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Nutritional Status and Associated Factors Among Pastoralist Children Aged 6-23 Months in Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia

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Abstract: Nutritional status of children is an important outcome measure of their health status. However, nutritional status and associated factors of pastoralist children were not well documented in Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia. Therefore, this study was designed to assess nutritional status and associated factors among pastoralist children aged 6-23 months in Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia. A community-based cross sectional study was conducted among 645 pastoralist children aged 6-23 months from February-March 2016. A stratified random sampling technique was used to select kebeles (smallest administrative unit) and children. Out of thirty-two kebeles, six were randomly selected. Data were collected using a structured questionnaire, 24 hour food recall and anthropometric measurements. Quantitative data were collected and analyzed using SPSS for windows version 20.0. Anthropometric indices were computed using WHO Anthro 2011 software (version 3.2.2). Bivariate and multivariable logistic regression analyses were conducted. Crude odds ratio (COR) and adjusted odds ratio (AOR) with 95% confidence interval (CI) were reported. Prevalence of stunting and underweight were higher in fewer than two children in Benna Tsemay compared to the national average. This study showed, being older child (12-23 months) (AOR=3.29, 95%CI, 2.03-5.32), being from agro-pastoralist (AOR=0.46, 95%CI, 0.24-0.88), middle wealth quantile household (AOR=0.40, 95%CI, 0.20-0.77), use of treated water (AOR=0.60, 95%CI, 0.37-0.96), being second birth order (AOR=2.17, 95%CI, 1.11-4.24), being female child (AOR=0.55, 95%CI, 0.37-0.82) and good child feeding practice of mothers (AOR=0.47, 95%CI, 0.28-0.78) were significantly associated with stunting of pastoralist children in Benna Tsemay Woreda (p<0.05). Having large family size (≥6 individuals) (AOR=30.93, 95%CI, 4.91-194.7), polygamous marriage (AOR=2.46, 95%CI, 1.07-5.61), being from agro-pastoralist (AOR=0.19, 95%CI, 0.05-0.66) and farming as maternal occupation (AOR=3.00, 95%CI, 1.36-6.62) were significantly affected with thinness of children (p<0.05). Being from pastoralist (AOR=3.18, 95%CI, 1.74-5.81) and being female child (AOR=0.35, 95%CI, 0.14-0.89) were significantly predicted underweight in children (p<0.05). In conclusion, high numbers of pastoralist children are suffering from chronic malnutrition with low dietary diversity score (DDS). Large numbers of mothers have poor infant and young child feeding (IYCF) practices. Being from pastoralist and poor family, elder and male child, and poor IYCF practices, polygamous marriage, and poor health service are factors for child under nutrition. Therefore, the authors recommend interventions targeting on community-based nutrition education on IYCF, dietary diversity, cultural food taboos, and family planning in Benna Tsemay pastoralist community.

Keywords: Nutritional Status, Associated Factors, Pastoralist Area

1. Introduction

Nutritional status of children is an important outcome measure of their health status [9]. Infant and young child feeding practices directly affect the nutritional status of children under two years, impacting on child survival [7].

Nationally, 40% of children under age five were stunted, 9% wasted and 25% underweight. The prevalence of stunting in children below five years in SNNPR averages about 44%, which is higher than the national average. The prevalence of wasting is higher among the pastoralist communities [9]. Overall, 9% of Ethiopian children are wasted, and 3% are severely wasted. The prevalence of stunting, wasting and underweight of under two year children in Ethiopia were 23.2%, 16.6% and 12.5% respectively [10].

The prevalence of malnutrition in Ethiopia is relatively well documented, but not specific to the regions, localities and residence so far. It is also varies among agrarian, mixed farming, agro-pastoralists and pastoralist communities. Data regarding the conditions of pastoralist areas is limited. Study conduct in other districts is not addressing the main associated factors of malnutrition in pastoralis tareas [10]. This study aimed to assess nutritional status and associated factors in children aged 6-23 months in Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia.

2. Materials and Methods

2.1. Description of the Study Area

The study was conducted in Benna Tsemay Woreda, South Omo Zone of Southern Ethiopia. This area is located 739 km South of Addis Ababa, the capital of Ethiopia and 551 km South of Hawassa, the capital of SNNPR. There are 32 Kebles in the woreda. According to Central Statistical Agency Population projection of 2015, the total population of Benna Tsemay woreda is 62,414 out of which 31,638 are males and 30,776 are females. The woreda is named after the two dominant local ethnic groups namely, Benna and Tsemay, which constitute 48.6% and 36.1% of the population, respectively [8]. The remaining 15.3% of the population is composed of people of other ethnic groups. There are 3 health centers, 27 health posts and 10 medium private clinics provide basic health care for the community at Benna Tsemay Woreda. Most of the kebeles are served by health posts, which focus on preventive aspects and are equipped with junior health extension workers. The livelihood of the local people in the district is based on mixed farming but pastoralism predominates over crop production.

2.2. Study Design and Period

Community-based cross sectional study was used to assess child feeding practices, nutritional status and associated factors among pastoralist children aged 6-23 months in the study area. The study employed both qualitative and quantitative methods to collected data from February-March 2016.

2.3. Sample Size Determination

Sample size estimation was carried out for each specific objective using double population proportion formula and the largest sample size of the specific objectives was taken as the total sample size of this study. Accordingly, the following assumptions were used to determine the largest sample size of the objectives: 95% confidence interval (CI), power of test =80%, ratio of exposed to unexposed 1:1, non-response rate =10%, (odds ratio=1.86, design effect=1.5 and 42% proportion of children's whose mothers are not educated were stunted [10]. Finally an Epi-Info software version 7.0.8.3, Statical application with the above assumptions provided a sample size of 646 households and this was the total sample size of the study.

2.4. Sampling Technique

A stratified random sampling technique was used to select kebeles and pastoralist children. There are 32 kebeles in Benna Tsemay woreda. The kebeles was stratified based on the pattern of livelihood system of the communities into pastoralist, agro pastoralist and farmers. Simple random sampling was used to select two kebeles from each stratum and a total of six kebeles were selected out of 32 kebeles.

A sampling frame was prepared by listing all households that have 6-23 months old children in the selected kebeles. One's households with under 6-23 month children were identified, the total calculated sample size was distributed for each kebeles by using proportional to size allocation. After that, simple random sampling was used to select the required number of children from the respective kebeles. Finally, the youngest child from the household in the restricted age group was taken as an index child regardless of sex discrimination. Only one child was selected using lottery method when more than one child is found in a given household.

2.5. Data Collection

A pretested and structured questionnaire was used to assess socio-demographic and economic characteristics, maternal and child's characteristics, water supply, sanitation and personal hygiene conditions, health service availability and health seeking behavior and mother's knowledge and practice towards child feeding.

