

## Chronic Undernutrition and Associated Factors among School Age Children in South West Ethiopia, 2015

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### Abstract

**Background:** Undernutrition remains to be a primary cause of morbidity and mortality among children in developing countries. School-age children are among the most commonly affected groups by chronic undernutrition. In Ethiopia, little is known about the magnitude of undernutrition in this older children, studies conducted in Addis Ababa indicated 31% of school age children were undernourished. Therefore, the aim of this study was to determine the magnitude of chronic undernutrition and identify the major factors associated with it that will guide a good intervention approach to halt the problem. **Methods:** A school based cross-sectional study was conducted on a total of 376 school children at Aman Sub town, south-west Ethiopia. Simple random sampling technique was applied to select schools and participants. Structured and pretested questionnaire was used to assess Sociodemographic and other variables. Data were analyzed using SPSS version 21.0. For nutritional indices WHO Anthro plus was used. **Results:** Two-fifth (40.2%) and almost one-third (28.2%) of children were stunted and underweight respectively. Older age groups (10-14), boys, having illiterate and employed mothers, maternal age of < 20 years during birth, lower monthly income (<50USD), large family size (>8) and rural resident were associated with an increase in the odds of stunting. Likewise, occupation of the mother, meal frequency, family size, monthly income and presence of chronic diseases were significantly associated with underweight in children. **Conclusion and Recommendation:** chronic undernutrition in the form of stunting and underweight is prevalent among school age children living in south west Ethiopia. Therefore, improving school feeding programme and provisions of health education regarding child nutrition should be considered.

**Keywords:** chronic, undernutrition, factors, school age, children, Ethiopia

### Background

Undernutrition remains to be a primary cause of morbidity and mortality among children in developing countries. It is a major public health problem and contributes to half of all deaths in children worldwide [1]. It is the most devastating problems facing the majority of the world's poor and needy, and continue to dominate the health of the world's poorest nations [2]. Nearly 30.0% of human population that includes infants, children, adolescents, adults and older persons in the developing world are currently suffering from one or more of the multiple forms of malnutrition [2].

School-age children are among the most commonly affected groups by chronic undernutrition. More than 200 million school age children are stunted and underweight and unless immediate action is taken, about one billion school children will be growing up by 2020 with compromised physical and mental development [3]. Considering the magnitude of the problem in children under five, nutritional programme in Ethiopia during the last few decades have been targeted at this age group. However, undernutrition is a significant problem in older children as well, a fact that is often passed over by policy makers and programme managers. School children are particularly vulnerable to short-term hunger, especially where diets of poor quality and unsafely prepared food are consumed. Factors such as the long distances children walk to school, having to complete responsibility before going to school and poor quality and quantity of meals consumed at home, contribute to hunger in schoolchildren. In addition it may come out from a broad range of conditions like prenatal under-nutrition, deficiencies of macro and micronutrients, infection and socioeconomic conditions [4].

In Ethiopia, little is known about the magnitude of undernutrition in this older children, studies conducted in Addis Ababa indicated 31% of school age children were undernourished [5]. Another study in North-West Ethiopia showed that the prevalence of stunting and underweight is 30.7% and 59.7% respectively [6].

High levels of stunting among children suggest that there will also be a long term deficit in mental and physical development that leaves children unable to take maximum advantage of learning opportunities in schools [7]. Children who come to school hungry have diminished attentiveness, a greater likelihood of becoming distracted and a lack of interest in learning, resulting in failure, low achievement and repetition [7].

Having these in mind, the aim of our study was to determine the magnitude of chronic undernutrition and identify the major factors associated with it that will guide a good intervention approach to halt the problem.

## Methods and Materials

### Study area and design

A school based cross-sectional study was conducted among school age children living in Mizan-Aman town, Ethiopia, on May 2015. The town has two sub-towns (Mizan and Aman) comprised of 10 kebeles. There is one General Hospital, one Health post, 15 private Health institutions (13 clinics & 2 Pharmacies) in Aman sub-town specifically. The town also has 8 elementary schools with a total of 5283 students (2796 males and 2487 females) and 1 high school. Enjera, godere (taro root), maize, vegetables and fruits are among the common staple foods in the study area.

