Determinants of Severe Acute Malnutrition among Under Five Children in Shashogo Woreda, Southern Ethiopia: A Community Based Matched Case Control Study

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Abstract

Background: Severe acute malnutrition is one of the major killers of under five children in developing countries including Ethiopia. However, little information is known about the determinant factors of severe acute malnutrition. Hence this study identified the determinants of severe acute malnutrition in Shashogo woreda, Southern Ethiopia.

Methods: An age matched community based case control study was conducted from February 20 to march 30, 2014 in 12 randomly selected rural kebeles of the Shashogo district, southern Ethiopia. The cases were 108 severely malnourished children under the age of five and the controls (n=108) were children without malnutrition recruited concurrently from under five children of the same kebele. Data was collected by face to face interview using structured questionnaire and the anthropometric measurements of the children was taken using standard procedures. Descriptive and summary statistics was done. Bivariate and multivariate analysis was done using conditional logistic regression on SPSS version 20.0 and Epi info version 7 software in order to determine factors associated with severe acute malnutrition.

Result: Multivariate analysis with conditional logistic regression revealed that severe acute malnutrition was associated with maternal illiteracy (AOR=8.683, 95% CI 2.668 – 28.26), lack of maternal autonomy in decision making (AOR = 3.46, 95% CI 1.272 – 9.414), diarrhea 2 weeks preceding the survey (AOR = 4.13, 95% CI 1.34– 11.47), sub optimal frequency of complementary feeding (AOR = 3.21, 95% CI 1.63 – 9.33) and visit to health institution after 24 hours of the onset of symptoms for sick child (AOR=3.95, 95% CI 1.465 – 10.647) after the effects of other significant variables were controlled.

Conclusion and recommendation: The findings of this study have confirmed the association of severe acute malnutrition with maternal education, maternal autonomy in decision making and inappropriate infant and young child caring practices. To reduce childhood malnutrition due emphasis should be given in empowering women and improving the knowledge and practice of parents on appropriate infant and young child caring practices.

Keywords: Severe acute malnutrition; Under five children; Matched case control study

Introduction

When the nutritional status of a child deteriorates in a relatively short period of time, the child can be said to have acute malnutrition. If a child's weight for height measurement is less than 70% of the normal range for his age (weight for height Z score <-3SD), then the child would be diagnosed as having severe acute malnutrition. Another criterion is when the child's MUAC is less than 11 cm [1].

Acute malnutrition is a devastating public health problem of epidemic proportions. Worldwide, about 55 million under five children suffer from acute malnutrition and an estimated 26 million of them had severely acute malnourished, most of who live in sub-Saharan Africa and South Asia. Every year, 3.5 million children die of malnutrition-related causes. Among this, severe acute malnutrition contributes to 1 million deaths of children annually [2-8].

SAM is a deadly condition. It kills children by increasing the case fatality of common childhood infections, and therefore it is an immediate or direct cause of child death. Malnourished children, who are ill, die because they are malnourished. Mortality rates in SAM children are 9 times higher than those in well-nourished children. According to the Maternal and Child Under nutrition Study Group, 3.5 million child deaths, 35% of the disease burden in children younger than 5 years, and 11% of total global disability-adjusted life-years (DALY) are attributable to maternal and child under nutrition [9]. It was estimated by the same group that stunting, severe wasting, and intrauterine growth restriction together were responsible for 2.2 million deaths and 21% of DALYs for children below five years of age [3].

In Ethiopia, child malnutrition is one of the most serious public health problem and among the highest in the world [10]. This high malnutrition rate in the country poses a significant obstacle for achieving better child health outcomes [11]. The percentage of children who are stunted is 44 percent; of which 21 percent are severely stunted, 29 percent of all children are underweight, and 9 percent of children are severely underweight, 10 percent are wasted and 3 percent are severely wasted [12]. In Southern Nations Nationalities and people region of Ethiopia (where the study area located), the percentage of children who are severely stunted, severely wasted & severely underweight is 22.9%, 1.9%, and 9.6% respectively [12].