Mother's knowledge and practice towards child feeding in children 6–23 months of age was assessed using structured questionnaire according to the current recommendation of World Health Organization [35]. Early initiation of breast feeding, exclusive breast feeding, time of introduction of solid, semi-solid or soft foods, minimum dietary diversity and minimum meal frequency for non-breast fed children was determined.

Anthropometric measurements
Recumbent length and weight measurements with data on

age and sex were collected to assess the nutritional status of children aged 6-23 months. Age of the child was calculated both from the child's date of birth and date of interview, since the year of birth is frequently reported in correctly. Immunization card was also used as an official document to estimate age of the child. In events where birth dates are not recorded or known with certainty, the mother/caregiver were probed for the approximate date of birth based on a local events calendar like harvesting time. If the age of a neighbour's child is known, the mother was asked whether their child was born before or after the "reference" to estimate their child age. The age was calculated using precise day by subtracting the date of birth from the date of data collection [36]. Height cut-offs (<85cm) was also used to estimate child age.

The weight of the children age 6-23 was measured to the nearest 0.1kg on a battery powered digital scale (Seca 770, Hanover Germany) and length of the child aged 6-23 months was measured in a recumbent position to the nearest 0.1cm using a length board with a sliding head bar following standard anthropometric techniques. Children who were unable to stand on the scale were weighed with the mother or caregiver, then the mother/caregiver was weighed alone, and the difference was used to obtain the net weight of the child. Each study subjects were remove their shoes, jackets and wearing light cloth during weight and height measurements.

The instrument was checked and adjusted to zero for each measurement. A form in the structured questionnaire was used to record information on anthropometric measurements. Duplicate measurements of weight and height were taken at the same day from each study subject using calibrated equipment's and standardized techniques. To avoid variability among the data collectors, all the anthropometric measurements were taken by the researcher (principal investigator). Anthropometric data were collected to calculate three indices of nutritional status: length-for-age, weight-for-length, and weight-for-age. All the anthropometric variables that were used in the evaluation of nutritional status were included.

2.6. Data Quality Control

The questionnaire was originally prepared in English and translated to local language "Bennga" and "Tsemayga" and back translated to English by two people for consistency and to avoid information bias. To avoid information bias data collectors were also selected from both Benna and Tsemay ethnic groups. Five percent (5%) of the questionnaire was pretested in local language to make sure that the questions would clear and could be understood by respondents before formal data collection. The pre-test was done out of the study kebeles.

A face-to-face interview was used to collect data using structured questionnaire. Diplomated nurses who are fluent in the local language "Bennga" and "Tsemayga" was used to administer questionnaires. Training was provided for data collectors.

Standardisation test was done for enumerators, weight, height and MUAC. Practical training for two days before the field test was given to each team member in order to ensure the standardization of methods. Six enumerators were taken the measurements of at least 10 children 6-23 months twice, with an interval of time between the 1st and the 2nd measure. Measurements of length and weight were taken in duplicate on each child. The weight scale was calibrated to zero level with no object on it before weighing every child. Continuous check-up of scales was carried out for their reliability. Data validity and reliability was maintained through close supervision of data collectors by the principal investigator. The principal investigator supervised and reviews every questionnaire for completeness and logical consistency and corrections was made on the spot.

2.7. Data Analysis

First, the data was checked for completeness, coded and entered into a computer. SPSS for windows version 20.0 (SPSS Inc) was used for statistical data analysis. Anthropometric indices were calculated using WHO Anthro 2011 software (version 3.2.2). Normality of continuous variables was checked using histograms and Q-Q plots. Descriptive statistics such as frequency, percentages and mean and standard deviation was used to present the study results.

Bivariate and multivariable logistic regression analyses were conducted to see the association of each independent variable on nutritional status of the pastoralist children. Both crude odds ratio (COR) and adjusted odds ratio (AOR) with 95% confidence interval was reported to indicate the strength of association between nutritional status of children and predictor variables. Significant variables with a p-value less than 0.25 observed in the bivariate analysis were subsequently included into the multivariable analysis to control potential confounders. In the multivariable logistic regression analysis, variables with a p-value of <0.05 were considered as statistically significant.

Hosmer - Lemeshow test was performed for model fitness. P-value >0.05 was considered a good fit. Linear regression analysis techniques were used for colinearity diagnostics. Multicollinerity effect for potential factors was checked by Variation Inflation Factor (VIF) value greater than 10 and tolerance value less than 0.1. No colinearity was found. Statistical graphs and tables were used to represent the study results. Household wealth index was estimated from asset and utility services ownership using principal component analysis (PCA) according to the Ethiopian Demographic and Health Survey (EDHS) wealth index [10]. The wealth index was then divided into 5 quintiles.

2.8. Ethical Considerations

Ethical clearance was obtained from Hawassa University College of medicine and health science Institutional Review Board (IRB). Permission was obtained from South Omo Zone and Woreda health offices. Informed consent was obtained from the mother and father of study participating child. Data obtained from each study participant was kept confidential.

Those children who are at risk and severely malnourished was referred to feeding programs available in the area and health facilities. Nutritional advice was also given for those mothers/caregivers on child feeding.

3. Results

Socio-demographic economic characteristics of the study participants

A total of 645 respondents of children aged 6-23 months participated in the study providing an overall response rate of 99.8%. The mean (±SD) family sizes of the households were 5.99±2.43. The mean (±SD) number of under five children per a household was 1.88±0.65. Most of head of the households, 442 (68.4%) were farmers by their occupation, whereas 101(15.6%) were pastoralists, 86(13.3%) were agro-pastoralists and the rest 14 (2.2%) were employed. Of the total households, 135(20.9%) were found in the lowest/poorest wealth quintile (Table 1).

Table 1. Socio-demographic economic characteristics of the study participants (n=645) in Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia, 2016.

Socio-demographic economic variables	Frequency(n)	Percentage (%)
Total family size		
2-3 individuals	113	17.5
4-5 individuals	183	28.3
≥6 individuals	349	54.0
Mean (±SD)	5.99±2.43	
Number of< 5 children in the HH		
1	172	26.6
2	387	59.9
3	77	11.9
Mean (±SD)	1.88±0.65	
Father's education		
No formal education	552	85.4
Primary education	48	7.4
Secondary education	37	5.7
Occupation of house hold head		
Farmer	372	57.7
Pastoralist	161	25.0
Agro-pastoralist	112	17.4
Wealth index		
Lowest	135	20.9
Second	121	18.8
Middle	134	20.8
Fourth	123	19.1
Richest	132	20.5

Maternal characteristics

The mean (±SD) age of mothers/caregivers was 26.75±5.56, ranged between 18 and 60 years. From the study participant, 252 (39.0%) were tradition religion followers, 180 (27.9%) had no religion, the rest 175 (27.1) were Protestant in religion. About 602 (93.2%) of mothers of children were married. About 582 (90.1%) mothers and 552 (85.4%) fathers of the children had no formal education. About 473 (73.2%) of the mothers were in a monogamous and 172 (26.6%) were in

polygamy type of marriage (Table 2).

