The burden and underlying determinants of under nutrition among under five year children in Gurage Zone

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ABSTRACT

Background: Malnutrition is one of the most common causes of morbidity and mortality in children under the age of five year. However, In Gurage zone Information about the prevalence and associated factors of malnutrition still limited. **Aims and Objectives:** The major objective of this study was assessing the burden and determinants of malnutrition among under five children. **Materials and Methods:** A community based cross-sectional study design was applied from December 25, 2016 to April 25, 2017. A total of 1040 eligible mothers were interviewed using structured interviewer administered questionnaires by trained data collectors working in pediatrics ward. Through systematic sampling technique study participant were included in the study. To test the existence of statistical relationship between independent and dependent variables multiple logistic regressions analysis was used. **Results:** The prevalence of malnutrition among study children was 38.8%. Logistic regressions analysis result indicated that Unimproved sanitation [AOR 1.58 (95%CI 1.13-2.2)], food insecurity [AOR 2.06 (CI 3.49-3.33)], maternal disempowerment [AOR 4.1(CI 2.69-6.24)], inadequate frequency of exclusive breast feeding [AOR 1.9 (95% CI 1.176-3.357]. showed a significant association with malnutrition. **Conclusion:** The prevalence of malnutrition among under five year children living in Gurage zone was 38.8 %. It was associated with utilization of unimproved sanitation, maternal disempowerment, food insecurity. Hence to abort the problem, it is better to enhance house hold food security, exclusive breast feeding, maternal empowerment and utilization of improved sanitation.

Key words: Malnutrition; Determinants of undernutrition; Burden of undernutrition in Gurage Zone

INTRODUCTION

The World Health Organization (WHO) defines malnutrition as a cellular imbalance between supply of nutrients and the body's demand for them. Malnutrition is a health outcome as well as it can increase the risk of both morbidity and mortality associated with other disease.[1]

Globally, malnutrition is one of the most common causes of morbidity and mortality in children under the age of five years.[2] Forty five percent (45%) of all child deaths that occurred in the world directly and indirectly associated with malnutrition. In support of this, of 6.9 million of death that occurred globally 3.1 million were associated with malnutrition.[3] In 2011, 165 million children were stunted, 101 million children were under weight, 52 million were wasted worldwide. Africa and Asia account the ninety percent of (90 %) of this statistics.[4]

In Africa, Ethiopia is the second-most populous country that inhabits approximately 83 million people and of these; around 14% of them were children under five years of age.[5] These children and their mothers were suffering disproportionately from poor health and nutrition in the

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country.[6] In 2014 nationally 44%, 25% and 9% of children under the age of five year were underweight and wasted respectively.[7] In addition, in Ethiopia 51 % of deaths that occurred among under five years children were associated with malnutrition.[7] In 2014, 44%, 26% and 7% of under year's children living in Southern part of Ethiopia were stunted, underweight and wasted respectively.[7]

The risk factors of malnutrition are multifaceted and complex. Besides, relative importance of each of the known risk factors is can vary from region to region and country to country. It has long been recognized that poor socioeconomic status, low education, sub-optimal nutrition and poor environmental and personal hygiene condition, poor nutritional status of the mother as a major risk factors of malnutrition but the relative importance of each of the known risk factors are can vary from set up to set up. There were a multiple of epidemiological studies done on determinants of childhood malnutrition but none of them simultaneously examine the role of food insecurity and maternal disempowerment on the risk of malnutrition. Besides, to the best of authors knowledge there is no empirical study done to assess the prevalence of malnutrition in Gurage zone. Hence, this study aimed to determine the prevalence and the determinates of malnutrition in Gurage zone.

METHODS AND MATERIALS

Study area
The study was conducted within community of Gurage zone which is located in southern region of Ethiopia with a total population of 1,279,646 (622,078 were men and 657,568 were women). The livelihoods of the residents were mainly based on agricultural product. Currently, the zone has one general hospital and different private and governmental health institution that has been offering different health care services.

Study design
A community based cross-sectional study design was applied from December 25, 2016 to April 25, 2017.used to describe the prevalence and associated factors of malnutrition.

Study population
All under five year children living in selected districts of Gurage zone were considered as study populations.

