

## Research Article

# Determinant of Severe Acute Malnutrition among Children Aged 6-59 Months in Konso, Southern Ethiopia: Case Control Study

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## ABSTRACT

**Background:** Severe acute malnutrition is an underlying cause for the deaths of more than 3.5 million children under the age of 5 each year worldwide. Interaction of socio-demographic, nutritional, and child health related factors influences on occurrence of malnutrition is not investigated in the current study area. Therefore this study is under taken to fill this gap in Konso district Southern Ethiopia.

**Objective:** To determine the determinant factors associated with malnutrition among children aged six month to fifty nine months in Konso and to provide information useful to better control this chronic problem.

**Methods:** Case-control study was conducted on 300 malnourished children (cases) and 531 children who were not malnourished (controls). Data was collected by using pretested and structured questionnaires. Data was entered in to EPI INFO version 7 and exported to SPSS version 20 for further analysis. Frequency and cross tabulation was conducted to describe relevant variables in relation to the outcome variables; multivariate logistic regression analysis was conducted to identify significant predictors based on p-value less than 0.05 with 95% confidence level.

**Results:** A total of 831 participants (300 with severe acute malnutrition and 531 no malnutrition for each) were enrolled in the study. The identified determinant factors for severe acute malnutrition was maternal literacy (AOR 0.14, 95% CI=0.03, 0.49), large family size (AOR 1.43, 95% CI 1.12, 1.82), pregnancy, short birth interval, increased age of child (AOR 1.23, 95% CI, 1.02, 1.48), and frequency of complementary diet feeding (AOR 0.67, 95% CI: 0.53, 0.85) were significant factors in multivariate logistic analysis.

**Conclusion and recommendation:** Socioeconomic and demographic variables have a significant influence on the odds of malnutrition in children. Continuous BCC and ACC Health education program should be strengthened and the program should focus on nutritional and child care practices to prevent and control childhood malnutrition. Special attention should be given for illiterate, large family size, low birth interval and for higher child age mothers during community based nutrition intervention.

**Keywords:** Acute malnutrition; Konso; Case control

## Introduction

There is an ongoing worldwide effort focused on the complete eradication of extreme poverty and hunger. However, the burden of malnutrition is still a major public health problem especially in resource poor countries.<sup>1</sup> Worldwide, only 36 countries accounted for 90% of all stunted children.<sup>2</sup> Under nutrition remains a major cause of disability and mortality, ranked as the top cause of global burden of disease and underlying 53% of deaths in children under five years.<sup>3</sup>

There is a general consensus today that a complex set of causes determines malnutrition. Inadequate and/or inappropriate dietary intake and infectious diseases are the immediate/direct causes while these in turn are related to a number of socio-economic, demographic, child care and environmental factors.<sup>4</sup>

Worldwide, of the 80 countries with available data, 23 have

levels of wasting (i.e., weight-for-height below  $-2SD$ ) greater than 10 percent. While a significant number of the world's 52 million wasted children live in countries where cyclical food insecurity and protracted crises exacerbate their vulnerability, the majority reside in countries not affected by emergencies. In these countries factors such as frequent incidence of infectious diseases, inadequate caring capacity and social and cultural practices are the major factors that need to be addressed to reduce wasting. Moderate and severe wasting represents an acute form of under nutrition, and children who suffer from it face a markedly increased risk of death. More than 29 million children under 5, an estimated 5 per cent, suffered from severe wasting.<sup>5,6</sup>

Ethiopia is the seventh wasting burden country from the ten most affected countries. The nationwide magnitude of wasting is almost 10%.<sup>7</sup> Some studies conducted in different parts Ethiopia shows that significant numbers of children are suffering from wasting.<sup>8,9</sup>

However, the factors associated with the problems of sever acute malnutrition may differ among Regions, Zones, and Communities, as well as over time. Identification of the major risk factors associated with severe acute malnutrition is essential to design appropriate policies and programs to rectify nutritional deficiencies and imbalances. This study, therefore, examines the influence of some of the feeding practices, child care, and socio-economic variables on sever acute malnutrition of children in Konso Woreda.