Table 1. Maternal characteristics of the study participants, Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia, 2016.

Maternal characteristics	Frequency (n)	Percentage (%)
Maternal age (in years)		
15-19 years	22	3.4
20-24 years	206	31.9
25-29 years	264	40.9
≥30 years	153	23.7
Mean (±SD)	26.75±(5.56)	
Religion of mothers		
Orthodox	36	5.6
Protestant	175	27.1
Traditional	252	39.0
No religion	180	27.9
Marital status of mother		
Married	602	93.2
Divorced/separated	24	3.7
Windowed	19	2.9
Maternal education		
No formal education	582	90.1
Primary education	40	6.2
Secondary education	19	2.9
Maternal occupation		
Housewives	400	61.9
Livestock herding	48	7.4
Farming	185	28.6
Marriage type		
Monogamous	473	73.2
Polygamous	172	26.6
Marriage order		
1st wives	555	85.9
2nd wives	85	13.2
Total number of children born to a mother		
≤ two children	217	33.6
3-6 children	337	52.2
≥ 7 children	91	14.1
Mean(±SD)	3.87±2.20	
Access to information on child feeding		
Yes	545	84.4
No	100	15.5

Child's characteristics

More than half, 361 (55.9%) of the children were male and 284 (44.0%) were female. The mean (±SD) age of the children was 12.8±5.50 with the minimum and maximum of 6 and 23 months, respectively. Most of the child birth order were 1st born 115 (17.8%), 2nd born 104 (16.1%), 3rd born 85 (13.2%) and 341 (52.8%) of them were 4th and above born. About 469 (72.6%) of the mothers had a birth interval of less than 23 months, 176 (27.2%) had a birth interval at least 23 months between the recent two births (Table 3).

Table 3. Child characteristics of the study participants, Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia, 2016.

Child characteristics	Frequency (n)	Percentage (%)
Sex of children		
Male	361	55.9
Female	284	44.0
Children's age (in month)		
6-8 months	178	27.6
9-11 months	121	18.7

Child characteristics	Frequency (n)	Percentage (%)
12-23 months	346	53.6
Mean (±SD)	12.8±(5.50)	
Birth order of the index child		
1st born	115	17.8
2nd born	104	16.1
3rd born	85	13.2
≥ 4th and above	341	52.8
Birth interval between the most recent two births		
≤ 23 months	469	72.6
> 23 months	176	27.2

Water supply, sanitation and personal hygiene conditions

Among the respondents, 240 (37.2%) of the households did not have toilet facility. On the other hand, 96 (14.9%) of the households dispose their solid wastes in an open field. The main sources of drinking water for the households were from non-improved source accounted 617 (95.5%) and improved source accounted 474 (73.3%). About 343 (53.2%) of the respondents did not treat water before drinking, posing a possible risk of water-borne diseases. This study has revealed that 415 (64.2%) of the mothers practiced washing their hands before and after feeding their child (Table 4).

Table 4. *Water supply, environmental and personal hygiene conditions of the study participants (n=645), Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia, 2016.*

Variable	Frequency (n)	Percentage (%)
Type of toilet/latrine facilities		
No toilet facility/bush/open field	240	37.2
Traditional pit latrine without shade	333	51.5
Latrine covered with shade	69	10.7
Method of solid waste disposal		
Dumped in street/open field disposal	96	14.9
Common pit	66	10.2
Buried/keeping in compound for fertilizer	132	20.2
Burning	351	54.3
Sources of drinking water		
Improved source	474	73.3
Non improved source	617	95.5
Use of treated water		
No	343	53.2
Yes	302	46.8
Time to fetch water in minutes		
<60 minutes	365	56.5
≥60 minutes	280	43.3
Hand washing before and after feeding child		
Yes	415	64.2
No	230	35.6

Health service availability and health Seeking behavior

About 461 (71.5%) of them others reported that there are health extension services in their kebele. It was also identified that 184 (28.5%) of the respondents did not visit a health extension service. About 536 (83.0%) of children were vaccinated except 109 (16.9%) who had never been vaccinated. About 223 (34.5%) of children had history of illness within the past two weeks prior to the survey (Table 5).

Table 5. *Health service availability and health seeking behavior of the study participants (n=645), Benna Tsemay woreda, South Omo Zone, Southern Ethiopia, 2016.*

Variable	Frequency(n)	Percentage (%)
Availability of health extension service in the kebeles		
Yes	461	71.5
No	184	28.5
Child ever vaccinated		
Yes	536	83.0
No	109	16.9
Type of vaccines taken		
BCG	427	66.1
Polio	532	82.4
Pentavalent	147	22.8
DPT	407	63.0
Measles	310	48.0
Vitamin A supplementation during the last 6 months		
Yes	218	33.7
No	427	66.1
Child's sickness in the past 2 weeks		
Yes	223	34.5
No	422	65.3
Child taken to health institution during sickness		
Yes	159	24.6
No	64	9.9

Nutritional status of study participants

The mean height (±SD), weight (±SD) and MUAC (±SD) of the study participants were 73.03 cm (±6.13), 8.60kg (±1.51) and 13.24 cm (±0.95), respectively.

Mean z score values of pastoralist children

The mean LAZ, WLZ and WAZ scores were-1.14, -0.36 and -0.97 respectively. The mean LAZ, WLZ and WAZ scores were negative in all age groups. The mean LAZ increases with age.

Table 6. *Mean ± SD of LAZ, WLZ and WAZ score of pastoralist children by age groups, Benna Tsemay woreda, South Omo Zone, Southern Ethiopia, 2016.*

Anthropometric measurements	6-8 months n= Mean ± SD	9-11 months n= Mean ± SD	12-23 months n= Mean ± SD	All children n= Mean ± SD
Length-for-age z score	-0.66±1.36	-0.80±1.35	-1.51±1.43	-1.14±1.45
Weight-for-length z score	-0.06±5.87	-0.47±1.26	-0.48±1.24	-0.36±3.26
Weight-for-age z score	-0.87±1.21	-0.85±1.15	-1.07±0.99	-0.97±1.09

Prevalence of stunting, wasting and underweight of pastoralist children

Anthropometric measurements of weight and height of children were performed to identify the nutritional status. Accordingly, stunting was found to be a common nutritional problem, in which 177 (27.4%) of children were found below -2SD while 9.3% of children were severely stunted. Nighty nine (15.3%) of children also were underweight while 64 (9.9%) were wasted. The prevalence of stunting was higher for children of 12-23 month old compared to the other age groups. The prevalence of wasting was low for all age groups (Table 7).

Table 7. Prevalence of stunting, wasting and underweight of pastoralist children by age groups, Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia, 2016.