Encouragingly, both underweight and stunting prevalence was reducing by 1.34% per year over the past decade. While this trend is clearly progressing in the right direction, Ethiopia will only reach the Millennium Development Goal (MDG) target of halving the number of underweight children if the percentage reduction is increased to at least 1.6 percentage points per year. This implies the need to intensify and scale-up known high impact nutrition interventions and those that address wasting [12]. Under the umbrella of the growth and transformation plan, the government of Ethiopia launched the fourth Health Sector Development Programme (HSDP-IV) which gives due considerations for nutrition than the three previous plans for reducing the prevalence of wasting from 11% to 3% [13].

From 2004/5, the Federal Ministry of Health (FMoH), alongside partners including UNICEF and others, commenced scale-up of SAM treatment services. This involved developing guidelines and establishing more in-patient and out-patient services across the country. In 2007, following international endorsement of the CMAM approach, the national protocol for SAM treatment was revised to include detailed guidance for the Outpatient Therapeutic Programme (OTP) and community mobilization activities [14]. However, the problem is still high in its magnitude and causing challenges for the attainment of the goals to reduce child mortality.

Therefore determining the risk factors of SAM has significant advantage in improving the effectiveness and efficiency of the intervention. Therefore this study aiming at determining the household associated risk factors, child characteristics associated risk factors, child caring practice associated risk factors and environmental related risk factors of SAM based on community based design at which many children can be represented in terms of residence, social status, disease conditions and the like, will strengthen the community based management of severe acute malnutrition. In addition, this study can guide policy makers to tackle the problem of the locality.

Methods and Materials

Study setting and participants

The study was conducted from February 20 to March 30, 2014 in Shashogo woreda of Hadiya zone, Southern Ethiopia using community based age matched case control study. The cases were children with SAM (WHZ-score < -3SD) and the controls were children without malnutrition (WHZ-score > -1SD) who were matched with similar age interval with the case (± 3 months). Matching was 1:1 individual and interval matching. Cases with known chronic illnesses like TB, HIV, and congenital abnormality that can affect feeding pattern of the child like congenital heart disease were excluded. In addition, those children not living in the area for more than 6 months were excluded.

Sample size determination and sampling procedure

Sample size was calculated by using two population proportion formula. The assumption used for sample size calculation is : detecting a 2.3 times higher risk of suboptimal infant feeding practices among the cases and a 34% prevalence of suboptimal infant feeding practice among the controls, based on EDHS 2011, 95% CI, and 80% power, case to control ratio of 1:1. Therefore, the required sample size was 108 cases and 108 controls.

Sampling procedure

Among the 36 kebeles of the district, 12 kebeles were selected randomly to be included in the study. After consulting the health extension workers of each selected kebele, the households who have under five children were reached, then anthropometric measurements of the children was taken to categorize the child as a case or control. Then using simple random sampling the children was included in the study until the desired sample size. Proportional allocation of the number of cases to participate in the study from each kebele was considered and the controls were selected from the same kebele and age interval.

Data collection procedures and measurement of variables

Anthropometric measurement of the children was measured based on the WHO standardized procedures. Weight and recumbent length/height was taken according to WHO standardized techniques [15]. Undressed or with minimal dressed children was weighed to the nearest 0.1 kg using 25 kilogram (kg) portable Salter spring scales, recumbent length/height was measured to the nearest 0.1 cm. Validation of instruments, and measurements and random auditing were done on a daily basis. Trained nurses were taken the anthropometric measurements in the houses of the selected children during day time. Data on exposure variables were collected by face to face interview using structured questionnaire.

Household wealth was assessed by constructing an index using principal components analysis. The first component, which explains most of the variance in the observed set of variables, is expected to reflect an unobserved dimension, and in the given model 'wealth'. The variables included in our factor analysis were the following: (1) number of livestock present in the household (cow, goat, sheep, chicken, and horse) (2) ownership and size of farm land (3) housing material for roof, walls and floor; and (4) type of toilet. The first component explained

49% of the variance. The regression scores from the first component were used to create an index that was divided into five equal categories and then grouped as the highest, medium, and lowest wealth index categories.

Maternal decision-making autonomy was estimated from 3 questions on decision making, i.e. decision regarding own health care, making small and large household purchases, decision on the money earned. These questions were originally developed and validated from Ethiopian Demographic and Health Survey [12]. To develop a score for analysis, the responses were coded as (a) 3 points for decisions made by the women; (b) 2 points for women who have some influence on decision-making; and (c) 1 point for those who do not have any influence or a very little influence. Then a composite score ranges from 3 to 9 was created to measure decision making autonomy, which was further divided into two categories, resulting in the final average score with lowest autonomy (<6)and highest autonomy (≥6).