**Methods**

**Study setting**

Konso Woreda is one of the five Woredas of Segen Area Peoples Zone (SAPZ) in SNNPR. It is located at 640 Km south west of Addis Abeba and 365 Km from capital city of SNNPR, Hawassa. The Woreda comprises two urban Keble’s and 41 rural kebele or peasant associations. There are 56 health facilities (HFs) in Konso [nine health centers (HCs) and 47 functional health posts (HPs)] providing health service for the community (Figure 1).

**Study design**

Institutional based unmatched case-control study was used to assess determinant factors in children aged six to fifty nine months in Konso District.

**Study population**

This study was conducted in Konso District in children age between 6-59 months years old. All children aged 6-59 months, who are found in Konso District, were the source population and children aged 6-59 months, who attended health services at the time of study/data collection were the study population.

**Sample size**

Sample size was calculated using Epi info version 7 based on the assumption 95% confidence level, 80% power, case to control ratio of 1:2 and including 10% non-response rate and 1.5 design effect which gives final sample size of: 858 [300 for cases and 558 for controls].

**Sampling procedure**

In the district 50 heath facilities providing acute malnutrition treatment by using simple random sampling technique 30 health facilities out of 50 were selected. From 30 health facilities using consecutive sampling technique 831 study participants were selected. Data collectors were interviewed the mother having a child in b/n 6-59 months of age (Figure 2).

**Data collection and quality assurance**

Pretested and structured questionnaire was prepared based on reviewed literatures. The questionnaire was prepared in English