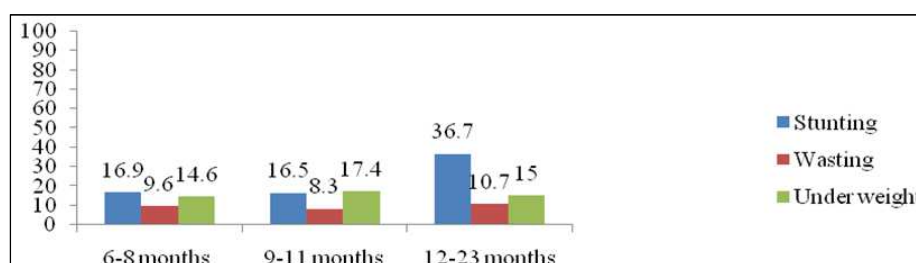| Anthropometric measurements	6-8 months n= n (%)	9-11 months n= n (%)	12-23 months n= n (%)	All children n= n (%)
Stunting				
Normal (≥-2SD)	148(83.1)	101(83.5)	219(63.3)	468(72.4)
Stunted (<-2SD)	30(16.9)	20(16.5)	127(36.7)	177(27.4)
Wasting				
Normal (≥-2SD)	161(90.4)	111(91.7)	309(89.3)	581(90.1)
Wasted (<-2SD)	17(9.6)	10(8.3)	37(10.7)	64(9.9)
Underweight				
Norma l(≥-2SD)	152(85.4)	100(82.6)	294(85.0)	546(84.5)
Underweight (<-2SD)	26(14.6)	21(17.4)	52(15.0)	99(15.3)

Figure 1. Nutritional status of pastoralist children aged 6-23 months in Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia, 2016 (n=645).
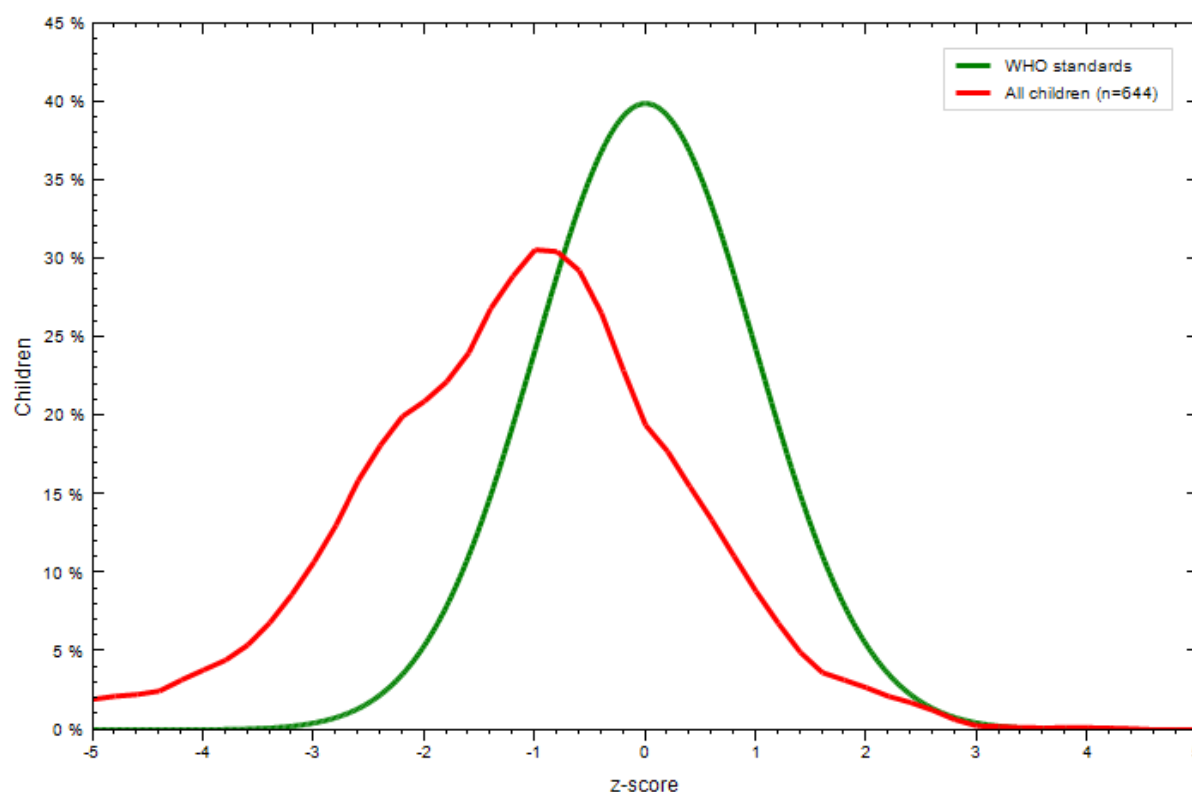

Figure 2. Distribution of stunting among children 6-23 months old pastoralist communities compared with WHOs standard population, Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia, 2016 (n=645).
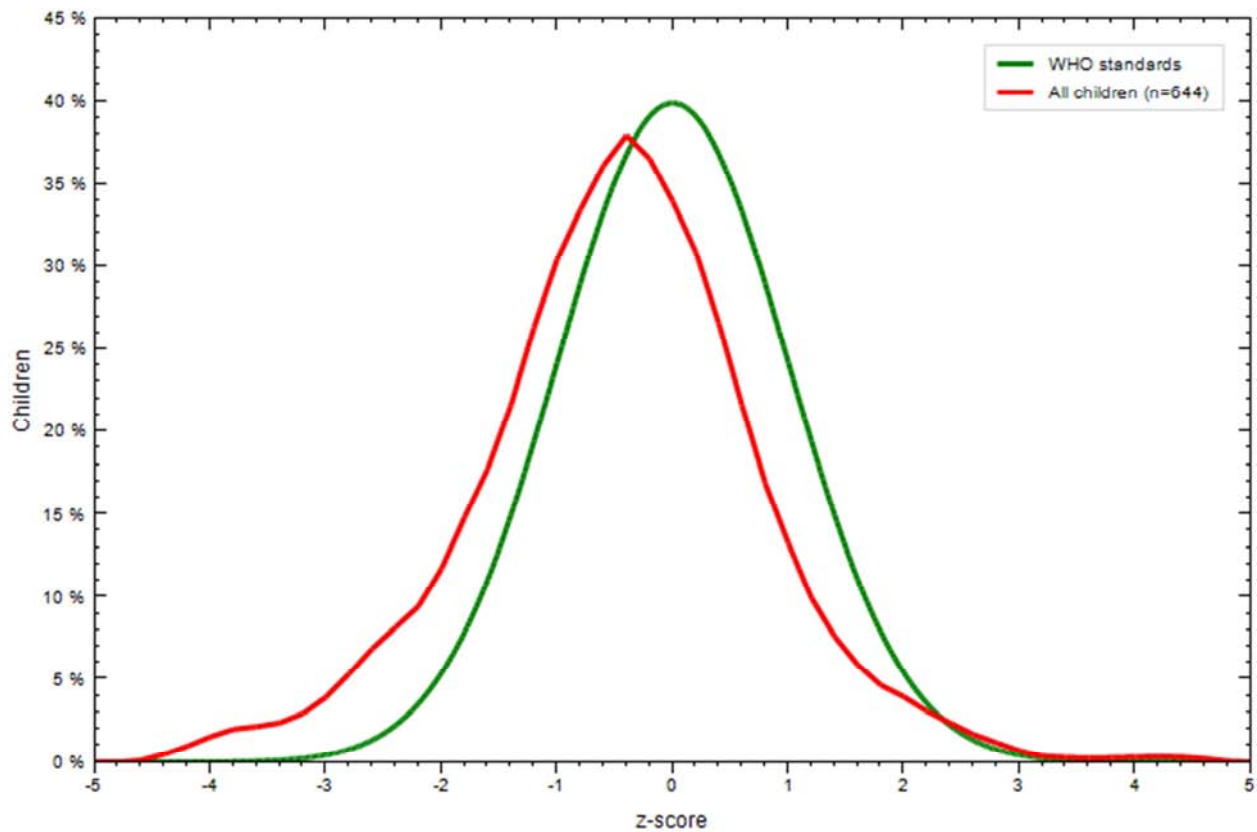
Figure 3. *Distribution of wasting among children 6-23 months old in pastoralist communities, compared with WHOs standard population, Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia, 2016 (n=645).*

