Prevalence of Stunting and Associated Factors in Children of 6-59 Months' Old in Ethiopia

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Abstract: *Introduction*: Malnutrition among under-5 year children is a common public health problem and it is one of the main reasons for the death of children in developing countries. About 35% of under-five children's death is associated with malnutrition globally. There are 165 million stunted, 99 million under-weighted, and 51 million wasted children globally. In Ethiopia, more than half of child deaths are associated with malnutrition. The objective was to assess the prevalence of stunting and associated factors in children of 6-59 months old in central Tigray, Ethiopia.

Methods: A community-based cross-sectional study was conducted in children of 6-59 months of age with a total sample size of 420. Systematic random sampling method was used. Data were coded and entered in the computer using SPSS version 20 Software and world health organization anthropometric version 3.3 was used to convert these nutritional data into Z-scores of the induces. Descriptive summary using frequencies, proportions, graphs and cross tabs is used to present study result. Binary Logistic regression analysis was carried out at two levels to identify factors associated with stunting

Result: The prevalence of stunting is 47% and variables like age of the mother, duration of breastfeeding and the way how to feed the child was the variable that had statistical significantly associated with stunting.

Conclusion: The prevalence of stunting is high and consistent as compared to other studies done in Ethiopia. This indicates that malnutrition among under-five in central Tigray is comparable with other regional states of Ethiopia.

Keywords: Malnutrition, Stunting, Wasting, underweight, Ethiopia.

BACKGROUND

Undernutrition and over nutrition are categorized as malnutrition, however, undernutrition which considers persons that are malnourished due to their diet do not supplement sufficient calories and proteins for the growth of the bod and Malnutrition among under-5 year children is a common public health problem and it is one of the main reasons for the death of children in developing countries [1-4]. Globally 155 million of 6-59 months age children were stunted among this 90 % of them are in Africa and Asia [5-8].

Low height for age (stunting) is considered a good indicator of child growth because it reflects the cumulative consequence of undernutrition and repeated infections sign of chronic malnutrition [9-11]. To alleviate the malnutrition-related problems different programs and strategies were implemented but still stunting is primary public health problems in developing countries including Ethiopia [12-14].

Child stunting is one major factor to 6- 59 months old age children morbidity and mortality due to high susceptibility to repeated infections and show low recovery from illness [15-18]. Stunting is the devastating result of poor nutrition in-utero and early childhood and Children suffering from stunting may never attain their full possible height and their brains may never develop to their full cognitive potential [19-22].

The federal democratic republic of Ethiopia government especially the ministry of health has been conducted many activities to improve the nutritional practice in 6-59 months old age children [3, 23-27]. However, the prevalence of stunting is still the highest problem in the country [28-30]. So the result of this study helps to know the magnitude of the problem and their associated factors including Scio demography, environmental, child-caring practice and repeated illness underline factors are identified clearly. Moreover, is important to make a plan for the prevention of these factors. Furthermore, the result of the study can be used as secondary resources for other researchers, governmental and none governmental organizations.

METHODS

Study Setting, Design and Period

The study was conducted in Enticho town, Ahferome Woreda (district), the central part of Tigray, North Ethiopia. And the total 6-59 months age children's are 1,990 out of which 53% are females and 47% are males. The total households of the town are 13,032 households. The community-based cross-

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sectional study design has been conducted from February to March 2017. All children from 6-59 months old age living in Enticho town, Ahferom woreda (district) central zone of Tigray Ethiopia were the source population and child was selected by systematic random sampling method using the sampling frame available in the town administration every interval of 31. Seriously ill child during the study and with deformities which makes difficulty in anthropometric measurement were excluded during the study.

Sample Size Determination

The sample size was determined using a single population proportion formula. A study was done in the same district, the southeastern zone of Tigray, Ethiopia shows that the prevalence of stunting, underweight and wasting to be 52% 21% and 12.6% respectively [31]. By using the assumptions proportion of stunting (P) = 52%, Z= 1.96 (95% level of confidence), and d = 5 %(marginal of error). By adding 10% of non-response rate the final sample size was 420 children.