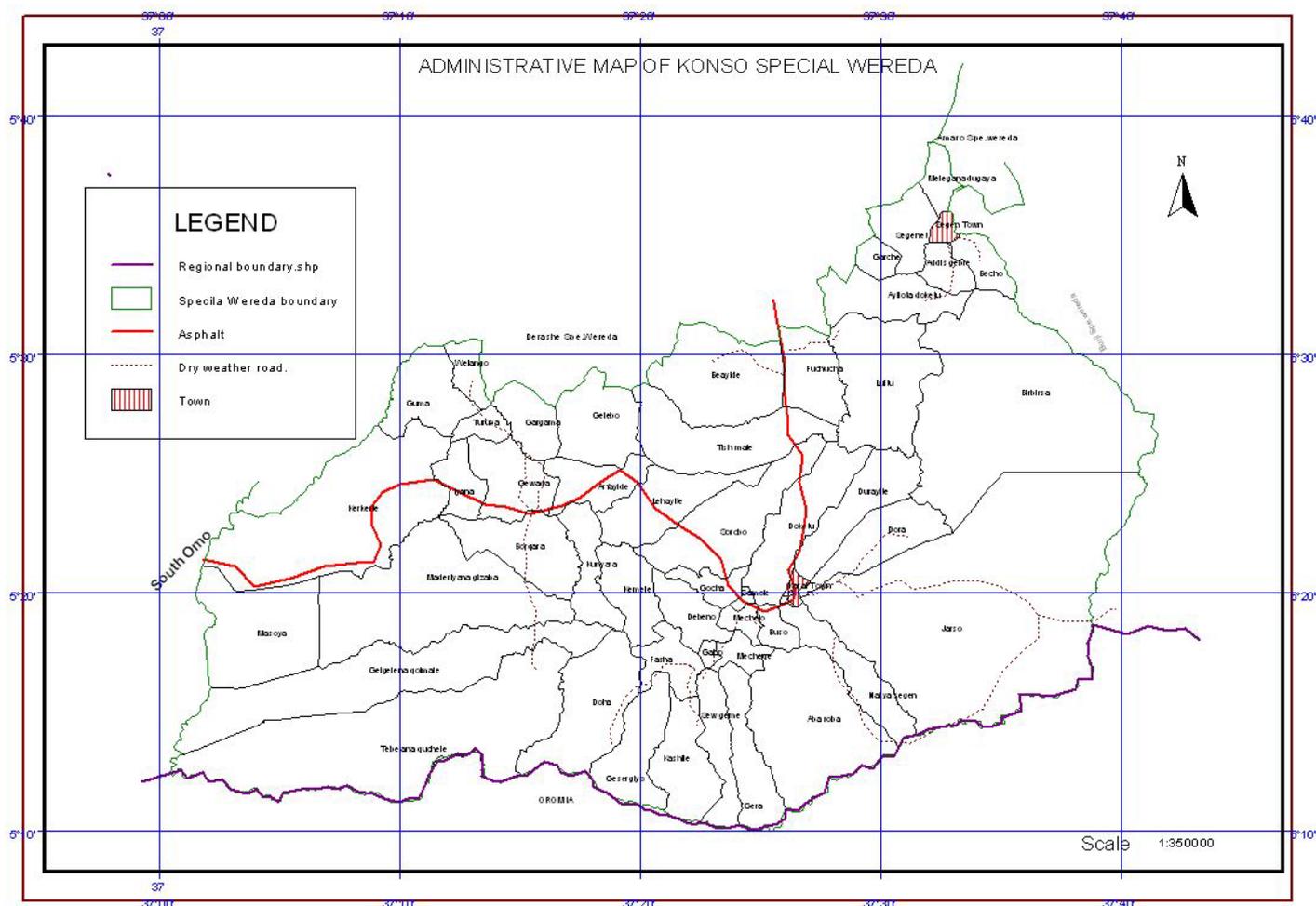
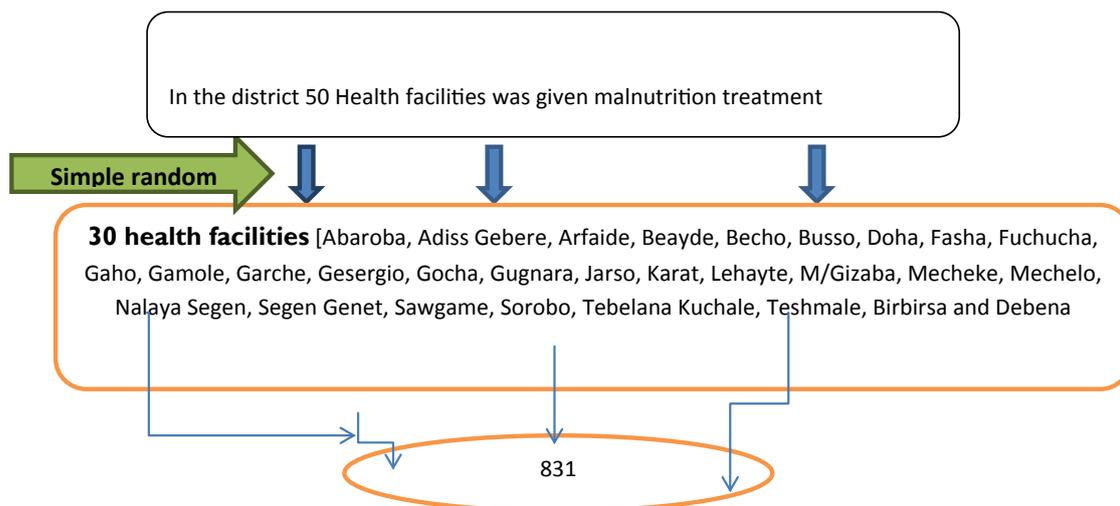


Figure 1: Map of Konso district (Source, Konso Woreda Health Office).



**Figure 2:** Schematic representation of data collection process in Konso district, 2015.

and then translated to Amharic. Training for data collectors and supervisors was provided for two days on the technique of interview and data collection. The data collection tool was pretested on the 2<sup>nd</sup> day of training in another health facility in order to sort out language barriers and contextual differences.

Intensive training and follow up were provided to data collectors. Questionnaires were checked for completeness daily by immediate supervisors. After checking for consistency and completeness, the supervisors were submitted the filled questionnaire to the principal Investigator.

### Data management and analysis

Data were coded and entered EPI-INFO version 7 and exported to SPSS version 20 for descriptive and inferential analyses. Frequencies and cross tabulations were used to check for missed values and variables. Errors identified were corrected after revising the original questionnaires. The necessary assumption of the logistic model was checked by Hosmer and Lemeshow's goodness of fit test statistics (p-value=0.22).