Inclusion and exclusion criteria
Those under five year children who had a mother who lived in Gurage zone for a minimum of six month were included in the study but Orphan children or children separated from his or her mother by various reasons were excluded from the study.

Sample size determination
The required sample size was determined through EPI INFO version 7.0 software. Since one of the objective was to determine the prevalence of malnutrition, single population proportion formulas with the following assumption i.e confidence levels of 95%, prevalence of wasting 13%, margin of error 3% was used. Based on the above assumptions, with additional 10% for non response rate and design effect of 2 the total sample size calculated was 1062.

Sampling technique and procedure
Since, the zone has a total of thirteen homogenous districts, four of the districts (Cheha, Enemor and Ener, Meskan and Abeshge Districts), which accounts about 31% of the districts, were randomly chosen. Then, the calculated sample size was proportionally allocated to each selected districts. Since kebele (the lowest subdivision district) within selected districts are homogenous, about 25 % of them were selected through lottery methods. Before selecting the study sampling frame was created through direct numbering of eligible households in the kebele. Finally, using sampling frame a total of 1062 participants were picked through lottery method.If more than one child was living in a single household and picked during selection, one of the child was included through lottery methods.

Study variables
household food security status, household maternal empowerment status, maternal height, maternal age, maternal occupation, educational level of the mother, access to improved water sources, sanitation, flooring type of the household, sex of the child, age of the child, birth order of the child, twinning religion, residence were considered as explanatory variables of the study where as malnutrition is the outcome variable of the study. To this study malnutrition means height for age Z -score or weight for height Z- score or weight for age Z-score less than -2 SD. Household Adequate Access to improved source of water was defined as Getting water 20 lit water/c/d for urban Vs 15 l safe water/cl/d for rural household from piped, protected ground water (wells, springs) source within one kilometer or <15 minute which is enough for daily need. A sanitation that constitutes one of the following: connection to a public sewer, connection to a septic tank system, pour-flush toilet, hygienic pit toilet, ventilated improved pit (VIP) toilet were categorized as improved sanitation (8) whereas a sanitation options which are not considered "improved" which include: Public or shared toilet, open pit toilet, Bucket toilet were defined as Unimproved sanitation (9). In addition, those mother who lack the autonomy to decide alone or jointly with her husband in any of the following three decisions making process:-her own and child health care, allocation of

household resource/household expenditure, and to visit their relatives(family) or health institution were diagnosed as disempowered mother.

Data collection techniques and quality assurance

The mothers of the selected children were interviewed using structured and interviewer administered questionnaire. The questionnaire incorporates questions that could measure maternal empowerment, socio-economic and demographic factors, child characteristics, maternal characteristics, environmental health and household food security status well. The English version questionnaire was translated in to Amharic version for common understanding. The nutritional status of the children was measured through anthropometric measurements. Weight scale was used to measure the weight and height of children. Measuring board instruments was used to measure the height of children aged below two. To assure the validity of the scale, the weight of the participants was measured in undressed or with minimum clothing, the weighting scales was calibrated with known weight object regularly and three data collector were assigned to measure the height and weight of the child. The scale indicator was checked against zero reading after weighing every child.

The questionnaire was pre- tested on 53 children (5% of the sample size) living in a population out of study population. To assure the quality of data, data collectors and supervisor got intensive two day training on objective of the study, procedure and technique of data collection. The supervisor and investigators closely monitors the data collectors.

Data processing and analysis

Using Statistical Package for Social Sciences version 21 (SPSS) data cleaning, recoding, categorizing and analyzing were done. Anthropometric data were analyzed through Emergency Nutrition Assessment software (ENA). Other statistical analysis was done by SPSS version 21. Through interviewing three questions that could measure the autonomy of the mother on decision related to resource allocation, own and child health care and mobility, maternal empowerment was measured. Household food insecurity status of the participants was assessed by using nine generic questions of Household Food Insecurity Access Scale (HFIAS) which was developed by USAID Food and Nutrition Technical Assistance (FANTA) (36). Through using this scale household food insecurity were categorized into four level i.e Foods secure, and mild, moderately and severely food insecure). To summarize the distribution of each variables mean, frequency and percentage of the variable were calculated. To evaluate the association between a single independent variable with dependent variable Crude Odds Ratio were used. To adjust the effect of confounder variables that had p-value less than 0.05

were entered in multiple logistic regressions analysis. To test the observed association is statistically significant or not 95% CI was used.