Data Collection Tool and Procedures

Data were collected using structured questionnaire through face to face interviewing of mothers or caregivers and measuring the anthropometrics like weight, height and mid-upper arm circumference (MUAC) of each child which was targeted for the study. The researchers strictly followed the measurement and recording of height and weight of children selected for the study to Uphold the consistency of anthropometric measurements. Date of birth of Children, in most cases, was established relying on the date given by the Mother or caretaker. For those with written evidence, the date of birth was obtained from expanded immunization (EPI) cards from the households.

Structured questioners were prepared for data collection and pretested on 5% of the sample size. The two-day training was given for four data collectors and the questioner was prepared in English and translated to local language Tigrigna and back to English to maintain the consistency of the data. Anthropometric measurements were taken from all children aged 6-59 months to assess their nutritional status; Length of the child aged 6-23 months was measured in a recumbent position to the nearest 0.1 cm using a board with an upright wooden base and a movable Headpiece. Height of children (24-59 months of age) was measured in a Standing-up position to the nearest 0.1 cm using a vertical board with a Detachable sliding

headpiece. Weight of the child was measured with light clothing and without shoes to the nearest 0.1 kg using UNICEF Electronic Children that can't stand in the weigh scale were measured together with his/her mother or caregiver, the mother was weighed with the child and weighed without the child and then subtract weight of the mother from the total weight. The difference between the two measures is the child's weight. Then the nutritional status of children was assessed using the indicators Weight-for-age, weight-for-height, and height-for-age, according to WHO reference standard.

Data Entry, Processing and Analysis

First, the data were checked for completeness and consistency. The data was cleaned and edited before analysis and data exploration was undertaken to see if there are items which were none logical. Then it was coded, entered and analyzed in the statistical software of statistical package for social science (SPSS) version 20 Software and variables like sex, age, height and weight entered in to world health organization (WHO) anthropometric version 3.3 to convert these nutritional data into Z-scores of the induces; height for age (H/A), weight for age (W/H) and weight for age (W/A) using the population standard of world health organization. Descriptive summary using frequencies, proportions, graphs and cross tabs is used to present study result.

A binary logistic regression model was applied to identify the factors associated with stunting of children because the dependent variable is dichotomies in nature. Bivariate analysis carried out to determine the differential of children of 6-59 months stunting by explanatory variables. Then those predictor variables which were significantly associated with the outcome variable at 0.2 and less level of significance from the bivariate analysis were entered into the multivariate logistic regression model. P-value <0.05 was considered as statistical significance at a multivariate analysis of binary logistic regression. The model fitness was checked by Hosmer and Lemeshow test and it was fitted. To control confounder in the model multivariate binary logistic regression analysis was applied and more over multi co-linearity of variables was by a variance inflation factor (VIF) and all variables were below the cut off (VIf<10).

Ethical Consideration

Ethical clearance was obtained from the Department of public health college of medicine and

health science of Adigrat University. Written informed consent from parents/guardians was obtained and the objective of the study, benefits, risks, and their right to participate or withdrawal from the study was explained to the parents or guardians. Privacy and confidentiality of collected information are ensured at all level. Children with severely malnourished with problems of shortage foods and who have complications were granted to advise their parents to bring them to the nearest health facility.

RESULTS

Socio-Demographic Characteristics of the Study Participants

The total sample size included in the study was 420 children. All the study subjects provided their relevant information which made the response rate 100%. Regarding maternal age, most of the mothers were in the age group of 25-29 which is about 151(36%). But a small number of mothers was in the age group of 15-19

Table 1: Socio-Demographic Characteristics of the Family and the Child in Enticho Town, Ahferom Woreda, the Central Part of Tigray, North Ethiopia, 2017