### Study participants

The required sample size was determined using single population formula by considering prevalence of stunting (25.6%) and underweight (19.0%) independently in a study conducted in other parts of the region [8] with 97% confidence Interval; Marginal of error (d) = 5%; non-response rate = 5%. The sample size that yielded the large number from the aforementioned nutritional indices was taken as our working sample since it accommodates all the assumptions. A total of 377 sample size was estimated and allocated proportionally across the two randomly selected primary schools namely Aman melestegna elementary school 1021(318) and Catholic KG School 184 (59). The allocated sample size again distributed to each grade level proportionally. In collaboration with school directors and instructors a study subjects were informed the purpose of the study and communicated to call their parents on scheduled dates. The parents' of a study subjects were further informed the purpose of the study and those who are willing and gave their consent to participate in the study were involved.

### Data collection procedure

A structured questionnaire adapted from different related studies were used to collect the data. It was pre-tested, modified and contextualized to the local situation and the research objective. The questionnaire was prepared in English then translated in to local language (Amharic and Bench) and back to English to check for consistency. In addition, review was made by different expertise for the consistency of language translation. Adequate training and orientation was provided for two days to data collectors who are clinical nurses and supervisors who are health officers who able to speak and write local languages.

Information on Sociodemographic variable of the family, parenting style/family characteristics, eating habit of the child, child's age, sex, and clinical condition in the previous two weeks were assessed using a structured face-to-face interview administered questionnaire. Weight and height of the study subjects were measured by portable electronic weight scale with a digital screen and height board /commercial stadiometer respectively at the school. Standing height was measured to the nearest 0.1 cm using height board /commercial stadiometer and weight was measured to the nearest 0.1Kg using a portable electronic weight scale with a digital screen designed and manufactured under the authority of UNICEF. The measurement of height was conducted without shoes and with children keeping their shoulders in a relaxed position, their arms hanging freely and with their head aligned in Frankfurt plane. Measurements were taken and recorded by two well-trained data collectors, which are referred as "leading" and "assisting" observer and their supervisor respectively. The role of the "assisting" observer was to help position the child correctly to the instruments while the "leading" observer records the measurements in all data collection.

### Data Management and analysis

Data collected in the health centers were checked for completeness, coded, and entered using Epi-Info version 3.5.4 then exported to SPSS version 21.0 for cleaning and analysis. For computing the nutritional indices, the data were exported to WHO Anthro plus statistical package version 3.2.2. Children were classified as stunted and under-weight when the Height-for Age (HAZ) and weigh-for-age (WAZ) Z scores were below minus two respectively. Severe stunting and underweight were also considered when HAZ and WAZ were below minus three Z – score, respectively. Chronic undernutrition was defined as the presence of either of the two indices below minus two Z-score.

The results are presented in percentages and tables where appropriate. Binary logistic regression was employed to examine the associations between socio-demographic and other variables with undernutrition to identify variables for consideration in multivariate analysis. Two different multivariate models were applied to identify factors associated with stunting, underweight and wasting independently. To ascertain the association between the dependent variables and the explanatory variables, simultaneously controlling for the aforementioned explanatory variables, (All socio-demographic characteristics and other covariates associated in bivariate with  $p < 0.2$  were used and entered) stepwise logistic regression was applied and adjusted odds ratios (AORs) and confidence intervals (95% CI) were constituted. In all analyses,  $P < 0.05$  was considered to be statistically significant.

### Ethical consideration:

Ethical approval was obtained from the college of Health science, Mizan-Tepi University. Officials of each facility were also contacted, and permission was granted to conduct the study. Informed written consent was

obtained from participants' family for their participation and the right to withdraw from the study at any time was also communicated to all of them. Undernourished children were referred for to nutritional rehabilitation center according to the national guideline.