Ethical consideration

Since the study procedure didn't undergone immoral and invasive procedures, letter of permission were obtained from the research ethics committee of Wolkite University. Cooperation letter to district health office was gained from Gurage Zone health bureau. After the study participants got clear explanation on the objective, risk and benefit of the research work their verbal consent was obtained.

RESULTS

A total of 1062 child-mother pairs were planned to be studied but only 1040 child-mother pairs were happy for the invitation. This gives us overall response rate of 99.4 %.

Socio-demographic characteristics

Of 1040 children who were included in the analysis almost half of them (47.8%) were Muslim; the rests were followers of orthodox (40.6%) and protestant (11.6%) religion. Looking at the age structure of participants, about eighty three percent of (83.6 %) mothers found within age range of 18 and 35 years where as sixteen percent (16.3%) and 0.2 % of the mothers were within age group greater than 35 and less than eighteen years respectively. Most of the study children were aged 6 month and above. Pertaining parental educational status about 39.9 percent of mother and sixty percent (60.4%) of father had primary and above level of education. regarding to parental occupation the majority of mother (88.6%) were housewife and eighty four percent (87.1%) of father were farmer.

Of 1035 participants, only sixty five percent (65.1%) of them were living in food secured household. The rest 7.3%, 18.3% and 9.3 % of participants were living in household with mild, moderate and severe type food insecurity.

In relating to maternal empowerment status, fourteen percent (14%) the mother were disempowered, twenty eight percent (28.2%) were partially empowered and the rest fifty seven point eight percent (57.8%) were empowered mother (see Table 1).

Child characteristics

In this study, the proportions of male and female children were more or less equal. Most of the study children were singleton and had age of 6 month and above. About fifty three percent (53.6%) of the children had fourth and above birth order. This study indicated that from a total of 1035 under five children, 400 (38.8%) of them had malnutrition (see Table 2).

Table 1 : Socio-demographic table characteristics of the mothers by the new born birth weight in Gurage zone public hospital, June 2017

Explanatory variables	Category	Case	Control
Maternal age group	<18yrs	1	7
	18-35 yrs	119	239
	>35 yrs	11	11
Religion	Ortodox	63	133
	Catholic	9	11
	Protestant	13	32
	Muslim	46	89
Maternal occupation	Employee	20	31
	Farmer	15	27
	Merchant	11	24
	Housewife	85	183
Maternal educational status	Had formal education	90	170
	Had no formal education	41	95
Maternal level of education	Primary	61	100
	Secondary	7	45
	Diploma	9	12
	Degree and above	13	13
Paternal educational status	Had formal education	101	197
	Had no formal education	30	67
Paternal level of education	Primary	46	103
	Secondary	26	55
	Diploma	9	10
	Degree and above	20	29
Paternal occupation	Employee	38	56
	Farmer	70	137
	Merchant	13	51
	Other	10	20

Table 2 : Characteristics of the study children in Gurage Zone, SNNPR, April 2016.

Child characteristics	Category	Frequency	Percentage
Sex	Male	540	52.0
	Female	498	48.0
	Total	1038	100.0
Age group	<6 month	70	6.7
	[6month-24)	399	38.4
	[24-36)	256	24.7
	[36-59)	313	30.2
	Total	1038	100.0
Birth order	First	122	11.9
	Second	164	15.9
	Third	191	18.6
	Fourth	552	53.6
	Total	1029	100.0
Twining	Twin	12	1.2
	Singleton	1002	98.8
	Total	1014	100.0
Child Nutritional status	Malnourished Malnurished	400	38.8
	Normal	631	61.2
		1031	100

Table 3 : Environmental and child feeding practice of study participants, Gurage Zone, SNNPR, April 2016

Explanatory variables	Category	Frequency	Percentage
Practice of exclusive breast feeding	Practiced	717	69.4
	Not practiced	316	30.6
	Total	1033	100
Frequency of exclusive feeding	< 8 times	85	8.3
	>=Eight times	941	91.7
	Total	1026	100
Adequate Access to improved water supply	Had access	642	62.7
	Had no access	382	37.3
	Total	1024	100
Sanitation type	Improved	592	57.3
	Unimproved	442	42.7
	Total	1034	100
Floor type	Mud	986	95
	Cement	52	5
	Total	1038	100