Variables	Response	Frequency	Percent (%)
Age of the Mother	15-19	5	1.2
	20-24	83	19.8
	25-29	151	36.0
	30-34	111	26.4
	35-39	58	13.8
	40-44	12	2.9
	Total	420	100.0
Marital Status	Single	15	3.6
	Married	398	94.8
	Divorced	7	1.7
	Total	420	100.0
mother educational status	Illiterate	57	13.6
	can read and write	21	5.0
	Grade 1-8	181	43.1
	Grade 9-12	120	28.6
	college / university	41	9.8
	Total	420	100.0
Mother occupation	Housewife	251	59.8
	gov't employee	72	17.1
	Merchant	60	14.3
	daily labour	19	4.5
	Other	18	4.3
	Total	420	100.0
monthly income	<=500	112	26.7
	500-1000	84	20.0
	1100-1500	45	10.7
	1600-2000	43	10.2
	>=2000	136	32.4
	Total	420	100.0
NO of 6-59 month children	1	334	79.5
	2	81	19.3
	3	5	1.2
	Total	420	100.0
family size	<=4	198	47.1
	>4	222	52.9
	Total	420	100.0
SEX of children	Male	253	60.2
	Female	167	39.8
	Total	420	100.0

which is 5(1.2%). Regarding the educational status of mothers, most of the mothers attend grade 1 up to 8 which is 181(43%) but only 21(5%) of them can only write and read. most of the mother's occupation was housewife which is 251959%), but smaller numbers of mother work in other occupations including bartender and others (Table **1**).

Feeding Practice of the Child

Regarding breastfeeding practice, most of the study subjects have fed breast milk since their birth which accounts 411 (97.9%) and the remaining 9(2.1%) did not feed breast milk instead they have fed formula milk. Those children who have got breast milk, fed for vary duration in time, 17(14%) fed for <12 months, 213(50.7%) fed for 12-14 months and 39(9.3%) fed for >24 months. 66(15.7%) of them feed their child less than 8 times per day and 354 (84.3%) of them greater than 8 times per day.

The exclusive breastfeeding rate for children 6 to 59 months of age was 391(93.1%), and 19(4.5%) started additional food at < 6 months, moreover, 10(2.4%) of them started complementary food at 7 to 12 months. All children initially starting food is almost porage and all the children in the study are immunized according to EPI.

Previous and Repeated Illness

Out of 420 study subjects, 82 (19.5%) of them reported different cases that they have experienced before the study. Among those 13 (3.1%) of them reported a history of fever, 20(4.8%) of them vomiting, 31(7.4%) reported a history of diarrhoea, 18(4.3%) reported a history of pneumonia. Regarding serostatus among 420 study subjects, 403(96%) of them have known non-reactive serostatus but 13(4%) of them have unknown serostatus.

Environmental Factors

Regarding the source of water 405(96.4%) of the respondents use tap water, 8(1.9%) from spring water and 7 (1.7%) of them use another source. Regarding latrine 343(81.7%) of them have functional latrine but 77(18.3%) of them have no functional latrine. Regarding the general cleansing of the house 258(61.7%) of the households has poor, 146[34.8%] fair and 16 (3.8%) of them have poor general cleanse of the house.

Anthropomorphic Measurement (Nutritional Status)

The finding of the study showed that the prevalence of stunting was 197(47%). Moreover, in the study area, the prevalence of wasting and underweight was 33(8%), 79(19%) respectively.
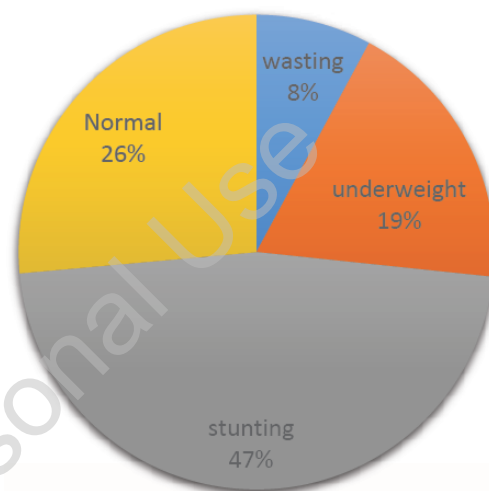

Figure 1: Pi-chart representing the prevalence of malnutrition in children, of 6-59 months in Enticho town, Ahferom woreda, Central part of Tigray, North Ethiopia, 2017.