Figure 4. *Distribution of underweight among children 6-23 months old in pastoralist communities compared with WHOs standard population, Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia, 2016 (n=645).*
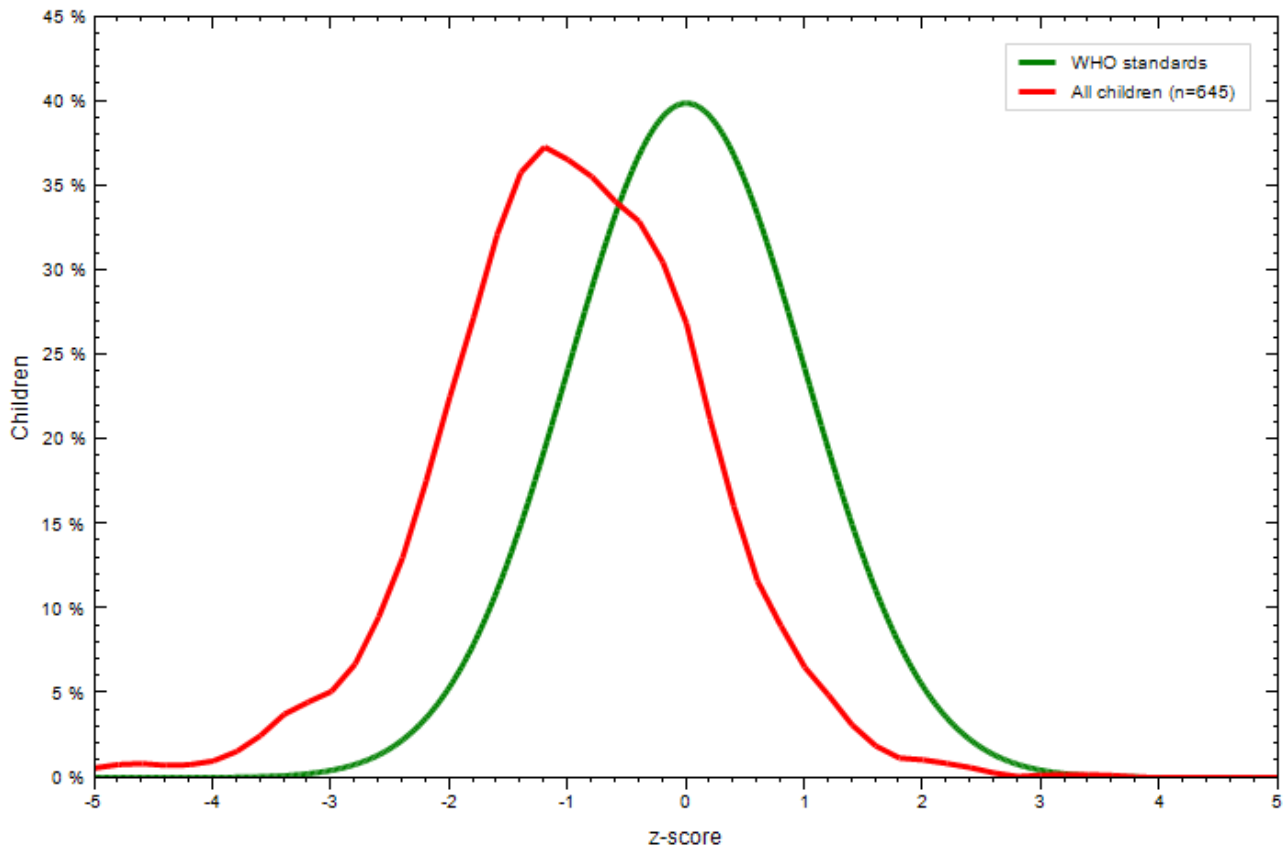
Factors associated with stunting among children in pastoralist communities

This study showed, being older child (12-23 months) (AOR=3.29, 95%CI, 2.03-5.32), being from agro-pastoralist (AOR=0.46, 95%CI, 0.24-0.88), middle wealth quantile household (AOR=0.40, 95%CI, 0.20-0.77), use of treated water (AOR=0.60, 95%CI, 0.37-0.96), being second birth order (AOR=2.17, 95%CI, 1.11-4.24), being female child (AOR=0.55, 95%CI, 0.37-0.82) and good child feeding practice of mothers (AOR=0.47, 95%CI, 0.28-0.78) did show significant association with stunting (p<0.05) (Table 8).

Out of the total stunted children, 127 (36.7%) were in the age range of 12-23 months and children in this age group had 3.29 times higher risk of being stunted than children 6-8 months old (AOR=3.29, 95%CI, 2.03-5.32). Sex of the children is also significantly associated with stunting. Female children's were 45% less likely to be stunted than male children (AOR=0.55, 95%CI, 0.37-0.82). Birth order of the index child was significantly associated with stunting. A child who's born on second order of birth was 2.17 times more likely to be stunted as compared to those children born on the first order of birth (AOR=2.17, 95%CI, 1.11-4.24).

Children whose household heads are agro-pastoralist in their occupation were 54% less likely to be affected by stunting than those children's whose household head were farmers in their occupation (AOR=0.46, 95%CI, 0.24-0.88). Children whose households with the middle wealth quintile were 60% less likely to be affected by stunting than children whose households had lowest wealth quintile (AOR=0.40, 95%CI, 0.20-0.77). Use of treated water showed statistically significant association with stunting. Children whose households use treated water had 40% lower risk of being stunted than those whose households did not treat water (AOR=0.60, 95%CI, 0.37-0.96).