Environmental and child feeding practice

Out of 1034 study participant, sixty-one percent of them (61.7 %) had adequate access to improved source of water. about fifty seven percent of them had improved sanitation where as the rest (42.7 %) of household had no improved sanitation. Moreover, majority of study children (95%) lived in household with muddy floor. Concerning breast feeding, about seventy percent (69.9%) of participants practiced exclusive breast feeding; about ninety two percent (91.7%) of mother gave exclusive breast feeding greater than or equal to eight times per day. (see Table 3).

Factors associated with malnutrition

Multivariate logistic regression analysis revealed that, lack of improved sanitation, not practicing exclusive breast feeding, food insecurity and maternal disempowerment were significantly associated with malnutrition.

Those children who had disempowered mother had 3.9 times higher risk of developing malnutrition compared to children with empowered mother)], [AOR 3.9 (95% CI 2.69 -6.24)].

Comparing to children living in food secured household, children living in a household with moderate and sever food insecurity had higher chance of getting malnutrition. Those children living in severely and moderately food insecured household had about two times more likely to develop malnutrition [AOR 2.06 (95% CI 3.49-3.33)] and [AOR 2.00 (95% CI 2.882-1.365)]. In this study, mild household food insecurity didn't show a statistical relationship with malnutrition

This study also demonstrated that children who didn't practice exclusive breast feeding had 1.44 times more likely to have malnutrition compared to children who practiced exclusive breast feeding [AOR 1.44 (95% CI

1.05-1.97)]. children living in households who didn't had had 1.58 times more likely to develop malnutrition [AOR 1.58 (95% CI 1.13-2.25)] than children living in household with improved sanitation. Children who experienced inadequate frequency of exclusive breast feeding had about two time's higher risk of malnutrition [AOR 1.9 (95% CI 1.176-3.357]. In this study, we didn't got enough evidence showing the association between access to adequate improved water source and malnutrition (see Table4).

DISCUSSION

By using a cross-sectional study design, this study assessed the prevalence and associated factors of malnutrition in Gurage zone. The study revealed that, the prevalence of malnutrition in study area was 38.8% and it was associated with lack of improved sanitation, not practicing appropriate exclusive breast feeding, food insecurity and maternal disempowerment.

Comparing to other prevalence study finding done in west Gojam zone and Dollo Ado district of Somalia region, the burden of malnutrition here in study area was high.[8] This may be attributed to variation in climate, human development efforts, variation in distribution of socio

demographic factors that has a strong association with children's' nutritional status. However, the finding of this study was very consistent with study done on Bule Hora districts of Southern Ethiopia.[9] The magnitude of malnutrition in Iran is lower than the magnitude in this study area.[10] The best explanation for the disagreement may be due to, introduction of successful public health interventions undertaken by government and nongovernmental organization in Iran, variation in social and human development.

Comparing to children who were living in household with improved sanitation, children living in households with unimproved sanitation had 1.58 times more likely to develop malnutrition. This variation might be due to children living in household with unimproved sanitation have more chance of exposure for repeated infections like diarrhea, intestinal parasitosis and other fecal born disease which ultimately compromises the nutrient intake of the growing child. This finding is in line with study done in Bola Hora Distracts in Somalia region of Ethiopia and Kwara State of Nigeria.[9,10] However, studies done in southern and North West of Ethiopia sanitation had no a valid statistical association with malnutrition.[11,12] The variation may be because of different technical definition applied for sanitation or the context.