## Results

### Socio demographic characteristics of the family

A total of 376 children and their mothers or caregivers were involved in the study. Among them, majority (81.1%) were urban residents while close to one-third (30.6%) were Bench ethnic group and almost two-fifth were orthodox in religion. Almost one-third (32.7%) of mothers were housewives while 41.8% of fathers were merchants. Regarding educational status 16.2% of mothers and 10.1% of fathers can't read and write. Almost half (47.3%) of family have less than or equal to 5 family members while the rest have above 6. Almost half (48.0%) of households earn above 100 USD while the rest below it. Most of (94.7%) of the households uses pipe water as a major water source and almost all (98.7%) have latrine. (Table 1)

### Child characteristics, feeding habit and nutritional status

As shown in table 2 below, above half (58.2%) of children were girls and more than two-third (70.2%) were within the age 10 to 14. Almost a quarter (24.5%) of children born when their mother were at the age below 20 years old and 56.4% were either first or second child for their parents. Concerning frequency of meal only 4.8% of children have meal less than 3 times per day. Two-third (66.0%) of them have their meal with their parents and almost all (99.5%) wash their hands before meal always. Below one tenth (8.3%) of children experienced either TB, DM, HIV or any other chronic illness in the last 1 year while 21.3% and 22.6% of them had diarrhea and fever respectively in the last 2 weeks.

Two-fifth (40.2%) of children were stunted in which 9.0% were severely stunted. In addition near to one third (28.2%) were underweight and 6.9% were severely underweight. The proportion of overall wasting and severe wasting were 8.8% and 2.7% respectively. (Table 2)

### Factors associated with stunting

The odds of stunting was significantly high in boys, age group 10 to 14, children from illiterate mother and employed, birth order of >2, born from mother at the age less than 20, family size above 8, monthly income below 50USD after multivariate logistic regression model was applied (Table 3).

### Factors associated with underweight

Out of the 376 children, 28.2% were underweight. Having employed mother, meal frequency at most three times a day, large family size (>8), low monthly income (<50USD) and presence of chronic diseases were significantly associated with increased odds of underweight in the multivariate regression model (Table 4)

## Discussion

A cross sectional study showed undernutrition in the form of stunting and underweight is prevalent among school age children in the study area. Above half of school children had either of the two forms of undernutrition. This study revealed a stunting prevalence of 40.2%, which is higher than different studies conducted in other parts of Ethiopia that showed 11% to 30.7% prevalence of stunting [5, 6, 8-11]. The reason for discrepancy could be due to the difference in the study areas. On the other hand a study conducted in Kenya indicated 42.0% of school age children were stunted[12] which is concurrent with our study. The Ethiopian DHS 2005 indicated that 50% of under-five children were stunted[13] which indicates there is persistence of stunting in older children as well.

Older age groups, boys, having illiterate and employed mothers, maternal age of < 20 years during birth, lower monthly income, large family size and rural resident were associated with an increase in the odds of stunting.

Children within the age group of 10 to 14 is 1.8 times more likely to be stunted than those with in 5 to 9 years. This result is concurrent with studies done in different parts of Ethiopia and other developing countries [8, 11, 12, 14, 15] The reason could be older children are more physically active and they participate in different activities in the school as well as at home that may lose a greater amount of energy[16]. In addition stunting in school age children could be related with exposure to poor nutrition during early childhood while recently there is expansion of maternal and child care practice that may decrease the prevalence for younger children.

The odds of stunting is 1.6 times higher among boys than girls which is in line with study conducted in other parts of Ethiopia[8, 11]. Similar findings were reported in a study done by E. J. CHESIRE and et al in which boys are more likely to be stunted than their counter parts[17]. This could be explained that boys are more active in participating in different sports and games than girls. An increasing energy loss and in appropriate nutrition is well known devastating problem in developing countries including Ethiopia.

In this study, the odds of stunting is almost 2 times higher among birth order greater than two than those two or less. This finding is in line with a study conducted by Degarege, D. and et al that found 5.4 times an increase in the odds of stunting[5]. Ethiopian parents give better care and attention for their first and second

children than the preceding one. This may result higher magnitude of undernutrition for children with higher birth orders as compared to lower ones. In addition as the birth order increase the family size also increase which is an additional burden on the family.

Children born when their mothers were within the age of 20 to 30 were 59% less likely to be stunted than those from born when their mother were below 20 years old. The finding is supported by studies in other part of Ethiopia[5].

The reason could be low birth weight infants due to low food intake by the mothers at first exposure for pregnancy[18]. In addition teenage pregnancy could be associated with adverse birth outcomes including low birth weight that can affect nutritional status during late childhood[19].