Good child feeding practice of mothers was stastically significant association with stunting. Children whose mothers had good child feeding practice were 53% less likely to be stunted compared to those children's whose mothers had poor child feeding practice (AOR=0.47, 95%CI, 0.28-0.78) (Table 8).

Table 8. *Predictors of stunting among children aged 6-23 months in pastoralist communities, Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia, 2016.*

Variable	Stunted n (%)	Normal/Non stunted n (%)	Crude OR (95%CI)	Adjusted OR (95%CI)	P-value
Children's age(in months)					
6-8 months	30(16.9)	148(83.1)	1	1	
9-11 months	20(16.5)	101(83.5)	0.97(0.52,1.81)	0.99(0.51,1.89)	0.978
12-23 months	127(36.7)	219(63.3)	2.86(1.82,4.48)	3.29(2.03,5.32)	0.001**
Occupation of household head					
Farmer	106(28.5)	266(71.5)	1	1	
Pastoralist	49(30.4)	112(69.6)	1.09(0.73,1.64)	0.87(0.51,1.48)	0.622
Agro-pastoralist	22(19.6)	90(80.4)	0.61(0.36,1.02)	0.46(0.24,0.88)	0.019**
Wealth index					
Lowest	54(40.0)	81(60.0)	1	1	
Second	35(28.9)	86(71.1)	0.61(0.36,1.02)	0.53(0.29,0.97)	0.042
Middle	28(20.9)	106(79.1)	0.39(0.23,0.68)	0.40(0.20,0.77)	0.007**
Fourth	31(25.2)	92(74.8)	0.50(0.29,0.86)	0.65(0.32,1.35)	0.257
Richest	29(22.0)	103(78.0)	0.42(0.24,0.72)	0.54(0.26,1.15)	0.114
Use of treated water					
No	105(30.6)	238(69.4)	1	1	
Yes	72(23.8)	230(76.2)	0.71(0.50,1.00)	0.60(0.37,0.96)	0.035**
Birth order of the index child					
1st born	30(26.1)	85(73.9)	1	1	
2nd born	37(35.6)	67(64.4)	1.56(0.87,2.79)	2.17(1.11,4.24)	0.022**
3rd born	20(23.5)	65(76.5)	0.87(0.45,1.67)	1.17(0.56,2.45)	0.670
≥4th and above	90(26.4)	251(73.6)	1.01(0.62,1.64)	1.85(0.96,3.56)	0.066
Sex of a child					
Male	114(31.6)	247(68.4)	1	1	
Female	63(22.2)	221(77.8)	0.61(0.43,0.88)	0.55(0.37,0.82)	0.003**
Child feeding practice of mothers					
Poor practices(<7.10)	107(30.6)	243(69.4)	1	1	
Good practices(≥7.10)	43(18.4)	191(81.6)	0.51(0.34,0.76)	0.47(0.28,0.78)	0.004**

1=Reference group

**Variables which shown significant association during the multivariate analysis at p value <0.05

Mother's age (in years), marriage type, maternal education, time to fetch water in minutes, access to information on child feeding, child feeding practice of mothers, minimum meal frequency didn't show significant association with stunting (p<0.05) and adjusted for those significant variables.

Marriage order, maternal education, fathers education, wealth index, use of treated water, birth order of the index child, birth interval between the recent two birth, child ever vaccinated, hand washing before and after feeding child, availability of health service and child feeding practice of mothers didn't show significant association with wasting (p<0.05) and adjusted for significant variables.

Head of the household, mother's age (in years), marital status of mother, marriage type, fathers education, wealth

index, total number of children born to a mother, birth order of the index child, birth interval between the recent two births, maternal occupation, child ever vaccinated, child ever taken to health institution, hand washing before and after feeding child, availability of health service, maternal knowledge, child feeding practice of mothers and minimum dietary diversity did show significant association with underweight (p<0.05) and adjusted for significant variables.

Factors associated with wasting among children in pastoralist communities

According to the multivariate analysis, having large family size (≥6 individuals) (AOR=30.93, 95%CI, 4.91-194.7), polygamous marriage (AOR=2.46, 95%CI, 1.07-5.61), being from agro-pastoralist (AOR=0.19, 95%CI, 0.05-0.66) and farming as maternal occupation (AOR=3.00, 95%CI, 1.36-6.62) did show significant association with wasting (p<0.05).

In this study, having large family size was found to be a risk factor for wasting. Children living in households with greater than or equal to six family members were 30.93 times more likely get wasted than those children living in households with two to three family members (AOR=30.93, 95%CI, 4.91-194.7).

Children whose mothers had in polygamy type of marriage was 2.46 times more likely to be wasted as compared to children whose mothers had in monogamy type of marriage (AOR=2.46, 95%CI, 1.07-5.61).

Children whose household heads are agro-pastoralist in their occupation were 81% lower risk of being affected by wasting than those children's whose household head were farmers in their occupation (AOR=0.19, 95%CI, 0.05-0.66).

Children whose mothers are farmers in their occupation were 3 times more likely to be affected by wasting than those children's whose mothers were housewife in their occupation (AOR=3.00, 95%CI, 1.36-6.62) (Table 9).

Table 9. *Predictors of wasting among children 6-23 months old in pastoralist communities, Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia, 2016.*

Variable	Wasted	Normal weight/length	Crude OR (95%CI)	Adjusted OR (95%CI)	P-value
Total family size					
2-3 individuals	6(5.3)	107(94.7)	1	1	
4-5 individuals	21(11.5)	162(88.5)	2.31(0.90,5.91)	8.51(1.49,48.69)	0.016
≥6 individuals	37(10.6)	312(89.4)	2.11(0.86,5.15)	30.93(4.91,194.7)	0.001**
Marriage type					
Monogamous	41(8.7)	432(91.3)	1	1	
Polygamous	23(13.4)	149(86.6)	1.62(0.94,2.80)	2.46(1.07,5.61)	0.032**
Occupation of household head					
Farmer	51(13.7)	321(86.3)	1	1	
Pastoralist	8(5.0)	153(95.0)	0.32(0.15,0.71)	0.35(0.13,0.93)	0.035
Agro-pastoralist	5(4.5)	107(95.5)	0.29(0.11,0.75)	0.19(0.05,0.66)	0.009**
Maternal occupation					
Housewives	37(9.3)	363(90.8)	1	1	
Farming	25(13.5)	160(86.5)	1.53(0.89,2.63)	3.00(1.36,6.62)	0.006**

1=Reference group
**Variables which shown significant association during the multivariate analysis at p value < 0.05

Factors associated with underweight among children in pastoralist communities

The result of multivariate logistic regression analysis revealed that, being from pastoralist (AOR=3.18, 95%CI, 1.74-5.81) and being female child (AOR=0.35, 95%CI, 0.14-0.89) did show significant association with underweight (p<0.05).