Factors Associated with Stunting

To identify the factors associated with stunting bivariate and multivariate binary logistic regression has been conducted. The model fitness and multi co-linearity were checked by Hosmer and Lemeshow test and variance inflation factor respectively. At bivariate analysis eight variables (mothers age, mothers education, monthly income, duration of breast milk, frequency of breast milk, who feed the child, source of water and cleanness of the house) were with a p-value less than 0.2, hence they transferred into multivariate analysis. Duration of breast milk, which feeds the child and mothers age were the variables that have a statistically significant association with stunting in the multivariate analysis with a p-value less than 0.05. Detail Table **2**.

DISCUSSION

In the current study, the levels of stunting were 47% (95% confidence interval of 41%, 51%) and duration of breast milk, who feeds the child and mothers age were the variables that have a statistically significant association with stunting.

Table 2:   Factors Associated with Stunting in Children's of 6-59 Months in Enticho Town, Ahferom Woreda, Central Part of Tigray, North Ethiopia, 2017

Variables		Stunting		COR(95% CI)	AOR(95%CI)	P-value
		yes	no			
Mothers age	15-19	4	1	4.97(0.936,53.885)	5.31(1.37, 9.47)	**0.0321***
	20-24	37	46	2.41(0.609, 9.558)	2.201(1.22,5.877)	**0.0159***
	25-29	77	74	3.12(0.813, 11.982)	3.260(1.228,8.382)	**0.0233***
	30-34	60	51	3.52(0.907, 13.736)	2.294(1.332,6.716)	**0.0281***
	35-39	16	42	1.14(0.274, 4.766)	1.095(1.10,10.918)	**0.042***
	40-44	3	9	1		
Mothers education	Illiterate	19	38	1		
	Can read and write	8	13	1.231 (0.436, 3.478)	1.531(0.182,1.555)	0.248
	Grade 1-8	87	94	1.851 (0.993, 3.452	1.799(0.405,2.77	0.518
	Grade 9-12	61	59	2.068 (1.072, 3.988)	1.893(0.439,5.817)	0.755
	College/univer	22	19	2.316(1.015, 5.283)	3.121(0.567,11.254)	0.642
Monthly Income	≤500	45	67	0.615(0.371,1.020)	0.615(0.371,1.020)	0.40
	500-1000	42	42	0.915(0.531,1.578)	0.915(0.531,1.578)	0.45
	1100-1000	18	27	0.610(0.308,1.21)	0.610(0.308,1.21)	0.158
	1600-2000	21	22	0.874(0.440,1.735)	0.874(0.440,1.735)	0.271
	>2000	71	65	1	1	
Duration of breastfeeding	<12 months			1.250(1.389,4.014)	1.610(1.289,4.014)	**0.021***
	12-24 months			1.769(01872,3.588)	1.769(1.72,3.588)	**0.007***
	>24 months			1	1	
Breastfeed Frequency	<8	36	30	1.49(0.849,2.438)	1.79(0.711,8.648)	0.117
	>=8	161	193	1	1	
Who feed the child	Himself	91	109	2.808(1.541,10.207)	2.341(1.241,11.401)	**0.0298***
	Elder siblings	13	24	2.524(1.251,17.093)	3.14(1.891,18.312)	**0.0146***
	Parents	93	90	1	1	
Source of water	Tap water	192	213	1	1	
	Spring	2	6	0.370(0.74,1.854)	0.410(0.451,1.854)	0.226
	other	3	4	0.832(0.184,3.765)	0.942(0.184,33.735)	0.811
Cleanness of the house	Good	125	133	1	1	
	Fair	65	81	1.016(0.676,1.527)	2.14(0.944,121.012)	0.940
	Poor	7		0.551(0.227,1.334)	1.551(0.324,97.334)	

*-statistical significant, 1-reference category.