Children from households with larger family members were also associated with higher odds of stunting. Those children from family size larger than 8 members were 2.2 times more likely to be stunted than those from households with less than 6 members. Similar findings have been indicated in other parts of the country and the world [5, 20-22]. As the number of household members increase the level of child care and dietary intake will decrease especially for families with inadequate food [23-25].

The other risk factor for stunting was the mother's occupation. The odds of being stunted among children of employed mothers were 1.8 than those having housewife mothers which is similar with studies that showed higher prevalence of undernutrition among children whose mothers were employed [5, 26-28]. Housewife mothers spend more time at home than employed mothers which is important to take appropriate care for their children especially during their early childhood. Poor nutrition during infancy and early childhood is one contributor of stunting during late childhood.

This study revealed that children of mothers who completed at least primary education were less likely to be stunted as compared to children whose mothers can't read and write. This is supported by different studies conducted in Ethiopia [5, 6, 29, 30] and other developing countries [20, 31-33].

On the hand the prevalence of underweight was 28.2 % as compared to the WHO reference group. Different studies in Ethiopia indicated that the prevalence of underweight among school children between 15.9% and 59.7% [5, 6, 8-11] which indicates the problem is high in the country.

Children from employed mothers, low monthly income, large family size, frequency of meal at most three and presence of chronic diseases (such as Diabetic Mellitus, Tuberculosis, HIV, etc...) are associated with higher odds of underweight.

Current monthly income of the family was strongly associated with underweight of school children. Those children from the family whose monthly income of less than 50USD were 2.2 times more likely to be underweight than those above 100USD which is in line with other studies in Ethiopia [6, 26, 34]. Families with low income are vulnerable to food shortage later may result undernutrition in the family including children. Likewise children from larger family size greater than 8 were associated with higher odds of underweight than those from small family size. Degarege D. et al and Mekonnen H. also indicated that larger family size is associated with underweight of their children. This could be due to insufficient amount of food for the household and in appropriate food preparation.

Those children from employed mothers are 2.1 times more likely to be underweight than those from housewife mothers. This could be as a result of the difference in quality of care and feeding practices among mothers who are employed and housewife.

In the same way children who have at most three meals per day were 2.5 times more likely to be underweight than those who have more than three meals which is in agreement with the previous study [5]. Presence of chronic illness is also associated with higher odds of underweight than children without any chronic illness. Infection is the main intrinsic factor associated with undernutrition in children.

This study didn't assess the level of micronutrient and didn't match for age and sex that could be considered as the limitation of the study. In addition some of the information could be affected by recall bias.

## **Conclusion**

Chronic undernutrition is prevalent among school age children living in Aman sub-town, South-West Ethiopia. Age, sex, place of residence, educational status and occupation of the mother, birth order, maternal age at birth and family size were major factors associated with stunting in school children. Likewise, monthly income of the family maternal occupation, frequency of meal, family size and presence of chronic disease were predictors of underweight in children. Therefore, improving school feeding programme and provisions of health education regarding child nutrition should be considered. Nutritional screening and supplementary feeding programs at school to undernourished children are vital.

## **Competing interests**

The authors declare that they have no competing interests.

### Authors' contributions

HYH, FG, and MA: Conceived and designed the study. MA, FG: collected and analyzed the data. HYH assisted data analysis. HYH drafted the manuscript. All authors read and approved the final manuscript.

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Table 1: Socio-demographic characteristics of the respondents and family in Aman Sub-town, South-West Ethiopia, May 2015.

Characteristics	Category	Cases (N=376)	Percentage (100%)
Residence	Urban	305	81.1
	Rural	71	18.9
Ethnicity	Bench	115	30.6
	Kaffa	64	17.1
	Amhara	99	26.3
	Oromo	52	13.8
	Silte	31	8.2
	Other	15	4.0
Religion	Muslim	119	31.6
	Orthodox	150	39.9
	Protestant	107	28.5
Occupation of mother	House wife	123	32.7
	Employer	95	25.3
	Farmer	43	11.4
	Merchant	82	21.8
	Other	33	8.8
Occupation of father	Merchant	157	41.8
	Employer	126	33.5
	Farmer	64	17.0
	Other	29	7.7
Education of mother	Cannot read & write	61	16.2
	Read & write only	35	9.3
	Primary	160	42.6
	secondary	68	18.1
	Above 12	52	13.8
Education of father	Cannot read & write	38	10.1
	Read & write	27	7.2
	Primary	110	29.3
	Secondary	104	27.7
	Above 12	97	25.8
Family size	≤5	178	47.3
	6-8	125	33.2
	>8	73	19.5
Income categorial	<500	11	2.9
	500-1000	32	8.5
	1000-2000	153	40.7
	>2000	180	47.9
Source of water	Pipe water	356	94.7
	Well	11	2.9
	Spring	8	2.1
	River	1	0.3
Presence of latrine	Yes	371	98.7
	No	5	1.3
<b>Total</b>		<b>376</b>	<b>100</b>