Children whose household heads are pastoralist in their occupation were 3.18 times more likely to be affected by underweight than those children's whose household head were farmers in their occupation (AOR=3.18, 95%CI, 1.74-5.81).

Sex of the child is also found significantly associated with underweight; female children were about 65% lower risk of being underweight as compared to male children (AOR=0.35, 95%CI, 0.14-0.89) (Table 10).

Table 10. *Predictors of underweight among children 6-23 months old in pastoralist communities, Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia, 2016.*

Variable	Underweight	Normal weight/age	Crude OR (95%CI)	Adjusted OR (95%CI)	P-value
Occupation of household head					
Farmer	41(11.0)	331(89.0)	1	1	
Pastoralist	50(31.1)	111(68.9)	3.63(2.28,5.79)	3.18(1.74,5.81)	0.001**
Agro-pastoralist	8 (7.1)	104(92.9)	0.62(0.28,1.36)	0.61(0.25,1.50)	0.289
Sex of a child					
Male	67(18.6)	294(81.4)	1	1	
Female	32 (11.3)	252(88.7)	0.55(0.35,0.87)	0.35(0.14,0.89)	0.028**

1=Reference group
** Variables which shown significant association during the multivariate analysis at p value < 0.05

4. Discussion

According to this study, the prevalence of stunting, wasting and underweight was 27.40%, 9.90% and 15.3%, respectively. The finding was similar with the report of EDHS 2014, which reported a prevalence of 23.2%, 16.6% and 12.5% of children less than two year were stunted, wasted, and underweight, respectively [10]. The prevalence of stunting and wasting among pastoralist children aged 6-23 months in Benna Tsemay woreda were similar to the finding of a study in Kenya, 28.19% and 8.8%, respectively [3]. This study was consistent with a study conducted in Somali Region, Ethiopia which showed 17.5%, 22.9% and 19.5% of infants and young children were wasted, stunted and underweight respectively [38]. This study was also consistent with a study conducted in northern Ghana which showed the levels of stunting, underweight and wasting in these children were 27.2%, 17.6% and 8.2%, respectively [17]. Based on the findings of this study, high prevalence of stunting was reported in the study area even if the prevalence of wasting and underweight were relatively lower. This could be due to the fact that, this community are minor and less privileged groups which may results to poor socio economic characteristics, poor health service delivery and lower literacy. This might be also be due to the difference in feeding frequency, food security at household level, lack of knowledge of the caregivers to provide balanced diet to their children and time variation. This might be due to differences in agro-ecology, feeding habits, lifestyles and demography between the two study areas.

Out of the total stunted children, 127 (36.7%) were in the age range of 12-23 months and children in this age group had 3.29 times higher risk of being stunted than children 6-8 months old. As the age of children increased the prevalence of stunting also increased. This study was similar with the report of EDHS 2014, showed that the prevalence of stunting increases as the age of a child increase; with the highest prevalence of chronic malnutrition found in children age 12-23 months (52%) and lowest in children between ages 6-8 months (9%) [10]. This study was also consistent with the study conducted in Lalibela Town Administration, showed that children aged 11-23 months were 2.3 times more likely to be affected by stunting compared to children age 6-8 months [37]. This finding was also consistent with the study in Vietnam which reported the highest risk of stunting among children aged 12-23 months and children in the youngest age group, (6-11 months) had a significantly lower risk of being stunting than children in the older age groups [26]. In Democratic Republic of Congo, an inverse linear association between age and stunting among children was reported [21].

The probable reason for higher prevalence of stunting among 12-23 months old children might be attributed to decreasing breast feeding frequency as children age get older so the energy required for their age might decrease due to low consumption of breast milk. The other possible reason could be that caring practices usually tend to decrease when children grown-up than infants and also usually when children get older they shift to eat and share family foods. The other possible justification for this difference may be explained by the fact that foods for weaning are typically introduced to children in the older age group, thus increasing their exposure to infections and susceptibility to illness. This tendency, coupled with inappropriate or inadequate feeding practices, may contribute to faltering nutritional status among children in these age groups [10].

Sex of the children is also significantly associated with stunting. Female children's were 45% lower risk of being stunted than male children. This finding was consistent with the study conducted in Lalibela Town Administration, showed that female children were about 25% lower risk of being stunted as compared to male children [37]. This finding is also similar with the study conducted in West Gojam Zone, Bule Hora district and Pastoral Community of Dollo Ado District, Somali Region, showed that male children were more likely to be stunted as compared to female children [6, 4, 31], respectively. Similarly, many studies in Ethiopia and elsewhere have reported that under-five male children are more likely to become stunted than their female counterparts [33, 13, 19, 28, 12].

On the contrary, the study conducted in Amita Pradhana, showed that female children are more likely to be stunted as compared to male but the association was significant only in case of moderate stunting [18]. This could be because boys are more influenced by environmental stress than girls. Thus, boys are more likely to display impact of chronic under nutrition; especially in environments where stresses are at play, like repeated infections and exposure to toxins and air pollutants [19, 28].

Birth order of the index child was significantly associated with stunting. A child who's born on second order of birth was 2.17 times more likely to be stunted as compared to those children born on the first order of birth. This finding was in line with the study conducted in Mizan-Aman Town, Bench Maji Zone and Hossana Town, Southern Ethiopia, showed that children of 4 and above birth order were 2.3 times more likely to be stunted than children of first birth order [15, 25]. Similarly, a study conducted in Ibadan, Nigeria, showed that the child being the fourth or higher birth order 4.5 times more likely to be undernourished [14]. Similar finding was also observed in study conducted in agro-pastoral households in Afar Regional State of Ethiopia, revealed that children of first birth order are expected to beat a significantly higher risk of stunting than children of higher birth. This finding was also supported by EDHS 2011 [9]. This might be due to the fact that the family is unable to satisfy child dietary and other health care related services because of more number of children and might also be due to low awareness of family planning. This might be because of the mothers' tendency to shift to the new born child expecting more care is required forit [16].

Children whose household heads are agro-pastoralist in their occupation were 54% less likely to be affected by stunting than those children's whose household head were farmers in their occupation. The national nutrition baseline

survey also indicated that the main occupation among the rural areas remains farming/ agriculture (86%) [2]. This indicates that children from farmer fathers were more affected by acute malnutrition compared to government employee.

Children (age 6-23 months) from households in the middle wealth quintile were 60% less likely to be stunted than children whose households were in the lowest wealth quintile. The odds of being stunting also declined as wealth quintile increased from lowest to richest. This finding was similar to EDHS 2011, showed that higher proportion of children in the lowest household wealth quintile were stunted (49%) than children in the highest wealth quintile (30%). A similar inverse relationship was observed between households wealth and stunting levels of children [10]. This finding was in agreement with the study conducted in Lalibela Town Administration, showed that children age 6-59 months whose family had middle wealth quintile were about 47% times less likely to be affected by stunting than children whose family had lowest wealth quintile [37].

