IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 10, Issue 11 Ver. II (Nov. 2016), PP 25-31
www.iosrjournals.org

Stunting and Its Associated Factors in Under Five Years Old Children: The Case of Hawassa University Technology Villages, Southern Ethiopia

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Abstract : *Stunting reflects chronic under nutrition during the most critical periods of growth and development in early life. It is one of the most important indicator and reflects the long term nutritional status of a child. The objective of this study was to determine prevalence of stunting and associated factors in Hawassa Zuria woreda of technology villages of Hawassa University. A community based cross-sectional study was conducted on 312 participants in Hawassa Zuria woreda from April to May 2015. A simple random sampling technique was employed to select households and study units. A logistic regression analysis was carried out. Odd ratios (Crude and Adjusted) were computed with 95% confidence interval to see strength of association between explanatory and outcome variables. The prevalence of stunting in the area was 26.6%. Children above 24months were (about four times (AOR=3.97[95%CI, 1.30-12.11]) more likely to be stunted than below 12 months old ones. Likewise, children whose family size more than or equal to five, mothers' age less than twenty-one years and fathers attended below grade eight were also more likely to be stunted than their counter parts, with Odds ratio of (AOR=3.13 [95%CI, 1.33-7.40]), (AOR=2.11[95%CI, 1.10-4.04]) and (AOR=6.52[95%CI, 2.66-15.94]) respectively. Additionally, children who were not fed colostrum's (AOR=7.93[95%CI, 4.00-15.77]) were more likely to be stunted. Prevalence of stunting was the lowest compared with the regional and national averages. Child age, breast feeding, family size, mother's age and father's educational level predicted stunting.*

Keywords: *Children, Hawassa Zuria, Stunting, Technology Village*

I. Introduction

Globally, under nutrition contributes directly or indirectly for at least 35% of deaths in under five aged children. It affects physical growth, contributes for morbidity and mortality, reduces cognitive development, reproductive and physical work capacity (1,2,3). Stunting reflects chronic under nutrition during the most critical periods of growth and development in early life. It is defined as the percentage of children aged 0 to 59 months whose height for age is below minus two standard deviations (moderate and severe stunting) and minus three standard deviations (severe stunting) from the median of the WHO child growth standards (4). Stunting is one of the most important indices of child well-being throughout the world and mostly occurs before three years of age. It reflects the long term nutritional status of a child assessed by height for age (5,6). Today's concerted focus on reducing stunting reflects an improved understanding of the importance of under nutrition during the most critical period of development in early life and of the long-term consequences extending in adulthood. According to evidences observed in 54 low and middle income countries, growth faltering on average begins during pregnancy and continues to about 24 months of age, this loss in linear growth is not recovered and catch up growth later on in child hood is minimal (4). With this in mind, this study was designed to determine magnitude of stunting and identify associated factors in under five children in Hawassa Zuria woreda of Hawassa University's technology villages.

Worldwide in 2011, the prevalence of stunting in under 5 years old children was 26% and of this, an estimated 80%) of stunted children lived in 14 countries. Of the 14 countries with high prevalence of stunting, Ethiopia was the 7th and contributes three percent to global burden (4) (UNICEF, 2013). According to Ethiopian demographic and health survey (2011), the prevalence of stunting in under five children was 44% (46% in rural areas versus 42% in urban areas) and the prevalence of stunting in southern nations and nationalities regional state is around 44% (7).

In tackling child under nutrition, the effort to reduce underweight has been shifting to prevention of stunting due to better understanding of nutrition. Based on this, WHO targeted to reduce stunted under five aged children by 40% in 2025. Likewise, the government of Ethiopia planned to reduce the prevalence of stunting from 44.4% to 30% by 2015 (4, 8). However, massive and similar interventions at national level could not have an overwhelming result in reducing under nutrition problems including stunting. Besides, different organizations have been running many developmental activities so as to improve the nutritional status and livelihood of the society. In Hawassa Zuria Woreda, Hawassa University has three technology villages in which comprehensive

development activities have been carried out which can improve the livelihood of the society. However, the prevalence of stunting and its predictors were not well identified in the areas. Therefore, this study was conducted to determine the magnitude of stunting and associated factors in the study area.