Immunization status of the children was assessed looking at vaccination card or asking the mother (caregiver). Completed immunization status according to the national programme within one month after the recommended time qualified as 'adequate immunization.' Immunization that was either incomplete or delayed by more than a month according to the national programme was classed as 'not adequately immunized'.

Data processing and analysis

Data were checked, cleaned, and entered in to SPSS version 20.0 software for analysis. Incomplete and inconsistent data were excluded from the analysis. Anthropometric data was analyzed manually in order to identify the cases and controls. Descriptive statistics were

used to describe the sample. The results of the descriptive statistics were expressed as percentage and frequency, as well as discordant and concordant pairs were described. Associations between independent variables and dependent variables were analyzed first using bivarate analysis using matched pair analysis in Epi info version 7.1software (Tables 1 and 2). Conditional logistic regression was applied using enter method with p <0.05 criteria to enter and exit from the model. Only those variables considered in the multivariable analysis were those having p <0.05 in the bivariate analysis. The magnitude of the association between the different independent variables in relation to dependent were measured using Mentel Henzel odds ratios (MH OR) and 95% confidence interval (CI) and P values below 0.05 was considered statistically significance. Omnibus test for goodness–of-fit of the model was applied to find the appropriateness of model.

Ethical clearance

Ethical clearance was obtained from Jimma University ethical review committee. Permission from the officials governing the district's health department was obtained, then verbal consent was obtained from the care givers of the child under study and Confidentiality of the information given by the respondent were maintained. During data collection those children with SAM but not getting appropriate care and treatment were referred to the health facilities.

Results

A total of 108 cases and 108 controls, who were matched with their

variables		control		COR(95% CI)	P value
		Yes	No	5.33(2.23 – 12.755)	
case	Mother illiterate	Yes	62	32	
		No	6	8	1.00	0.001
	Paternal illiteracy		Yes	No	2.7(1.307 – 5.578)	
		Yes	66	27	
		No	10	5	1.00	0.007
	Maternal autonomy		Yes	No	2.545(1.267 – 5.113)	
		Yes	64	28	
		No	11	5	1.00	0.009
	Family size		>5	≤5	2.27(1.235 – 4.16)	
		>5	38	34		0.008
		≤5	15	21	1.00	

Table 1: Bivariate analysis of parent socio- demographic factors using discordant pairs of cases and controls, among under five children of Shashogo district, March 2014 (n = 108 pairs).

variables		control		COR(95% CI)	P value
		Male	Female	1.706(0.937 – 3.104)	
case	Sex of the child	Male	32	29	
		Female	17	30	1.00	0.08
	Diarrhea 2 weeks preceding the survey		Yes	No	5.4(1.997 – 13.541)	
		Yes	3	27	
		No	5	73	1.00	0.001
	Fever 2 weeks preceding the survey		Yes	No	3.2(1.090 – 8.254)	
		Yes	3	16	
		No	5	84	1.00	0.023

Table 2: Bivariate analysis of child characteristics using discordant pairs of cases and controls, among under five children of Shashogo district, March 2014 (n = 108 pairs).

respective age intervals were analyzed, with the response rate of 100%. The mean weight of cases and controls were 4.84 kg and 7.12 kg, with standard deviation of 1.67 and 2.19 respectively. The average weight for height percentile was 62.0 and 91.74 among the cases and the controls respectively.

Parental socio demographic characteristics associated with severe acute malnutrition

The average maternal age of the cases and controls were 32.7 and 31.0 years respectively. Among the surveyed 216 mothers, 37 (34.3%) of the mothers of cases and 23 (21.3%) of the mothers of the controls were in the age group above 35 years. It was seen that there is significant difference among cases and controls in relation to the maternal age (OR = 2.0, 95% CI 1.053 – 3.799).

The head of the households were spouse in 6(5.6%) of the cases and 3(2.8%) of the controls, which is similar to their current marital status at which 94.4% households of the cases and 97.2% households of the controls were currently married or living together. There was no significant variation in the severe wasting of the children in relation to the head of the household and current marital status of the mother.

