Children's nutritional status and its determinants in small towns, Sebeta Hawas district, Oromia, Ethiopia.

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Abstract

The study was aimed to assess the prevalence and examine determinant factors of children's nutritional status in non-administrative two small towns (Awash Bello and Boneya) located Sebeta Hawas district, Oromia region. Cross-sectional design was employed in the existing two small towns selected randomly. The sample size was determined by using single population proportion formula then adjusted by finite population correction factor to draw the final 230 sample children and then allocated proportionally to each small town. Then the households were selected using systematic random sampling. If there is more than one child in the selected household only one child was considered randomly. Structured questionnaire was used to gather information on the demographic, socio-economic, and maternal and child caring practice, as well as environmental factors. While anthropometric measurement was used to collect height, weight and MUAC following the standard measurement tools and procedures. Information was entered into Epi-Data version 3.1 and anthropometric measurements were converted into Z-scores by WHO Anthro version 3.2.2., 2011 software. Then exported to STATA 13 and analyzed using descriptive statistics and inferential statistics. The result revealed that the prevalence of overall malnutrition was 46%. Specifically, stunting was (22.6%), underweight (16.1%) and wasting (7.4%), respectively. Bivariate and multivariate logistic regression model was employed to analyze determinants child malnutrition. Multivariate model revealed that age of child, number of under-five children in the household, no formal fathers and no formal maternal education, less than1500ETB monthly income, Antenatal care visit less than four times during pregnancy, not exclusive breast feeding and no fully vaccination were found positive and significant determinants for child malnutrition. And, child birth order was negative and significant determinant for child malnutrition. Thus, need continues training, awareness creation activities, special attention for child and maternal healthcare services by Sebeta Hawas district Health Office and other practitioners.

Keywords: Malnutrition, Boneya, Determinant, Nutritional status

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Introduction

The concept of determinants origins in the original approach for the causes of child malnutrition lays out the hierarchical relationship between the immediate, underlying, and basic determinants of child nutritional status. The immediate determinants, which manifest themselves at the level of the individual child, are dietary intake (energy, protein, fat, and micronutrients) and health status. These factors themselves are interdependent. A child with inadequate dietary intake is more susceptible to disease; disease in turn depresses appetite, inhibits the absorption of nutrients in food, and competes for a child's energy. The underlying determinants, which impact child nutritional status through the immediate determinants, manifest themselves at the household level. The first, household food security is assured access to enough food of adequate quality for living an active healthy life. The second is the quality of caring practices for children and women. Examples of caring practices for children are child feeding, health-seeking behaviors, and cognitive stimulation. The most obvious aspect of care for women that affects children's nutritional wellbeing is care and support during pregnancy and lactation. Women are typically the main caretakers of children after birth, and in order to provide quality care they need continued adequate food consumption and health care, rest, and measures to protect their mental health, such as protection from abuse. The third underlying determinant, health environment and services, conditions children's exposure to pathogens and the use of preventative and curative health care. Elements of a health environment include access to safe water, to sanitary facilities for disposing of human waste, to health services, and to shelter [1].

Information from the 2016 EDHS results revealed that in Ethiopia there was a very high prevalence of chronic child malnutrition in that more than one out of two under-five children (or 38 percent) was stunted. These figures are very high even compared to the developing countries which are severely affected by the problem of child stunting. Regional difference are prominent in Ethiopia, more than two in five children are stunted [with Amhara region (46.3%) leading to Benishangul (42.7%) and Afar regions (41.1%)]. EDHS conducted from 2000 to 2016 (for children under-five years of age), the prevalence of stunting has decreased from

66.6 percent in 2000 to 38 percent in 2016. But this figure is still the highest prevalence rate among the sub-Saharan African countries. Although there is a substantial decline in the aggregate prevalence rate of stunting in the under-five children of age, there are great differentials in child stunting rates between the regions within the country, with Oromia region took the prevalence rate (i.e., 36.5 percent of prevalence for stunting [2-4]. Furthermore, the framework also conceptualize caring practice behavior include maternal and child caring practices such as antenatal care visit during pregnancy, depletion of colostrums, exclusive breastfeeding, duration of breastfeeding, vaccination and age at start of complementary feeding, as well as child health conditions during the last weeks before the data collection period which has associated with child malnutrition. Environmental factors deals with sanitation and hygiene practice of the household like use of toilet facility, waste disposal practice and source of drinking water. The single arrow shows how those associated factors directly affect the child malnutrition and there is no backward association between determining factors as well as child malnutrition. The nutritional status of children is important as it determines their health, physical growth and development, academic performance and progress in life. Today, it is a formidable challenge. In globe every country is facing a serious public health challenge from malnutrition and almost one in three people on the planet is malnourished [5,6]. Nearly half of all countries are dealing with more than one type of malnutrition at the same time [7]. Children are more pretentious than adults, though the estimates indicate that 156 million children under-five age around the world were affected by stunting and 50 million children were wasted. Africa and Asia bear the greatest share of all forms of malnutrition. Which presented as 56 percent of all stunted children and 68 percent of all wasted children under-five age lived in Asia; Africa takes the share of 37 percent stunted and 28 percent wasted under-five children [8].