The prevalence of stunting in the current study is consistent with researches done in Pakistan [32] and South Asia [33]. Moreover, this research is comparable with a study conducted in Ethiopia Amhara region North Shewa 52% [34], Lalibela town 51% [35], Libokemkem 49% [11], in the southern part of the country humbo district 53% [36]. And Tigray region of the country 46.7% [37].

The prevalence of stunted children in this study area is much higher than that of the study done by WHO, UNICEF, WORLD BANK GROUP which was 22.2% [22]. Besides, These prevalence rates of malnutrition indicated that the under-five children of this study area have a higher prevalence of stunting compared to national figure from EDHS 2016 report and in Amhara region of the country [38, 39]. This difference in the prevalence of stunting might be due to the study area included in the current research was an only urban residence but in the previous three study's included both urban and rural residences.

Duration of breastfeeding has a statistically significant association with stunting. Children who feed

less than 12 months are 1.6 times more likely to be stunted with AOR 1.61, and 95% CI 1.289,4.014 as compared to those feeding >24 months. In contrast a study done in Ethiopia shows the longer duration of breastfeeding practice might encourage lower acceptance of none breast milk foods and lower energy intake in children in this study the risk of severing stunting was 8 times higher among children breastfeeding more than 2 years while it is about 6 times among those between 1-2 years [40]. This indicates the increase in risk to be stunted with a short period of duration of breastfeeding of the children's.

Mothers age which is between 20-24 years have a significant association with stunting in our study. The risk of stunting decreased by 25% if the mother aged between 20-35 years than if less than 20 and above 35 years and this result is consistent with a study conducted in Ethiopia shows that children's from older mother had a higher risk of malnutrition [41].

Children who are feeding by elderly siblings have significant associations with stunting. Children who feed by their siblings are 3.14 times more at risk than those feed by their parents. This could be attributed to the fact that parents give more attention to personal hygiene which decreases the risk of faeco-oral disease. In contrast, a study conducted in Addis Ababa shows that children from the governmental employee are more malnutrition because they are feeding by servants, siblings or others [42].

CONCLUSION

In our study, the prevalence of stunting was consistent with other studies done in Ethiopia. This indicates that malnutrition among under-five in central Tigray is comparable with other regional states of Ethiopia. In this study maternal age, duration of breastfeeding, the way how to feed the child were the main factors affecting stunting which needs to be addressed. Majority of the respondents were the child's mothers which maximize the accuracy of obtained information for the source population. The study design was a cross-sectional study hence may not show the temporal relationship of exposure and outcome variables and recall bias was potential bias.

ABBREVIATIONS

AOR = Adjusted Odds Ratio

COR = Crude Odds Ratio

EPI = Expanded program for Immunization

MUAC = Mid Upper Arm Circumference

H/A = height for Age

W/H = Weight for Height

W/A = Weight foe Age

SPSS = statistical package for social science

WHO = World Health Organization

DECLARATIONS

Ethics Approval and Consent to Participate

The research proposal was approved by the institutional ethical review board of Adigrat University Ethiopia, College of health sciences, and department of public health. Written informed consent was obtained from their parents or guardians of the 6-59-month-old children. Participation was purely voluntary and they can be free to decline or withdraw at any time in the course of the study. Personal identification of the respondents was not asked. They were also be assured that the information provided orally be used only for research purpose and would, therefore, be strictly anonymous and Data was entered as confidential, anonymous, aggregate analysis and reporting system was put secured.

Consent for publication

Not applicable.

Availability of data and materials

➢ All data generated or analyzed during this study are available in request from the corresponding author.

Competing Interests

The authors declare) that they have no competing interests

FUNDING

There was no fund for the current study

AUTHORS CONTRIBUTIONS

Berhane Fseha participated in the preparation of the proposal, design of the study, data analysis and

presents the data, preparing a draft of the manuscript and critically reviewing. Similarly, Gebrehiwot Gebremariam participated in the design of the study, data analysis and presentation, reviewing of the manuscript. Both authors read, accepted and approved the final manuscript

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