II. Methodology

2.1 Study area

The study was conducted in *Hawassa Zuria* woreda of Hawassa University technology villages, Sidama zone in Southern Ethiopia. *Hawassa Zuria* woreda of Hawassa University technology villages, the area is located 302 km from Addis Ababa. According to (29), the total population of the woreda is 151,016 (76,112 males and 74, 924 females). The woreda consists of 23 kebeles having 30,820 households with 4.9 average family size. The total area of the woreda is 305.2 sq km. The altitude of the woreda ranges from 1501 to 2500 above sea levels. The average annual rainfall record ranges from 801 to 1000 mm with average temperature between 17.6-22.5^{o}C. The woreda is known in growing maize, potato, haricot bean and *enset* (9).

2.2 Source and study population

The source population of this study was 6 to 59 months old children lived in the three kebeles included in the study for at least six months before the survey, whereas the study population was randomly selected from the source population.

2.3 Sample size, sampling technique and study design

The study was community based cross-sectional study. The sample size was calculated using the single population proportion formula. For this, we calculated two sample sizes using the prevalence of stunting in Southern Ethiopia which is 44%, whereas the second sample size was calculated considering prevalence of 50%, which is usually used for unknown prevalence for associated factors of stunting. The confidence level and margin of error with 95% (α=0.05) and d=0.05 were also considered for sample size calculation. Additionally, due to the total eligible population number (N=3302), which was lower than 10,000, we used finite population correction formula. Moreover, we added 5% for non-response rate. From the two sample size calculation, the largest sample size was taken (n=363). Out of the 23 kebeles existing in Hawassa Zuria woreda, Shamina Garmama, Doyo Chale and Tankaka Umbullo were purposively selected being part of Hawassa University technology villages. Sampling frame was obtained by listing households with 6-59 month old children in sampled kebeles. Then, sample size was allocated to each kebeles by PPS. Finally, study participants were randomly selected from each Kebele. From households which had more than one child in the specific age group, the youngest child was included in this study (29).

2.4 Study variables

Dependent variable: stunting

Independent variables: socioeconomic and demographic characteristics such age of child, maternal age, education of mother and father, land holding of the household, monthly income, ANC follow up, vitamin A supplementation, length of breast feeding, bottle feeding, complementary food introduction, feeding colostrum's, and birth gap between the indexed child and preceding one.

2.5 Data Collection Procedures

Information about the households was collected using pre-tested semi-structured questionnaire by face to face interview. The questionnaire was first developed in English and translated to Amharic. At least grade 10 completed who are fluent in local language, Sidamigna, were recruited for data collection and supervision. Intensive training was provided for data collectors. Principal investigator and supervisor was overseeing the data collection. Body length of children age up to 23 months was measured without shoes and the height was read to the nearest 0.1cm by using a horizontal wooden length board with the infant in recumbent position. However, height of children 24 months and above was measured using a vertical wooden height board by placing the child on the measuring board, and child standing upright in the middle of board. The child's head, shoulders, buttocks, knees and heels touched the board during length/length measurements.

2.6 Data Analysis

Data was checked for completeness and consistency. Then, it was coded and entered in to SPSS software version20.0. Anthropometric data was analyzed using WHO Anthro version3.2.2. Children with height for age below -2SD were considered as stunted and -3SD as severely stunted. Then the result of stunting was filled in to SPSS software. Finally, the whole data was analyzed using SPSS software. Descriptive statistics like frequencies and percent were computed. Bivariate and multivariable binary logistic regression analyses were conducted to identify predictors of stunting. Strength of association between dependent and

independent variables was proved by OR at 95% Confidence Interval. P-value less than 0.05 were taken as a cut off points for statistical significance test. Results were displayed using tables and graphs.

2.7 Ethical Clearance

Ethical approval was obtained from Institutional Review Board of Hawassa University. Permission was obtained from the woreda health office. Informed consent was obtained from mothers of study participants.