The average family size was 6.51 and 5.85 respectively among the households of the cases and the controls, i.e. 86.1% of the households of the cases have greater than 5 family sizes as compared to 76.9% of the controls, whereas the average number of under five children in a household is 1.72 and 1.60 among cases and controls respectively. Under five children of the households with family size of greater than 5 were seen associated with severe wasting of the children (OR = 2.267, 95% CI 1.235 – 4.161).

The illiteracy rate was 98 (90.7%) among mothers of the cases and 71 (65.7%) among the mothers of controls similarly, 93 (86.1%) among the fathers of the cases and 76 (70.4%) among the controls. Under five children whose mother is illiterate were significantly associated with severe wasting of the children (OR = 8.25, 95% CI 2.923 – 23.287); similarly under five children whose father is illiterate were also seen associated with severe wasting of the children (OR = 2.7, 95% CI 1.307 – 5.578).

Majority of the mothers, 102 (94.4%) of the cases and 105 (97.4%) of the controls, were housewives with no occupation. The main paternal occupation is farming in both the cases and controls (95.2% and 97.2% respectively). There was no significant difference on the child severe wasting in cases and controls in relation to the maternal and paternal occupation (P value >0.05).

Majority of the parents of the cases and controls were in the lowest wealth quintiles (53% of the cases and 44% of the control's parents). Only 11% of cases and 15% of the control's parents were in the highest wealth quintiles. In this study, it is not indicated that household wealth index is significantly associated with severe wasting of under five children (OR = 0.96, 95% CI 0.422 – 2.167). Only 16 (14.8%) of the mothers of the cases were autonomous in decision making while 36 (30.6%) among the controls. Children whose mothers are not autonomous in decision making were seen significantly associated with severe wasting of the children (OR = 2.545, 95% CI 1.267 – 5.113).

From the 216 surveyed case and control children, 56.5% of the cases and 45.4% of the controls were females. There was no significant difference in severe wasting in relation to the sex of the child (OR = 1.706, 95% CI 0.937 – 3.104). The mean age of the cases and controls were 19.12 and 18.98 respectively; majority of the cases of severe

wasting were in the age interval of below 24 months. Among the cases 76(70.4%) of the children were born in the fifth or lower order of birth, so does 87(80.6%) of the controls. The remaining 32(29.6%) of the cases and 21(19.4%) of the controls were born after the fifth order of birth. There was no statistically significant association seen between birth order and severe wasting of the children (OR = 1.687, 95% CI 0.909 – 3.132).

Concerning the morbidity status of the children, 28(25.9%) of the cases and 10(9.2%) of the controls had diarrhea 2 weeks before the survey likewise 17(15.7%) of the cases and 12(11.1%) of the controls had fever 2 weeks preceding the survey. There was significant association between severe wasting and the morbidity status by diarrhea (OR = 5.4, 95% CI 1.997 – 13.54) and fever (OR = 3.2, 95% CI 1.090 – 8.254).

All of the enrolled cases and controls (100%) were completed immunization, and took vitamin A supplementation. In addition to this all of the children had breast feeding that was initiated immediately after birth. None of them took pre lacteal feeding and squeezed out the first breast milk. At the time of the survey, 91 (84.3%) of the cases and 91 (84.3%) of the controls were breast feeding, and all of them were practicing breast feeding at night. However, among those who were breast feeding, only 41 (45%) of cases and 60 (65.9%) of the controls had practiced optimal frequency of breast feeding (> 8 times in a day). Sub optimal frequency of breast feeding was seen significantly associated with severe wasting of the children (OR = 2.58, 95% CI 1.187 – 4.59) (Table 3).

All of the surveyed children were used breast feeding exclusively for six months. After the age of six month all of the cases and controls had initiated complimentary feeding by milk (55.6% cases and 59.3% controls), butter (1.9% of cases and 2.8% of controls), sugar (5.6% of cases and 5.6% of controls), Bulla/Atimit (37% of cases and 32.4% of controls). However, only 13% of the cases and 35.2% of controls had practiced optimal frequency of complimentary feeding (≥ 3 times in a day). Sub optimal frequency of complementary feeding were also seen significantly associated with severe wasting of the children (OR = 3.5, 95% CI 1.94 – 11.24).