Frequencies and cross tabulation were calculated to describe the study population in relation to relevant variables. Binary logistic regression analysis was conducted to assess the crude association between dependent and independent variables. Finally Independent variables which show association in Binary logistic regression analysis and those which have P-value less than 0.25 entered into multivariate logistic regression model, to identify significant factors associated with outcome variables. Finally significant factors were identified based on AOR include with 95% Confidence level.

### Operational definition

Severe Acute Malnutrition (SAM) (Cases) - are defined as all children b/n 6-59 months of age whose weight for height who fall below minus three standard deviations (-3 SD) from the median of the reference population or with bi-lateral pitting edema or weight for height less than 70 percent of the median reference population or their mid upper arm circumference (MUAC) less than 11 cm are considered as severely acutely malnourished.

### Ethical consideration

A letter of ethical approval was taken from Ethical Clearance Committee. An official letter of co-operation was also taking from the Zonal Health Office and the Woreda Health Office. Prior to interview, data collectors were requested for the respondents' verbal consent after informing them about the confidentiality of the information they provided. Participation in the study was voluntary and they could choose not to participate. However, interviewers were told that their involvement will be important to their health and health of their community. Following this, 30 (3.33%) was not participated. Children having malnourished, were assessed for complications and severe cases were transferred to stabilization center for better management. Health information regarding the causes and effects of malnutrition and how to respond to them was provided.

### Results

#### Socio-demographic characteristics

A total of 831 study participants below the age of five (300 with severe acute malnutrition and 531 without severe acute malnutrition) were participated in the study. There were 155 (51.7%) males in the cases and 278 (52.4%) in the controls. The illiteracy rate was higher among mothers of the cases 283 (94.3%) than the controls 372 (70%). Majority of the mothers, 225 (75%) of the cases and 395 (74.4%) of the controls, were mothers with no occupation. The main paternal occupation is farming both in the cases 233 (77.7%) and the controls 407 (76.6%). Majority of the mothers, 186 (62%) of the cases and 365 (68.7%) of the controls, religion was Christian Protestant (Table 1).

#### Child health care indicator

The number of children greater than three was noticed more frequently in the household of the cases 189 (63%) than in the controls 134 (25%). Birth interval of less than 24 months was higher in the cases 114 (39%) than the controls 22 (4.4%). Diarrhea was the most commonly reported morbidity found in 180 (60%) of the cases and 88 (16.7%) of the controls.

**Table 1:** Socio-economic and demographic characteristics of children and their parents/caregivers, Konso district, 2015.

Variable	Status of participants		Total	
	Cases	Controls		
<b>Sex of child # (%)</b>	Male	155 (51.8)	278 (52.5)	433 (52.2)
	Female	144 (48.2)	252 (47.5)	396 (47.8)
<b>Age of child mode(SD)</b>		12 (8.28)	12 (11.6)	12 (10.6)
<b>Mother occupation</b>	House wife	225 (75)	395 (74.4)	620 (74.6)
	Petty trading	51 (17)	96 (17.1)	147 (17.7)
	Government employee	0 (0)	20 (3.8)	20 (2.4)
	Daily laborer	6 (2)	7 (1.3)	13 (1.6)
	Other	18 (6)	13 (2.4)	31 (3.7)
<b>Marital status</b>	Married	292 (97.3)	518 (97.6)	810 (97.5)
	Other	8 (2.7)	13(2.4)	21(2.5)
<b>Husband occupation</b>	Farmer	233 (77.7)	407 (76.6)	640 (77)
	Other	67 (22.3)	124 (23.4)	191 (23)
<b>Mothers religion</b>	Protestant	186 (62)	365 (68.7)	551 (66.3)
	Orthodox	86 (28.7)	111 (20.9)	197 (23.7)
	Other	28 (9.3)	55 (10.4)	83 (10)
<b>Saving account</b>	No	281 (93.7)	481 (90.6)	762 (91.7)
	Yes	19 (6.3)	50 (9.4)	69 (8.3)
<b>Cultivated land</b>	No	25 (8%)	52 (9.8%)	77 (9.3%)
	Yes	275 (92%)	479 (90.2%)	754 (90.7%)

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**Table 2:** Multivariate logistic regression analysis for predictors of severe acute malnutrition, in Konso, Southern Ethiopia, 2015.