Table 2: Child characteristics, feeding habit and nutritional status in Aman Sub-town, South-West Ethiopia, May 2015.

Variable	Categories	Frequency (n)	Percentage (%)
<b>Sex</b>	Boy	157	41.8
	Girl	219	58.2
<b>Child age (in years)</b>	5-9	112	29.8
	10-14	264	70.2
<b>Maternal age at birth</b>	<20	92	24.5
	20-30	204	54.2
	>30	80	21.3
<b>Birth Order</b>	≤2	212	56.4
	>2	164	43.6
<b>Frequency of meal</b>	At most 3	181	48.1
	Above 3	195	51.9
<b>With whom does the child feed</b>	Alone	128	34.0
	With	248	66.0
<b>Wash hand before meal</b>	Yes	374	99.5
	No	2	.5
<b>Presence of chronic diseases</b>	Yes	31	8.3
	No	345	91.7
<b>Sickness last 2 wks.</b>	Yes	123	32.7
	No	253	67.3
<b>Diarrhea</b>	Yes	80	21.3
	No	296	78.7
<b>Fever</b>	Yes	85	22.6
	No	291	77.4
<b>Height for age</b>	Stunted (All)	151	40.2%
	Severe stunting	34	9.0%
	Moderate stunting	117	31.1%
	Normal	225	59.8%
<b>Weight for age</b>	Underweight (All)	106	28.2%
	Severe underweight	26	6.9%
	Moderate underweight	80	21.3%
	Normal	270	71.8%
	Total	376	100



Table 3: Multivariate analyses of risk factors for stunting in South West Ethiopia, May 2015

Variable	Stunting		Crude OR (95% CI)	Adjusted OR (95%CI)
	Yes	No		
<b>Residence</b>				
Rural	39	32	2.10 (1.25, 3.54)	<b>1.55 (1.07, 3.19)*</b>
Urban	112	193	1	1
<b>Sex</b>				
Boy	71	86	1.43 (0.945, 2.18)	<b>1.62 (1.03, 2.28)*</b>
Girl	80	139	1	1
<b>Child age</b>				
5-9	35	77	1	1
10-14	116	148	1.72 (1.08, 2.75)	<b>1.83 (1.15, 3.28)*</b>
<b>Education status of mother</b>				
Cannot read & write	28	33	1	1
Read & write only	15	20	0.88 (0.38, 2.04)	0.81 (0.29, 1.98)
Primary	60	100	0.71 (0.39, 1.28)	<b>0.62 (0.31, 0.97)*</b>
Secondary and above	48	72	0.79 (0.42, 1.46)	<b>0.59 (0.29, 0.89)*</b>
<b>Education status of father</b>				
Cannot read & write	21	17	1	1
Read & write	14	13	0.87 (0.32, 2.35)	0.91 (0.40, 2.32)
Primary	51	59	0.70 (0.33, 1.47)	0.78 (0.39, 1.91)
Secondary and above	65	136	0.39 (0.19, 0.78)	0.62 (0.24, 1.02)
<b>Occupation of mother</b>				
House wife	39	84	1	1
Employer	43	52	1.78 (1.02, 3.10)	<b>1.82 (1.21, 2.08)*</b>
Farmer	21	22	1.53 (0.85, 2.73)	1.41 (0.88, 2.84)
Merchant	34	48	2.06 (1.01, 4.17)	1.69 (0.93, 3.76)
Other	14	19	1.59 (0.72, 3.49)	1.23 (0.59, 3.33)
<b>Occupation of father</b>				
Merchant	59	98	1	1
Employer	54	72	1.25 (0.77, 2.01)	1.46 (0.87, 2.41)
Farmer	25	39	1.07 (0.59, 1.93)	1.27 (0.69, 2.13)
Other	13	16	1.35 (0.61, 3.00)	1.39 (0.64, 3.21)
<b>Monthly Income (USD)</b>				
<50	21	22	1.54 (0.79, 3.00)	<b>1.96 (1.17, 3.69)*</b>
50-100	61	92	1.07 (0.69, 1.66)	1.43 (0.91, 2.32)
>100	69	111	1	1
<b>Family size</b>				
≤5	63	115	1	1
6-8	49	76	1.18 (0.73, 1.89)	1.41 (0.94, 2.25)
>8	39	34	2.09 (1.20, 3.64)	<b>2.21 (1.26, 3.79)*</b>
<b>Maternal age at birth</b>				
<20	49	43	1	1
20-30	63	141	0.39 (0.24, 0.65)	<b>0.41 (0.27, 0.81)*</b>
>30	39	41	0.83 (0.46, 1.52)	0.79 (0.34, 1.44)
<b>Birth Order</b>				
≤2	71	141	1	1
>2	79	85	1.85 (1.22, 2.81)	<b>1.96 (1.32, 3.03)*</b>