Table 4 : Factors associated with malnutrition from logistic regression analysis model, Gurage zone, SNNPR, April 2016

Explanatory variables		Malnutrition		Per COR (95%CI)	AOR tage	95%CI for AOR	
		No	Yes			Lower	Upper
maternal empowerment status	Disempowered	52	88	4.582 (3.104, 6.765)	3.952	2.606	5.991
	Partially Empowered	135	146	2.928 (2.173, 3.946)	2.704	1.970	3.712
	Empowered	417	154	1.00	1.00	-	-
Level of food insecurity	Food secured	449	218		1.00	-	-
	Mild food insecurity	42	34	1.667 (1.031, 2.695)	0.867	2.534	0.867
	Moderate food insecurity	96	91	1.952 (1.405, 2.714)	2.008	2.882	1.365
	Sever food insecurity	42	54	2.648 (1.715, 4.089)	2.009	3.490	1.339
Practice of exclusive breast feeding	Practiced	473	239	1.00	1.00	-	-
	Not practiced	153	160	2.070 (1.579, 2.713)	1.448	1.060	1.977
Frequency of exclusive feeding	< 8 times	30	53	3.049 (1.911, 4.865)	1.987	1.176	3.357
	>=Eight times	592	343	1.00	1.00	-	-
Adequate Access to improved water supply	Had access	387	248	1.00	1.00	-	-
	Had no access	236	144	0.952 (0.773, 1.237)			
Sanitation type	Improved	404	183	1.00	1.00	-	-
	Unimproved	225	213	2.090 (1.618, 2.700)	1.584	1.180	2.126
Floor type	Mud	589	388	2.196 (1.138, 4.239)	1.889	0.877	4.068
	Cement	40	12	1.00	1.00	-	-

Those children who didn't practice exclusive breast feeding had 1.4 times more likely to develop malnutrition compared to children who practiced exclusive breast feeding. This can be best explained by the fact that, till six months exclusive breast milk can prevent repeated infection through providing all of the necessary nutrients for healthy development;through providing important antibodies against common childhood illnesses and through preventing babies from ingesting contaminated water that could be mixed with infant formula. Hence, lack of this opportunity may compromise the nutritional status of the children. Encouragingly, this finding was in line with studies done in different part of Ethiopia, Bangladesh and Nepal.[9, 11-19]

Malnutrition in this study area didn't show a significant association with Access to adequate source of improved water. This statistically insignificance result can be best explained by due to the majority of population in both malnourished and well nourished group had access to adequate source of water.

This study also indicated that children living in household with sever food insecurity had 2.1 times more chance of developing malnutrition compared to children living in food secured household. This risk dissimilarity may be due to the fact that children living in household with severe food insecurity can have more chance for inadequate food intakes, eating poor-quality food, and to have disrupted eating patterns. Compared to study done in different part of the world this finding was very consistent with studies done in Nepal, East-Central Uganda, and Colombia.[20 -26] However, this finding was not in line with the finding of other similar studies done in east rural Ethiopia which revealed that food insecurity had no significant association with malnutrition.[9,27] This inconsistency might be due to the copying mechanism of mother living in food unsecured household which forces mother to reduce their own intakes to secure their infants and small children. The difference may also be explained by the high prevalence of food secured household and its insufficiency to secure the nutritional wellbeing of the children. Study done in slum area of South Africa also showed inconsistent result. This inconsistency may be due to the difference in measurement tools, use of convenient sampling technique which is a potential source of selection bias, and also may be due the copying mechanism of the setup.

Children of disempowered mother had 3.9 times more risk of malnutrition compared to those children with empowered mother. This might be best explained by the fact that, disempowered mothers do not have the autonomy to allocate the household resource for the preparation of adequate quantity of quality proofed food recommended for growing children, for utilization of the appropriate preventive (e.g. immunization) and curative (while their child get sick) health care service for their growing child. The observed difference may be also due to the fact that, disempowered mothers have less probability to utilize maternal health care services (antenatal, delivery care,postnatal care) and other medical care that are crucial to enhance the overall care of their children.[28]

This study has some strength and limitations. The sampling technique and the study design applied make the finding upon prevalence of malnutrition to be representative of the target population. However, since it applies a cross-sectional study design it is difficult to assure the temporal relationship between some independent variable and dependent variable.

CONCLUSION AND RECOMMENDATIONS

The prevalence of malnutrition among under five year children living in Gurage zone was 38.8 %. This public health problem was associated with utilization of unimproved sanitation, maternal disempowerment, food insecurity and not practicing exclusive breast feeding. Hence, this study implicated that the prevalence of malnutrition is high compared to other area. Hence, Gurage zone health department should abort the problem through enhancing food security status of the household, maternal empowerment, improved sanitation and exclusive breast feeding.

Data availability
The data generated or analyzed during the current study are available from the corresponding author on reasonable request.

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