Regarding the change of feeding pattern for the sick child, 46 (42.6%) of cases and 63 (58.3%) of the controls mentioned providing additional feeding when their child is sick. However all of the mothers had mentioned that they took their child to the health facilities for treatment, only 61% of the mothers of cases and 82% mothers of the controls were used to visit within 24 hours of the onset of symptom. Children whose mothers do not take to the health institution within 24 hours of the onset of the symptom were associated with severe wasting of the child (OR = 2.643, 95%CI 1.429 – 4.888).

Washing practice were practiced by all of the mothers of the cases and controls, 89 (82.4%) of the cases and 99 (91.7%) of the controls had practiced once daily while the remaining 8.3% of the cases and 17.6% of the controls were practiced every third day. There was significant difference in frequency of washing practice among cases and controls (OR = 0.091, 95% CI 0.012 – 0.704)

The number of children ever born by a mother was variable among the cases and the control. Fifty percent of the mothers of controls and 66.7% of mothers of cases had given birth of more than three children. Increased maternal parity were associated with the severe wasting of the children (OR = 2.20, 95% CI 1.195 – 4.050).

Mothers who planned birth were 96.3% in controls and 81.5% in the cases. Under five children whose parents had planned to give birth were shown statistically significant association with severe wasting (OR = 5.0, 95% CI 1.709 – 14.628) (Table 4).

Antenatal care follow up was practiced in 85 (78.7%) of the mothers of cases and 97 (89.8%) of the mothers of control. Among those mothers who practiced antenatal care, 76 (89.4%) mothers of cases and 89 (91.8%) mothers of controls were visited four times in the entire period of pregnancy. Antenatal care follow up was significantly associated with severe wasting of the children (OR = 4.00, 95% CI 1.337 – 11.965).

All of the mothers included in the survey had no history of using extra food during pregnancy and lactation. However their health condition was good in majority of the mothers (95.4% of cases and

variables			control		COR(95% CI)	P value
case			4 -7 times	≥8 times		
	Frequency of breast feeding in a day	4-7 times	27	31	2.58(1.187 – 4.59)	
		≥8 times	12	21	1.00	0.005
			≤2 times	3-5 times		
	Frequency of complementary feeding	≤2 times	8	28	3.5(1.94 – 11.24)	
		3-5 times	8	64	1.00	0.0001
	Take to health institution when the child is sick within 24 hours		No	Yes		
		No	10	37	2.643(1.429 – 4.88)	
		Yes	14	47	1.00	0.002
	Change pattern of feeding for sick child		Yes	No	1.00	
		Yes	23	40		0.034
		No	29	16	1.379(1.041 – 2.90)	
	Frequency of washing		daily	Third day		
		daily	29	3	1.00	
		Third day	33	43	0.091(0.012– 0.704)	0.022

Table 3: Bivariate analysis of selected child caring practices with SAM using discordant pairs of cases and controls, among under five children of Shashogo district, March 2014 (n = 108 pairs).

variables			control		COR(95% CI)	P value
case			home	Health institution	6.0(0.7223 – 19.839)	
	Place of birth	home	98	6		
		Health institution	1	2	1.00	0.07
	Planned birth		Yes	No	5(1.709 – 14.63)	
		Yes	82	20		
		No	4	2	1.00	0.003
	Parity		>3	≤3	2.20(1.195 – 4.050)	
		>3	36	33		
		≤3	15	24	1.00	0.011
	ANC		No	Yes	4.0(1.337 – 11.97)	
		No	7	16		
		Yes	4	75	1.00	0.013

Table 4: Bivarate analysis of selected obstetric factors with SAM using discordant pairs of cases and controls, among under five children of Shashogo district, March 2014 (n = 108 pairs).

94.4% of controls). It was not seen that significant difference among the mothers of cases and controls in relation to the health condition during pregnancy (OR = 0.80, 95% CI 0.215 – 2.978).

Majority of the mothers 105(97.2%) of the cases and 99(91.7%) of the controls give birth of the surveyed child at their home. Only the remaining 2.8% of the cases and 8.3% of the controls mothers had given birth in health institutions. In the current study, the place of birth of the children were not seen significantly associated with severe wasting (OR = 0.143, 95% CI 0.018 – 1.161).

Environmental factors associated with severe acute malnutrition

All the surveyed households got water from public tap. There was no difference among the cases and the controls with regard to the source of water. None of the households treats water at their home. The average water utilized per household was 25 liters per day for cases and 27 liters for controls, and the mean time to fetch water from the source of public tap was 12 minutes for cases and 11 minutes for controls. No significant variation was seen among the cases and controls with respect to the amount of water utilized per day in a household and time required for fetching water (Table 5).