**Note:** \* P<0.05 In the fully adjusted model: sex, age, resident, family size, maternal education, fathers' education, maternal occupation, fathers' occupation, monthly income, maternal age at birth, birth order of the child, , were used for stunting. Aman Town, South-Western Ethiopia, 2015.

Table 4: Multivariate analyses of risk factors for underweight in South West Ethiopia, May 2015

Variable	Underweight		Crude OR (95% CI)	Adjusted OR (95%CI)
	Yes	No		
<b>Residence</b>				
Rural	25	46	1.50 (0.87, 2.60)	1.31 (0.77, 3.02)
Urban	81	224	1	1
<b>Sex</b>				
Boy	46	111	1.10 (0.70, 1.73)	1.12 (0.71, 2.34)
Girl	60	159	1	1
<b>Child age</b>				
5-9	29	83	1	1
10-14	77	187	1.18 (0.72, 1.94)	1.33 (0.85, 3.08)
<b>Occupation of mother</b>				
House wife	24	99	1	1
Employer	35	60	2.41 (1.31, 4.43)	<b>2.12 (1.16, 3.48)*</b>
Farmer	13	30	1.79 (0.81, 3.93)	1.57 (0.71, 3.74)
Merchant	22	60	1.51 (0.78, 2.93)	1.62 (0.83, 2.76)
Other	12	21	2.36 (1.02, 5.45)	1.84 (0.89, 5.34)
<b>Monthly Income (USD)</b>				
<50	17	26	1.96 (0.98, 3.94)	<b>2.16 (1.04, 3.87)*</b>
50 - 100	44	109	1.21 (0.74, 1.97)	1.43 (0.91, 2.22)
>100	45	135	1	1
<b>Family size</b>				
≤5	41	137	1	1
6-8	33	92	1.20 (0.71, 2.03)	1.11 (0.78, 2.25)
>8	32	41	2.61 (1.46, 4.65)	<b>2.35 (1.23, 4.49)*</b>
<b>Frequency of meal</b>				
At most three	69	112	2.63 (1.65, 4.20)	<b>2.52 (1.51, 4.05)*</b>
Above three	37	158	1	<b>1</b>
<b>With whom the child feed</b>				
Alone	39	89	1.18 (0.74, 1.89)	1.26 (0.81, 2.01)
With family	67	181	1	1
<b>Presence of chronic diseases</b>				
Yes	18	13	4.04 (1.90, 8.59)	<b>3.96 (1.82, 8.51)*</b>
No	88	257	1	<b>1</b>
<b>Sickness in the last 2 weeks</b>				
Yes	44	79	1.72 (1.08, 2.74)	1.41 (0.85, 2.62)
No	62	191	1	

**Note:** \* P<0.05

In the fully adjusted model: sex, age, resident, family size, maternal education, maternal occupation, monthly income, frequency of meal, with whom the child feed, presence of chronic disease and sickness in the last 2 weeks were used for underweight. Aman Town, South-Western Ethiopia, 2015.