Factors	Controls # (%)	Cases # (%)	COR(95% CI)	AOR (95%)	
<b>Age of children (in month )</b>	531 (100)	300 (100)	0.97 (0.95, 0.98)	1.23 (1.02, 1.48)	
	0–23	22 (4.4)	114 (39.3)	1	1
<b>Birth interval (in months)</b>	24–48	111 (22.3)	144 (49.7)	0.25 (0.15, 0.42)	0.22 (0.07, 0.70)
	>48	364 (73.2)	32 (11)	0.02 (0.01, 0.03)	0.05 (0.02, 0.18)
<b>Duration of breast feeding(in months)</b>	531 (100)	298 (100)	0.96 (0.93, 0.98)	0.81 (0.68, 0.96)	
<b>frequency of complementary feeding</b>	<3 days	22 (4.1)	19966.3	1	1
	≥ 3 days	509 (95.9)	101 (33.7)	0.02 (0.01, 0.04)	0.67 (0.53, 0.85)
<b>Mothers attending formal education</b>	No	372 (70.1)	283 (94.3)	1	1
	Yes	159 (29.9)	17 (5.7)	0.14 (0.08, 0.25)	0.14 (0.03, 0.49)
<b>Large family Size</b>	529 (100)	300 (100)	1.49 (1.35, 1.65)	1.43 (1.12, 1.82)	

### Nutritional care and practices

Almost all the children were breast feed for varying lengths of time and the duration of breast feeding was not significantly different in the two groups. In both groups breastfeeding was initiated immediately following birth in 208 (69%) of the cases and 451 (85%) of the controls. Lack of exclusive breastfeeding for the first 6 months of age was more common in the cases 217 (73.8%) than in the controls 47 (9.3%). The cases were

initiated complementary diet at a significantly younger age when compared with the controls. Cheka is the most commonly introduced feeding at the earlier age in both groups.

### Determinants of severe acute malnutrition

Multivariate analysis of logistic regression was performed to examine the net effect of each independent variable in the model on malnutrition in children, while controlling for the other independent variables. Severe acute malnutrition was

independently associated with maternal illiteracy; increased number of children in the household, pregnancy, short birth interval, increased age of child, duration and frequency of breast-feeding for the first six months of life and frequency of complementary diet feeding were identified as significant factors (Table 2).

## Discussion

This finding showed that, children of mother attending formal school were found to be at significantly lower risk of being malnourished as compared with children of mother without education. In a case-control study in Bangladesh, the maternal illiteracy was associated with a fourfold increase in the risk of severe acute malnutrition in their children<sup>10</sup>; which is almost similar in this study. The results of the DHS 2011 survey for Ethiopia showed a positive relationship between mothers' education and the nutritional status of their children.

Recurrent infection has been associated with malnutrition, especially diarrhea.<sup>10</sup> A prospective study carried out in other parts of Ethiopia found that malnourished children had significantly higher incidences of diarrheal diseases than their well-nourished counterparts, signifying that malnutrition in itself increased the risk of infection among fewer than five children.<sup>11</sup> However in this study diarrhea and fever were not significantly associated with the nutritional status of the child. Preceding birth is also another important demographic variable affecting nutritional status of children. The significant and higher risk of malnutrition among children of lower preceding birth, i.e., having a preceding birth interval of less than 24 months interval, could be due to uninterrupted pregnancy and breastfeeding, since this drains women nutritional resources. Close spacing may also have a health effect on the previous child, who may be prematurely weaned if the mother becomes pregnant again too early. As the preceding birth interval of the child decreases, the likelihood of being malnourished increases. Similarly low birth interval has been found as a risk factor for severe acute malnutrition in studies done in Sudan.<sup>12</sup> Finding of this study showed that the risk of malnutrition increases with age. As age of a child increased by one month the likelihood of being malnourished increased by 1.2 times. This may be an indication of either inappropriate food supplementation in quantity and/or quality during the weaning and older period or exposure to diseases. Children in the youngest age group were at a significantly lower risk of being malnourished as compared with children in the older age groups. This low risk may also be due to the protective effect of breastfeeding, since almost all children are breastfed and most continue to breastfeed during their first year of life. These finding is consistent with other studies conducted in the southern parts of Ethiopia.<sup>4</sup>