This might be due to children from greater income /rich families can have improved nutritional status. Rich families can afford more nutritious food, clean water, hygiene, and health care. This allows them to have a more diversified diet and to attain more effective child care activities. At the community level, greater income means better access to quality health care, improved water, and sanitation systems and greater access to information.

The finding of this study, showed that about 617 (95.5%) of the households in the study population relied on unsafe water supply from unprotected water sources. Rural households are not use anappropriate treatment method to ensure that water is safe for drinking as compared to urban [9]. Therefore, diarrhea and water born diseases caused by unsafe drinking water at households' level might be increase the prevalence of malnutrition directly or indirectly. Present finding revealed that, method of water treatment showed statistically significant association withs tunting. Children whose households use treated water had 46% lower risk of being stunted than those whose households did not treat water. This finding was consistent with the study conducted in Nghean; where approximately 23% of households did not use a method of treating drinking water was more likely exposed to stunting [27]. On the contrary, the study conducted in Mbeere South Sub Country, Kenya, showed that there was no direct relationship between water treatment, use of source of drinking water and nutritional status (p>0.05) [29].

In this study, having large family size was found to be a risk factor for wasting. Children living in households with greater than or equal to six family members were 30.93 times more likely get wasted than those children living in households with two to three family members. This was consistent with a study done in Dale Woreda, southern Ethiopia, which showed having a large family size was identified as major risk factors for wasting [23]. This was also in agreement with a study done in North West Ethiopia [24]. Similarly, a study reported by Babar and his colleagues showed that the larger the size of family the poorer the nutritional status of the children would

be [5]. This could be partially explained in that, as the family members increase, there will be sharing of resources in household including food which will result in lack of adequate food especially for children [32]. Families with more children generally devote less time to take care of their children [16].

Children whose mothers had in polygamy type of marriage were 2.46 times more likely to be wasted as compared to children whose mothers had in monogamy type of marriage. Similarly, a study conducted in northern Tanzania, showed that polygamous households in a village becomes positively associated with child WHZ [11]. Another study conducted in Ibadan, Nigeria, showed that polygamous marriage was one of the maternal factors associated with under nutrition [14].

Children whose household heads are agro-pastoralist in their occupation were 81% lower risk of being affected by wasting than those children's whose household head were farmers in their occupation. Children whose mothers are farmers in their occupation were 3 times more likely to be affected by wasting than those children's whose mothers were house wife in their occupation.

Children whose household heads are pastoralist in their occupation were 3.18 times more likely to be affected by underweight than those children's whose household head were farmers in their occupation. This was consistent with a study done in agro-pastoral households in Afar Regional State of Ethiopia, revealed that children living in households having less experience in agro-pastoral mode of life were more vulnerable to malnutrition [16].

Sex of the child is also found significantly associated with underweight; female children were about 65% lower risk of being underweight as compared to male children. This finding was consistent with a study conducted in Bule Hora District, South Ethiopia, showed that male children were 2.5 times more likely to be under weight than female children [4]. This finding was also similar to a study conducted in Pastoral Community of Dollo Ado District, Somali Region, showed that male children were 1.7 times higher risk of being under-weighted as compared to female children [31]. This finding is also similarity with a number of other studies conducted in Kwara State, Nigeria, [30] and in Eastern Uganda [20] that found out male children is more likely to be underweight than females children's. This finding contradicts to a case study conducted in Garissa sub-county, showed that female children were significantly about 2 fold more likely to be underweight than male children [1]. Studies done in Ethiopia and Vietnam also reported that boys were more likely to be under-weight [19, 22].

Program managers, policy makers and local administrators should pay attention to improve the mother's knowledge towards child feeding practices, cultural food tabos, and dietary diversity for better child nutritional status.

Strengths of the study

Among the notable strengths of this study, it is the first study done in this thematic group of Benna and Tsemay children which gives important baseline information regarding nutritional status of children in pastoralist communities to all concerned partners. This study is community based on showing real nutritional condition of children 6-23 months of

age. The study included large sample size in order to enhance the power of the findings. Incorporation of both quantitative and qualitative study designs could be considered as the strength. The study used both anthropometric measurement and dietary assessment to assess the nutritional status of pastoralist children in the study area. In this study also used wealth index to assess socio economic status of household since under estimation and over estimation of monthly income. In addition, logistic regression was also used in the statistical analysis, so the interaction was analyzed and confounding factors were controlled, also the most important factors were identified.

Limitations of the study

The cross sectional study design may not enable to determine causal relationships. There may be recall bias in 24 hour recall dietary assessment.

5. Conclusions

In conclusion, high numbers of pastoralist children are suffering from chronic malnutrition with low DDS. Large numbers of mothers have inadequate knowledge about IYCF practices. Poor child feeding practices were suboptimal among mothers and significantly associated with child nutritional status in the study area. Poor child feeding practices well predicted stunting among children in the study area.

Majority of mothers had a positive attitude about breast feeding initiation, provision of colostrum's for newborn infants and exclusive breastfeeding in the first six months among children's aged 6-23 months old in the community. But certain mothers had negative attitude about introduction of complementary feeding and dietary diversity which had an effect on the nutritional status among children's aged 6-23 months old in the community.

Among the nutritional problem identified, stunting was found to be the commonest one. Based on the findings of this study, high prevalence of stunting was reported in the study area even if the prevalence of wasting and underweight were relatively lower. The prevalence of stunting increased with age in which young children in age 12-23 months were more exposed to stunting.

Findings from this study showed that the predictors of stunting were being older child (12-23 months), being from agro-pastoralist, middle wealth quantile household, use of treated water, being second birth order, being female child and adequate maternal knowledge about appropriate child feeding. Being from pastoralist and being female child are the independent predictors of underweight. Whereas, having large family size, polygamous marriage, being from agro-pastoralist and farming as maternal occupation independently predicted wasting in the study area.

Recommendations

The following recommendations are suggested based on the results of this study: Provide sustained nutrition education programs to mothers focusing on appropriate feeding practice through community-based nutrition programs is critical to accelerate improvement in children nutritional status in the study area. Nutrition programs should also pay attention to

cultural beliefs and food taboos on infant and young child feeding. Households should treat drinking water which is obtained from unprotected water sources and river by boiling, bleaching and strained through cloth. Use of family planning should be encouraged to help the family to have small family size which can improve household income and proper sharing of resources. There is a need to address the issues of polygamous marriage through multidisciplinary approach at community level should be carried out to consequently reduce wasting among children. Close monitoring of the gap between poorest, middle, and richest households can help in the reduction of the gap in nutritional status between children in the highest and lowest socio economic quintiles. The findings of this study had its implications for health care workers and other concerned bodies including policy makers to carry out the national nutrition strategy on IYCF by considering the living conditions of the pastoralist communities. Further longitudinal studies should be done to see unexplored variables (Antenatal care, seasonal factors, household food security and dietary adequacy of pastoralist children in the community) that were not included in this study.

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