Latrine was not available in 24 (22.2%) households of the cases and 13 (12%) household of the controls. Among the households having latrine, all of them were wooden pit latrine. There was significant variation among the cases and controls in relation to the availability of latrine (OR = 2.222, 95% CI 1.012 – 4.880). Ninety percent (90%) households of the cases and 83.3% households of controls dispose waste in the open field. There was no significant difference among the cases and controls associated with the place of waste disposal (OR = 0.807, 95% CI 0.181 – 3.592).

Almost all (95.4%) households of the cases and 92.6% of the controls were thatched type households. Only 5 (4.6%) households of the cases and 7.4% of the controls had separate room for kitchen and animals. In this study, the type of house did not show significant association with severe wasting of the children (OR = 0.143, 95% CI 0.018 – 1.161).

Determinants of severe acute malnutrition in multivariate analysis

Multivariate analysis were computed for selected variables using conditional logistic regression, by setting enter and exit criteria for the variables i.e. p value ≤ 0.05 in bivariate analysis and those variables associated with SAM in the reviewed literatures. Accordingly,

Variables	Case (n = 108)	Control(n= 108)	P - value	COR(95% CI)
Availability of latrine				
Yes	84 (77.8%)	95 (88%)	0.047	2.22 (1.012 – 4.880)
No	24 (22.2%)	13 (12%)		1.00
Place of waste disposal				
Open field pit / burning	98 (90.7%)	90 (83.3%)	0.778	0.807(0.181 – 3.592)
	10 (9.3%)	18 (16.7%)		1.00
Type of house				
Thatched	103 (95.4%)	100 (92.6%)		1.00
Corrugated iron sheet	5 (4.6%)	8 (7.4%)	0.069	0.143(0.018– 1.161)

Table 5: Environmental factors associated with severe acute malnutrition among under five children in Shashogo district, southern Ethiopia, April 2014 (n = 216).

among the socio demographic characteristics maternal illiteracy and autonomy in decision making were seen significant determinants of severe acute malnutrition. The Under five children whose mother is illiterate were 8 times more likely to be severely wasted than those children whose mother is literate (AOR = 8.67, 95% CI 2.67 – 28.26). Likewise children whose mother is not autonomous in decision making were 3.5 times more likely to be severely wasted than the counterpart child (AOR = 3.46, 95% CI 1.27 – 9.41). However other socio demographic variables like paternal illiteracy and family size were not statistically significant in the multivariate analysis of the current study (Table 6).

Morbidity status of the child by diarrheal disease in the last 2 weeks preceding the survey were also seen one of the determinant of the severe wasting in under five children. Severe wasting was 4 times more likely to occur in children who had diarrhea before 2 weeks than those children who hadn't diarrhea within 2 weeks preceding mal nutrition (AOR = 4.13, 95% CI 1.34– 11.47). However morbidity status of the child by fever in the last 2 weeks preceding the survey were not seen

significantly associated with severe wasting in under five children in multivariate analysis of the current study.

Furthermore the multivariate analysis also revealed that children who had sub optimal frequency of complimentary feeding (≤2 times a day) were 3 times more likely to be severely wasted than children who took 3-5 times per a day complimentary feeding (AOR = 3.21, 95% CI 1.63 – 9.33) whereas frequency of breast feeding were not seen as associated factor in the multivariate analysis of the current study.

Similarly children who were not taken to health institutions within 24 hours of the onset of symptom were 4 times more likely severely wasted than those children who were taken within 24 hours of the onset of symptom (AOR = 3.95, 95% CI 1.47 – 10.64).