This study also showed that the likelihood of being malnourished was 1.43 times higher among families who have increased number of children compared with low number of children in the house hold. The effect of a large family size with competition for food has been implicated as a risk factor for severe malnutrition in other studies as well.<sup>12</sup> This supports the notion that non-nutritional factors should be essential

components in the effort to reduce severe acute malnutrition in Ethiopia.

Infant and child feeding practices are major determinants of the risks of malnutrition. Optimal infant feeding practices include exclusive breastfeeding for six months of age. Breast feeding is usually associated with improved growth, at least during the first few months of life and malnutrition in general rare in this period in normal children when feeding is optimal. Breastfeeding is a norm in Ethiopia; nearly all the children in both groups were breastfed. The national survey indicated that 96% of children under the age of 5 are breastfed.<sup>13</sup> However, the proportion of exclusively breastfed children up to 6 months was found to be less than optimal in the cases (only 26% EBF) than controls. Breastfeeding was initiated within the first hour after birth around 63% of the cases and 85% of the controls. This is nearly in concordance with the national value of 69%. Although most of the women continued to breast feed their babies well into the first year of life earlier starting of complementary feeds and discontinuation of breast feeding after then was common among the malnourished children and this was one of the most important factors to the development of malnutrition in the study population. This shows that malnutrition in early infancy may be attributed to the lack of exclusive breastfeeding. Besides, early complementary feeding that may expose infants to pathogens and increase their risk of infection which would also negatively affect their nutritional status. A study done in China showed that the introduction of other diet before the age of six months increased the prevalence of pneumonia and diarrheal diseases.<sup>14</sup> Similarly a study in Kenya showed an increased risk of being underweight when complementary food was started early.<sup>15</sup> As a global public health recommendation, infants should be exclusively breastfed for the first 6 months of life to achieve optimal growth, development and health. Thereafter to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to two years of age or beyond.<sup>12</sup>

Feeding less than three times a day more commonly observed in the severely malnourished group than the controls. It is usually associated with burden of workloads which prevent women from dedicating time to their children. This indicates that it is not only lack or shortage of food that predisposes young children to malnutrition but also lack of knowledge on appropriate infant and young child feeding and care practices.

## Strengths and Limitations of the Study

### Strengths

Use of nurses as data collectors who know local languages and this reduces information biases.

### Limitations

It is possible that selection bias could occur since cases are selected from institutions, but efforts were made to choose the controls as randomly as possible. It is also realized that recall of information remains a potential source of bias; attempts were made to overcome this by probing mothers to respond by association with life events.

## Conclusion

As seen in the study, education of mothers, number of children in the household, preceding birth interval, child's age, duration of breast feeding and frequency of complementary diet feeding were associated with severe acute malnutrition in children below the age of 5 years. So the following recommendations are forwarded to different bodies.

## Recommendations

### To the community

Parents are encouraged to ensure that their infants are breastfed exclusively and breastfed up to the age of two year.

### To health extension workers and health workers

Providing simple and "easy to understand" information to the mothers/caretakers on how to care for a child especially during the first year of child life. Increasing the coverage and providing quality FP programs.

### For government and NGO

Strengthen sustainability of health extension program by giving regular training in the management of malnutrition and focusing on essentials nutrition actions. Encouraging of girls education especially on primarily school.

## Acknowledgement

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## Authors' Contribution

AE initiated the research, wrote the research proposal, conducted the research, did data entry and analysis and wrote the manuscript. EA involved in the write up of methodology of proposal and research work.

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