4	1	
Child birth order more than 2				
Yes	10774.8	9063	1.750(1.053,2.908)*	0.031
No	3625.2	5357	1	

* Significant at p value less than 0.05. ~ 137 case, 138 controls

The further analysis with multiple logistic regression revealed that acute malnutrition was independently associated with mothers who did not graduate as model by health extension program , using river and / or spring as a source of drinking water and season of child birth if 'Belge'from the intermediate factors. Late time initiation for breastfeeding after birth, lack of exclusive breastfeeding, depriving of colostrums, bottle feeding and child ill in the last two weeks from the proximal factors (Table 4).

Table 4:- AOR for predictors of acute malnutrition, HidhebuAbote Woreda, February 20 to March 20, 2013.

Variables	AOR (95%CI)	P value
Intermediate factors		
maternal age at first birth <20years		
Yes	0.536(0.250, 1.146)	0.108
No	1	
Number of under 5 children >1		
Yes	0.837(0.388, 1.804)	0.650
No	1	
Family size >4		
Yes	1.434(0.679, 3.027)	0.344
No	1	
Mothers did not graduate as model by health extension program		
Yes	7.246(2.779,18.896)*	<0.0001
No	1	
No latrine		
Yes	1.187(0.450, 3.130)	0.730
No	1	

Used other than pit as solid waste disposal method		
Yes	0.928(0.386, 2.231)	0.868
No	1	
Used open field as liquid waste disposal method		
Yes	1.332(0.570, 3.114)	0.508
No	1	
Cook inside the residential house		
Yes	0.761(0.305, 1.896)	0.557
No	1	
Domestic animal live in the house with family members		
Yes	0.921(0.327, 2.591)	0.875
No	1	
Drinking water not pipe		
Yes	5.349(2.279,12.552)*	<0.0001
No	1	
Season of child birth		
Kiremte/Winter	1.543(0.632, 3.766)	0.341
Mehir/Autumn	1.314(0.547, 3.158)	0.541
Bega/Summer	1	
Belge/Spring	0.154(0.040, 0.601)*	0.007
Proximal factors		
Late initiated for breastfed after one hour		
Yes	4.248(1.558,11.581)*	0.005
No	1	
Mother squeezed out and threw colostrum		
Yes	2.706(1.076, 6.808)*	0.034
No	1	
Lack of exclusive breast-feeding in the first 6 months ^		
Yes	4.586(1.404,14.980)*	0.012
No	1	
Breastfed less than 8 times in the last 24 hrs		
Yes	0.840(0.241, 2.925)	0.784
No	1	
Bottle-fed		
Yes	3.111(1.117, 8.663)*	0.030
No	1	
Child ill in the last two weeks		
Yes	4.136(1.999, 8.556)*	<0.0001
No	1	

* Significant at p value less than 0.05. ^ Cases 137, controls 138

DISCUSSION

There have been a few studies on the predictors of acute malnutrition among 6-23months children in Africa. Assessment of children aged 6-23 months in terms of wasting in the present study seems to be logical as the first 2 years of life are crucial for children's present and future health and nutritional status and, more specifically, for their mental, physical, and emotional development. After the age of 2 years growth is likely to be normal even in the poorest regions. Thus, reduction of child malnutrition levels depends on efforts aimed at the fetus and first 2 years after birth. Community based case-control study such as the present study is the method of choice to ascertain the predictors of acute malnutrition in developing countries like Ethiopia. This study has provided pertinent information about the predictors of acute malnutrition among 6-23months children for decision makers. Among the intermediate factors, mothers did not graduate in health service program are associated with increased risk of acute malnutrition. Children of mothers who did not graduate as model by health extension program are seven times more likely to be wasted as compared to children of mothers who graduated as model by health extension program. This finding can be explained by mothers involved in family centered nutrition package had an adequate concept/knowledge about the essence and value of nutrition understood the nutritional care that mothers and children require; and enabled to acquire adequate knowledge and skills on balanced diet and supplementary food preparation.

Source of drinking water is found to be significantly associated with acute malnutrition. Malnourished children whose families used spring and /or river as a source of drinking water are five times more likely to be wasted as compared to who used pipe water. This was reported by the studies done in rural Malawi and Zambia [14, 15]. This finding can be explained by the long distance mothers spent much time to fetch water; lack of potable water which may cause water borne diseases like diarrhea and shortage of water which may cause water washed diseases. Lack of potable water, poor sanitation and dangerous hygiene practices increase vulnerability

to infection and waterborne diseases, which are direct causes of acute malnutrition [16]. Children born in 'Belge'/Spring season have 85percent lower likelihood of being wasted as compared to children born in 'Bega'/Winter. This finding can be explained by children born in 'Belge' season start complementary food in 'Bega' season when enough food and/or money expected than other seasons.