As seen in Table 1, apart from the over mentioned variables none of the obstetric and environmental determinants were seen significant in the multivariate analysis of the current study.

variables			control		COR(95% CI)	AOR(95%CI)
case	Mother illiterate		Yes	No	5.33(2.23 – 12.75)	**8.67(2.67 – 28.26)**[**]
		Yes	62	32		
		No	6	8	1.00	1.00
	Paternal illiteracy		Yes	No	2.7(1.307 – 5.578)	2.19(0.973 – 4.91)
		Yes	66	27		
		No	10	5	1.00	1.00
	Maternal autonomy in decision making		Yes	No	1.00	1.00
		Yes	64	28		
		No	11	5	2.545(1.26 – 5.11)	**3.46 (1.27 – 9.41)**[**]
	Family size		>5	≤5	2.27(1.235 – 4.16)	1.60(0.78 – 3.26)
		>5	38	34		
		≤5	15	21	1.00	1.00
	Diarrhea 2 weeks preceding the survey		Yes	No	5.2(1.997 – 13.54)	**4.13(1.34– 11.47)**[**]
		Yes	3	27		
		No	5	73	1.00	1.00
	Fever 2 weeks preceding the survey		Yes	No	3.2(1.090 -8.254)	2.13(0.431 – 7.931)
		Yes	3	16		
		No	5	84	1.00	1.00
	Frequency of breast feeding in a day		4 -7 times	≥8 times	2.58(1.187 – 4.59)	1.9(0.310 – 4.012)
		4-7 times	27	31		
		≥8 times	12	21	1.00	1.00
	Frequency of complementary feeding in a day		≤2 times	3 – 5 times	3.5(1.94-11.27)	**3.21(1.63 – 9.33)****
		≤2 times	64	28		
		3 – 5 times	8	8	1.00	1.00
	Take to health institution when the child is sick		>24hours	Within 24 hours	2.64(1.429- 4.88)	**3.95(1.47 – 10.64)**[**]
		>24hours	10	37		
		Within 24 hours	14	47	1.00	1.00
	ANC follow up		No	Yes	4.0(1.337-11.96)	2.82(0.523 – 15.22)
		No	7	16		
		Yes	4	75	1.00	1.00
	Availability of latrine		No	Yes	2.2(1.012-4.88)	1.47(0.456 – 4.75)
		No	6	16	1.00	1.00
		Yes	7	79		

Table 6: Determinants of severe acute malnutrition among under five children of Shashogo district, southern Ethiopia, April 2014; A multivariate analysis (n = 216).

Discussion

Nutritional status of under five children can be affected by different spectrum of factors. This study aiming in identifying the determinants of severe acute malnutrition has tried to identify factors that are associated with severe wasting among under five children. Accordingly the result of this study was discussed as follows.

Among the socio-demographic characteristics of the households of the cases and controls, maternal illiteracy and lack of maternal autonomy in decision making have shown significant association with severe wasting of children, but family size were not.

Even though the effect of a large family size with overcrowding and inadequate spacing has been implicated as a risk factor for severe acute malnutrition in different studies [16-18], in the current study it is not revealed that large family size is significantly associated with SAM. This discrepancy might be due to rural set up of the study area at which many of the community people are living in socially integrated condition.

This study revealed that maternal illiteracy is related with severe wasting of the children. Under five children whose mother was illiterate is more likely severely wasted than those children having literate mother, which is consistent with many reviewed studies conducted in Gimbi, Gondar, and Mulago city of Kampala [11,17,18]. However in the current study, it was observed that paternal education is not significantly associated with SAM of the children, which is not consistent with many reviewed literatures [11,16,17]. This discrepancy of lack of association between parental education and children's nutritional status might be attributed to the overall literacy status of the study setting in that the majority of the parents involved in the study were illiterate. Another explanation for this variation might be the culture and tradition of the study area, at which the fathers of the children are not responsible in caring their children. They usually focus on the agricultural and outdoor activities. They consider caring of the children as the responsibility of the mothers.

Autonomy of the mothers in decision making was significantly associated with the severe wasting of under five children. Children whose mothers were not autonomous in decision making were more severely wasted than those children whose mothers were autonomous in decision making. This result is in line with studies that were conducted in Gimbi district of Oromia region and Somalia of Ethiopia [11,19]. This could be explained by the fact that the provision of joint care by biological parents requires joint decision on the care or treatment of their children in order to improve children's nutritional status. Such decision might also require women's autonomy to participate in the decision making process of the household equally with the men. This result also supports the current policy of government in which empowering women, women education and increasing influentially of women has significant impact for the health of the family and the community.