III. Results

From the total of 363 participants expected, 312 were participated in this study with response rate of 86%. About half (50.3%) of the study participated children were male with 66.3% above 24 months. The About 60% of mothers were aged 21 years or less, 97.8% attended less than grade 8, and 92.3% were housewives. About 70.19% of the fathers attended less than grade 8(Table 1). Out of 312 participants in this study, 228(73.1%) and 250(80.12%) had family size of five or more and under five aged children less than three in number. More than half (54.2%) of the households were owned less than ½ with 62.5% below 1000 ETB. (Majority of (88.14%) of households owned animals. About 88%of the study participated mothers had ANC follow up with 63.78% delivered in health facilities. From the children participated in this study, 202(64.7%), 167(53.5%), 172(55.1%) and 269(86.2%) were given colostrum's, started complementary food at the age of six months, drunk liquid food using bottle in the last 24hrs and took vitamin A supplementation respectively (**Table 2**).

It was found that stunting was increased with age of the child (COR=3.70, [95% CI, 1.39-9.83]). Shorter length of breast feeding also contributed for stunting (COR=3.04, [95% CI, 1.19-8.06]). Similarly, bottle feeding in the last 24hrs (COR=2.20 [95%CI, 1.31-3.64]), and larger family size (>5) (COR=3.69 [95CI, 1.75-7.79]) predicted stunting.

Table 1: Demographic characteristics of study participants (N=312)

Variables	Frequency	Percent
Age of child (Months)		
<12	42	13.5
12-24	63	20.2
>24	207	66.3
Sex of the child		
Male	157	50.3
Female	155	49.7
Maternal age (Years)		
=<21	187	59.9
>21	125	40.1
Marital status		
Married	312	100
Maternal Education (Grade)		
<8	305	97.8
=>8	7	2.2
Maternal Occupation		
Housewives	288	92.3
Other	24	7.7
Paternal age (Years)		
=<21	91	29.17
>21	221	70.83
Paternal Education (Grade)		
<8	219	70.19
=>8	93	29.81
Paternal Occupation		
Farmer	265	84.84
Recruited worker	13	4.17
Other	34	10.89
Head of the household		
Father	305	97.75
Mother	7	2.25

Table 2: Socio-economic and child caring characteristics of study participants (N=312)

Variables	Frequency	Percent
Total Family Size (Number)		
<5	84	26.9
=>5	228	73.1
Number of under-five aged children		
<3	250	80.12

= > 3	62	19.88
Landholding Size (Hectare)		
<0.5	169	54.2
=>0.5	143	45.8
Monthly Income (Ethiopian Birr)		
<500	36	11.5
500-1000	81	26
>1000	195	62.5
Decision maker on the finance of the household		
Father	271	86.85
Mother	9	2.88
Both jointly	32	10.27
Household Own Animal		
Yes	275	88.14
No	37	11.86
Birth Interval between indexed child and preceding child (months)		
<12	18	5.8
12-24	27	8.7
>24	267	85.6
Mother ANC attendance during pregnancy of indexed child		
Yes	274	87.8
No	38	12.2
Place of deliver indexed child		
Health facility	199	63.78
Home	113	36.22
Age of introducing Complementary food to indexed child (months)		
<6	116	37.2
6	167	53.5
>6	29	9.3
Colostrums' given to indexed child		
Yes	202	64.7
No	110	35.3
Vitamin A supplementation given to indexed child		
Yes	269	86.2
No	43	13.8
Ever bottle feed the indexed child		
Yes	140	44.9
No	172	55.1

Low monthly income (less than500 ETB), mother's age during child birth (than 21 years), and father's educational level (below grade 8) significantly associated with stunting with odds of (COR=2.55 [95CI, 1.20-5.42]), (COR=1.80 [95CI, 1.05-3.08]), and (COR=2.90 [95CI, 1.51-5.54]). Children who were not fed colostrum's had about 5 times higher chance to be stunted (COR=5.33 [95CI, 3.11-9.14]) (**Table 3**).

According to **Table 3**, children who were aged above 24 months were about 4 times more likely to be stunted than below 12 months old ones (AOR=3.97 [95%CI, 1.30-12.11]), Children whose family size was 5 or above were 3.13 times more stunted than families with less than 5 (AOR=3.13 [95%CI, 1.33-7.40]). Children who had mother with age less than 21 years old age were 2.11 times more exposed to stunting than their counter parts (AOR=2.11 [95%CI, 1.10-4.04]). Children whose fathers attended below grade 8 were 6.52 times more vulnerable to stunting compared to their counters (**Table 3**).