The consequences of malnutrition are factually devastating. An estimated 45 percent of deaths of children under age 5 are linked to malnutrition [9]. The Malnutrition and diet are now the largest risk factors responsible for the global burden of diseases [10]. The problem of malnutrition is serious and worldwide; developing countries are highly vulnerable. For instance in Africa the number of stunted children is rising by 16 percent from year a 2000 and 2015 and the half of the increment was by western Africa. Nevertheless prevalence of stunting and wasting under-five children also high in Eastern Africa 37.5 percent and 6.6 percent estimated respectively [8]. While in Ethiopia 38 percent of children under age five are stunted, while 10 percent of children are wasted, and 24 percent of children under age five are underweight [4] which is high compared to WHO reference point. Economic growth and human development require well-nourished populations who can learn new skills, think critically and contribute to their communities. Early life under nutrition is an underlying cause associated with about a third of young child deaths. Among the survivors that become stunted in the first two years of life, their capacity to resist disease, to carry out physical work, to study and progress in school, are all impaired across the life course [11].

Ethiopia is among the highest level malnutrition in children aged six to fifty-nine months in the world and it has long in history; most pressing health problems as well as 57 percent of child deaths are associated with malnutrition in Ethiopia [12]. The Ethiopian Demographic and Health Survey (EDHS) measure based on comparisons between Ethiopian children aged under five years with the latest WHO multi-country growth references show that 38 percent of children under age five are stunted, and 18 percent of children are severely stunted while 10 percent of children are wasted, and 3 percent are severely wasted and 24 percent of children under age five are underweight, and 7 percent are severely underweight. While in Oromia region the prevalence of child malnutrition indicated that 36.5 percent of the children are stunted with 17.1 percent severely stunted; 10.6 percent of the children are wasted with 3.5 percent severely wasted and 22.5 percent are underweight with 6.6 percent severely underweight which placed in the seventh level among the regions [4].

On the other hand many empirical studies have been conducted on the prevalence and determining factors of malnutrition. For instance, a cross sectional study by [13] identified that the determinants of malnutrition in drought prone rural area. Similarly [14] studied that the food insecurity and its association with children's nutritional status and find out other associated factors in rural area. Moreover, [15] carried out a cross-sectional study and identified that the magnitude and the determinants of malnutrition in food surplus rural area [16] showed that the main determining factor of children under nutrition through community based cross-sectional study in urban setting. Similarly [17] identified the chronic malnutrition prevalence and associated factors on children aged 6-59 months in town. And also [18] indicated that the associated factors of malnutrition on facility based cross-sectional study within urban area. But most of them gave due attention for rural areas and few of them looked urban areas. Particularly, the knowledge of the relative giving of the major risk factors associated with malnutrition in non-administrative small towns was scarce. Thus the aim of this study is, therefore, to estimate the prevalence of malnutrition and identify its determinants among children age 6-59 months in non-administrative small towns of Sebeta Hawas district, Oromia Region.

Materials and Methods

Description of the study area

Sebeta Hawas District is found in Oromiya Special Zone around finfine, Oromia Region which is located between 8° 44' 59.99" N latitude and 38° 39' 59.99" E longitude with a total surface area of 867.92 km^2. The district has 36 rural and 4 town *kebeles*; the total number of population accounts 162,852 out of this 83,528 male and 79,324 female [4]. According to the information obtained from Sebeta Hawas district Administration Office, the total population of the small towns Boneya and Awash Bello were having estimated population of 2,365 and 1,932 respectively. The two small towns were characterized by high production of cereals and legumes while majority of females were engaged in pity trade to diversify means of livelihood (Figure 1).