Among proximal factors, the time child initiated for breastfeeding after birth was significantly associated with acute malnutrition. The children lately initiated for breastfeeding after birth were four times more likely to be wasted as compared to those children initiated for breastfeed within an hour. This is in line with study done in Gondar University Hospital [17]. This finding may be due to pre-lacteal feeds were given. EDHS of 2011 indicated that nationally, only 52% of newborns are put to breast within one hour of birth. In our study 35.7% of cases and controls received pre-lacteal feeds. Children who received pre-lacteal feeds (butter, sugar and water, water) were protective for acute malnutrition in this study which is not agree with study done in India [18]. This finding may be due to the variables were confounded by other variables. Nationally nearly three children in every ten (27 percent) are given pre-lacteal feeds within the first three days of life. The practice of giving pre-lacteal feeds is discouraged because it limits the infant's frequency of suckling and exposes the baby to the risk of infection [19].

Lack of exclusive breastfeeding was 32percent both in cases and controls. Malnourished children introduced other diet before six months of age were 4.6 times more likely wasted as compared those did not. This indicated that children with acute malnutrition were started with complementary diet too early. This is in line with other study [17,18]. In Ethiopia the mean duration of exclusive breastfeeding is 4.2 months; and mothers exclusively breastfeed approximately half of children under six months (52%) [19]. The global recommendation for infant and young child feeding to ensure optimal health and development is that an infant should be breastfed exclusively for the first six months of life, with adequate and safe complementary foods from that time and continued breastfeeding up to two years of age or beyond. Breastfeeding, especially early initiation and exclusive breastfeeding, is one of the most critical factors in improving child survival. Exclusive breastfeeding in the first infant feeding and child survival months appears to offer greater protection against disease, especially in low and middle-income countries where 35% of all under-five deaths are associated with malnutrition [20].The colostrums feeding status was also significantly associated with acute malnutrition. The children who deprived of the colostrums are2.7 times more likely to be wasted than children who fed the colostrums. This is reported in another study [17].This may be due to children denied colostrums which is highly nutritious and has antibodies that protect the newborn from infection [21].

Other proximal factor is bottle feeding which is more commonly observed in the malnourished group than the controls. Children feed on the bottle were about three times more likely being wasted than children who did not feed on the bottle. Bottle-feeding is discouraged at any age. It is usually associated with increased risk of illness, and especially diarrheal disease, because of the difficulty in sterilizing the nipples properly. Bottle-feeding also shortens the period of postpartum amenorrhea and increases the risk of pregnancy [9]. Similarly illnesses of the children in the last two weeks were significantly associated with acute malnutrition. Those children ill in the last two weeks were about four times more likely wasted than those did not ill. This is in line with study done in Uganda and Western Kenya [22, 23]. This may be due to a combination of disease and malnutrition weakens the metabolism, forming a vicious circle of infection and undernourishment [16]. In our study 34(27.8%) children affected by diarrhea and 14 (9.8%) affected by fever despite it was not significantly associated. On this research by considering the main strength of this research lies on its simple random sampling methods for data collection and community-based study among under two years children, so that the results were generalizable to the general population of under two years children in the community and case control study. And also this study had a few limitations: This study was cross-sectional study design, so cause and effect relation was not assured because of cross-section study design. Micronutrients deficiencies and maternal nutritional status were also not considered in this study.

Conclusion and recommendation

The findings showed that independent predictors of acute malnutrition were suboptimal child feeding practices that are not according the recommendation of the national infant and youth child feeding guidelines, mothers not graduated by health extension program, illness of the child during the past two weeks before the survey and using unclean water source (spring/river).

As breastfeeding is a natural act and learned behavior. Interventions for improving the nutritional status of children should target behavior change communications on optimal child feeding practices based on the final guideline; and improving water and sanitation including home based treatment of water using 'Wuha' Agar.

Finally this study identified that distal, intermediate and proximal factors associated with Acute Malnutrition among 6 - 23 months Children in the study area. Therefore, those factors associated with Acute Malnutrition would be emphatically considered during development of child health and Nutritional programs by police makers in collaboration with others responsible bodies.

Federal ministry of health would be better to give greater emphases to address under two years child

Nutritional status to improve through health education by using mass media and community mobilization in more comprehensive manner by integrated to health extension program of model family graduation package about child nutritional and optimal child feeding practices based on the final guideline and improving water and sanitation.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Abdulkerim Abate participated in Conceptualized the study, designed the study instrument and conducted the data analysis and wrote the first draft and final draft of the manuscript

Dereje Bayissa and Tefera Belachew are participated in approved the research proposal with some revisions, participated in data analysis, revised subsequent drafts of the paper and involve in critical review of the manuscript. All authors read and approved the final manuscript.

Acknowledgement

We owe great gratitude to the Jimma University College of Public Health and Medical Sciences, Department of Epidemiology for supporting this study. Our thanks also go to HidhebuAboteWoreda Health Office for good facilitation and all data collectors and supervisors that were involved in the data collection process.

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