Table 3: Factors associated with stunting in 6-59 months old children (N=312)

Variable	Category	Stunting		Crude OR (95% CI)	Adjusted OR (95% CI)
		Yes	No		
Age of child	<12 months	5	37	1 (R)	1 (R)
	12-24 months	9	54	1.23 (.38-3.98)	1.06 (.28-3.98)
	>24 months	69	138	3.70 (1.39-9.83)*	3.97 (1.30-12.11)*
Length of Breast Feeding	<1 year	10	12	3.04 (1.19-8.06)*	1.67 (.47-5.92)
	1-2 year	53	144	1.34 (.75-2.42)	1.30 (.59-2.85)
	>2 year	20	73	1 (R)	1 (R)
Sex of the Child	Male	37	120	.84 (.50-1.33)	
	Female	46	109	1 (R)	
Bottle feeding in the last 24hrs	Yes	46	94	2.20 (1.31-3.64)*	.68 (.27-1.69)
	No	37	135	1 (R)	1 (R)
Gap between the indexed and preceding child	<12 months	5	13	1.02 (.35-2.97)	
	12-24 months	5	22	.61 (.22-1.65)	
	>24 months	73	194	1 (R)	
Family size	<5	13	71	1 (R)	1 (R)

	=>5	70	158	3.69 (1.75-7.79)*	3.13 (1.33-7.40)*
Education of mother	< 8 grade	160	126	2.13 (1.3-3.68)*	1.47 (.5-3.88)
	= > 8 grade	23	103	1 (R)	1 (R)
Mother's usual occupation	Housewives	79	209	1 (R)	
	Other	4	20	.53 (.18-1.59)	
Land size owned by HH's	<0.5H	44	125	.94 (.57-1.55)	
	= > 0.5 H	39	104	1 (R)	
Monthly income	<500	14	22	2.55 (1.20-5.42)*	1.80 (.65-5.00)
	500-1000	30	51	2.35 (1.33-4.17)*	1.43 (.58-3.53)
	>1000	39	156	1 (R)	1 (R)
Age of mother	<21 years	58	129	1.80 (1.05-3.08)*	2.11 (1.10-4.04)*
	= > 21 years	25	100	1(R)	1(R)
ANC attendance during pregnancy of indexed child	Yes	70	204	1 (R)	
	No	13	25	1.52 (.74-3.12)	
Age of complementary food introduction to child	<6 months	35	81	1.25 (.74-2.11)	
	6 months	43	124	1 (R)	
	>6 months	5	24	.60 (.22-1.67)	
Fed colostrums of indexed child	Yes	30	172	1 (R)	1 (R)
	No	53	57	5.33 (3.11-9.14)*	7.93 (4.00-15.77)*
Vitamin A supplementation	Yes	74	195	1 (R)	
	No	9	34	.70 (.32-1.52)	
Education of Father	< 8grade	70	149	2.90 (1.51-5.54)*	6.52 (2.66-15.94)*
	=>8grade	13	80	1 (R)	

*significant level was determined at $p<0.05$

IV. Discussion

It was found that magnitude of stunting in Hawassa University technology villages: Shamina Garmama, Doyo Chale and Tankaka Umbullo kebeles at Hawassa Zuria woreda was 26.60%, which is the lowest of the previous reports in Boricha woreda of Sidama zone (37.2%), southern Ethiopia (44%) and national average (40%) (10, 11). In addition, it is also lower than finding in the same woreda (45.8%) (12). This difference might be due to difference in study period gap (three years), sampled area (technology village) and the outcome of development activities which have been carried out by Hawassa University in the study area. However, the current finding is comparable with the EDHS report in urban areas of the country (24.3%) (10). This could be due to the fact that the study woreda is nearby the capital city of southern Ethiopia which might have influenced their livelihood activities, income, dietary habits and mother and child care.