More over this study described morbidity status of the child with diarrhea preceding 2 weeks before the onset of SAM is significantly associated with severe wasting of the children. Cases had more history of diarrhea than the controls. This can be due excessive loss of fluids and electrolytes, loss of appetite, lack of absorption of food in the intestine due to high motility of the intestine during diarrhea episodes. Similar finding was seen in the studies done in Gimbi and Nigeria [11,20]. On the other hand, the present study does not show significant association between morbidity status of the child with fever preceding 2 weeks before the onset of SAM and severe wasting of the children. This is inconsistent with the similar studies conducted in Gimbi and Nigeria [11,20]. This might be due to high endemicity of malarial disease in the study area, resulting in the homogeneity of the feverile disease among the cases and the controls.

Breastfeeding is a custom in the area; all the children in both cases and controls were breastfed which is in concordance with the national EDHS 2011 survey that indicated 98% of children under the age of 5 were breastfed [12]. Breastfeeding was initiated within the first hour in all of the cases and controls. This is higher than the national value of 52% [12]. This might be due to increased awareness in breast feeding currently among the community. According to the study conducted in Gondar the severely malnourished children are more likely to receive pre lacteal feeds than the controls. The use of pre lacteal feeds is not recommended as it can make the infant ill and interferes with breastfeeding. However the presence of association between pre lacteal feeding and SAM couldn't be assessed in the current study due to the homogeneity of the study subjects, thus none of the children has taken pre lacteal feeding. Similarly none of the mothers of cases and controls had squeezed out the first breast milk, colostrums and all of the children were breastfed exclusively for 6 months. There was no variation among the cases and controls. Moreover all the cases and controls were completed immunization and vitamin A supplementation. Some studies shown that failure to complete immunization were associated with SAM [18,21].

Children having sub optimal frequency of complementary feeding were more likely severely wasted than those children having optimal frequency of complementary feeding were. This result is consistent with many studies conducted in Ethiopia, Africa and globally [11,12,17,18,21-23]. And the finding of this study also supports one of the health sector policy of strengthening infant and young child feeding practices to prevent child mortality [24].

In the current study, it was indicated that children who were taken to health institution within 24 hours are less likely to be severely wasted than those who were not taken. Similar finding was seen in Gimbi district [11]. This finding supports that taking sick children within 24 hours of the onset of the symptoms is advisable in order to prevent further disease progression and early detection of the problem.

In many studies, obstetric factors like a mother haven't antenatal care follow up is associated with SAM of the children [16,22,23]. However this study revealed that, there is no significant difference in children whose mother haven't antenatal care follow up and those having in relation to SAM. This inconsistency might be due to the difference in the ANC service quality. Currently ANC service is being provided in the health post level, which may compromise the quality of the service even though it has a value in increasing the access of the service.

According to the study conducted in different parts of Ethiopia by the young lives research group, children of households that use a pit latrine or flush toilet are less likely to be wasted [16]. However in this study, the availability of latrine is not significantly associated with SAM. This might be even if almost all of the community of the study area have pit latrine, still they have mal practice of defecating in the open field.

Unlike many hospital based case control studies, the current study was conducted in the community level having representative samples of cases and community controls. Community controls were used to match with the cases from general population of under five children. Finally matched analysis and the conditional logistic regression were computed to identify the determinant factors. Apart from the mentioned strengths of the study, it has also some limitations since this

study assesses history of exposure retrospectively, it may be prone to recall bias during data collection time as some of the variables need a recall to situations happened before the actual data collection time. The study also can't determine the effect of matched variable (age) to the dependent variable (SAM). Therefore it is better to have further studies should be conducted at community level in order to identify the determinants of SAM, having in mind the over mentioned limitations.

Conclusion and Recommendations

In sum, this study has identified maternal illiteracy, lack of maternal autonomy in decision making, diarrheal disease, sub optimal frequency of complementary feeding and not taking children timely to health institution for treatment as determinants of SAM among under five children. Therefore it is recommended to promote women education and empowerment. Moreover, Promotion of better child caring practices by improving practice of parents on appropriate infant and young child feeding practices, particularly the optimal complementary feeding practices should be emphasized.

Acknowledgements

About the author

Mr. Nebiyu Dereje was born in Hosanna, southern Ethiopia. He was graduated with Bachelor of Science in the department of public health in Hawassa University in 2009. After graduation he was employed in Hosanna College of health sciences as instructor and served for 3 years before beginning post-graduation program. In 2012/13 he joined post-graduation in Jimma University in the department of Masters of public health in Epidemiology. Currently he is working as a faculty member in Hosanna college of health sciences, Ethiopia.

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