Sex of the children did not show association with stunting. Similar findings were obtained at Mwanza district of Tanzania and south east of Nigeria. However, study conducted in Bulle Hora district in Ethiopia revealed that being male contributed for increased odds of stunting (13, 14, 15). The age of child was one of the predictors of stunting in this study. As the age of child increased, the prevalence of stunting was increased. This finding is in line with previous study in Ethiopia (10, 11, 16). Appropriate breast and complementary feeding is crucial factor for the nutritional and health status of children in community with high risk of contamination including Ethiopia (17). However, length of breast feeding and age of complementary food introduction age did not show significance association with stunting in the present study.

According to this study, family size associated with increased odds of stunting. This could be related with increased cost of the family which leads to increase to food and nutrition security. This result is supported by previous studies in Tahtay Adeyabo and Addis Ababa district in Ethiopia (18, 19). In contrary, family size had no association with under nutrition in Mwanza district, Tanzania (Ahmed, 2013). Bottle feeding (specifically bottles with nipples at their tips) is not recommended because improper sanitation associated with bottle-feeding can introduce pathogens to the infant (11). In the current study, bottle feeding of children had no association with the presence of stunting; but not feeding colostrums had increased the odds of stunting significantly ($p<0.05$). Similar result was observed on bottle feeding in study conducted in Boricha woreda, southern Ethiopia (11). Contradicting results were also observed on bottle feeding in study conducted around West Gojam district and Somali region of Ethiopia (20, 21). This could be due to a high prevalence of bottle feeding in the present study area. Similar results were found on feeding colostrums in study conducted in Ethiopia and Kenya (21, 22).

The birth gap did not show association with stunting. According to WHO technical consultation group on birth spacing after having a live birth, the recommended interval before attempting the next pregnancy is at least 24 months which can reduce the risk of adverse maternal, peri-natal and infant outcomes. Contradicting finding was reported from India (23). This might be due to the fact that majority (85.6%) of the mothers gave birth to indexed children more than two years' gap. Mothers' educational level and occupation also did not show a significant association with stunting. Similar findings were reported from different parts of Ethiopia, India and

Iran (15, 18, 19, 20, 24, 27), but contradicting results were seen both in education of mother and occupation in Nandi District of Kenya and Addis Ababa of Ethiopia respectively (19, 25). Additionally, vitamin A supplementation, land size owned by households, monthly income and antenatal care attendance during pregnancy of indexed child had no association with stunting in this study. Different studies also supported these findings (15, 19). On the opposite, different findings revealed the association of stunting with vitamin A, antenatal care attendance and monthly income (19, 26, 27, 28). These might be attributed to high coverage (86.2%) of vitamin A supplementation among sampled population and may be due to enhanced access to vitamin A rich vegetables and fish being situated nearby by lake Hawassa. The odds to be stunted for children born from fathers with lower education level and younger mothers (<21 years) were 6.52 and 2.11 respectively, compared with their counter parts. This may be attributed to the increased nutritional demand of young mother which results in malnutrition for both the mother and fetus. EDHS 2011 also reported that adolescent pregnancy is one of the causes for malnutrition in Ethiopia (7). Besides, the observed lower educational level of the father contributed for stunting may be due to reduced awareness on maternal and child care practices.

V. Conclusion

The current study showed that magnitude of stunting in technology villages of Hawassa University is lower than the Southern Ethiopia and national average. This study also identified that stunting is predicted by child age, family size, age of mother, feeding colostrum's and educational status of father in the study area.

Limitation of the study

The study did not include other technology villages of Hawassa University. The study design was not comparative. The cross-sectional design employed did not allow establishing causal-effect relationship of independent and dependent variables.

VI. Recommendation

Nutrition intervention and other livelihood improving activities which are carried out by Hawassa University and other government and non-government organization should be continued for further reduction of stunting in the area. Designing of stunting reduction strategy in the area should consider family size, age of mother, feeding colostrum's and educational status of father. Further comparative study should be done to compare stunting on technology villages with other non-technology villages of Hawassa University and see the seasonal variation with longitudinal study. Further study should be done on the prevalence of colostrum's intake and associated factors in the area.

Acknowledgments

The authors would like to thank Hawassa University, Research and Technology Transfer Vice-president Office, and College of Agriculture, Graduate Studies and Research Coordination Office for their financial and technical support to conduct this research. Moreover, the authors would like also thank the study participants and data collectors participated in this research.

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