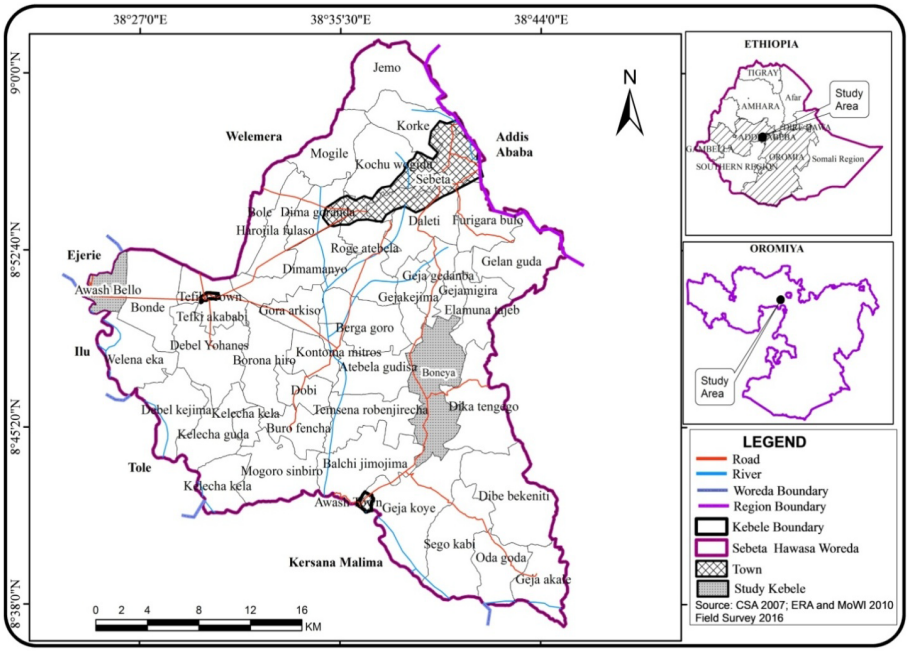

Figure 1. *Study area map (Source: CSA, 2007; ERA and MoWI, 2010).*

Study design

Cross-sectional design was employed to collect relevant and sufficient information within short period of time. The study design was used quantitative and qualitative research approach to assess the complex variables of child malnutrition in the small towns of Sebeta Hawas district; from February 21 to March 21, 2017.

Study population

The study population was children age 6-59 months pair with their mothers or caregivers lived in Awash Bello and Boneya towns of Sebeta Hawas District

Inclusion and exclusion criteria

Mothers or caregivers who have children age 6-59 months lived in the study area at least for six months prior to data collection were incorporated under this study. In the same manner visitors of the selected household during the data collection who have a child age 6-59 months were not included under study.

Data sources

Both primary and secondary sources of data were used to gather the information required for the study. The primary data was collected from eligible respondents (mother or caregiver of index child) and anthropometric measurement. Whereas, secondary data were collected from available document at Sebeta Hawas Health Office, catchment Health Center and Health post.

Sample size determination

To determine the children to be included in the study different methods were employed in order to get representative sample size. Therefore Cochran (1963:75) formula to yield the required sample for proportions was used as Cited by [19].

Thus,

$$n = \frac{z^2}{e^2} pq$$

Where:

n= Sample size required

p=The estimated proportion of an attribute that is present in the population, (expected prevalence).

q=1-p

z= Z- Score associated with appropriately chosen level of confidence (95%) with the table value of 1.96.

e= The desired level of precision

To estimate the sample size, assume p=0.50 maximum expected prevalence of malnutrition for the study area was not known. Accordingly, the desired level of precision 5% with 95% level of confidence the Z value equals 1.96. The estimated sample size to be:

$$n = \frac{(1.96)^2}{(0.05)^2}[0.5(0.5)] \approx 384$$

The total population (total children age 6-59 months) of the small towns are 570; need to adjust using finite population correlation factors. Because, it is advisable to adjust the sample size. Finite population correction factor applied when the sample represents a significant (e.g. over 5%) proportion of the population as cited by [20]. The formula should be:

$$n_a = \frac{n}{1 + \frac{n-1}{N}}$$

Where: n_a = The required sample size, N = The total population of the children age 6-59 months in the study area, n = The sample size estimated based on the assumption of $p = 0.50$.

Thus, the final sample size:

$$n_a = \frac{384}{1+\frac{384-1}{570}} \approx 230$$

Adding 10% contingency for non-response, the final sample size of 6-59 months child-mothers/caregivers pair participate in the study was:

$$n_a = 230 + 10\%(230) = 230 + 23 = 253$$

Sampling techniques and procedures

The study employed mix of sampling techniques; the sampling of the Sebeta Hawas district was purposive, the major reason being the geographical proximity of the area. On the other hand, simple random sampling technique was used to identify the sample household with eligible children. According to information obtained from Sebeta Hawas district administration office, the district has 36 rural k*ebeles*; 4 town *kebeles* and four non-administrative small towns. Thus, the two non-administrative Awash Bello and Boneya small towns were selected randomly. Then to generate a sampling frame for each small town, the calculated 253 sample were allocated based on probability proportional to size. Finally, the eligible households with children age 6-59 months were identified for each small town from Health Post family folder and selected using simple random sampling technique. The first eligible household was selected using systematic random sampling then proceed by adding $(\frac{N}{n})$ up to the required sample size were obtained. When there was more than one child age 6-59 months present in the selected household only one child was chosen randomly (Table 1).

Data Collection Instrument and Procedure

Qualitative and quantitative research method was used to collect the information on the determinants of child malnutrition. The structured questionnaire was administered to eligible respondents (mothers or caregivers of eligible child) to collect quantitative data. The information was collected by 4 enumerators who have one diploma and other have 3 BSc degree as well as fluent in local/Afan Oromo language with similar experience in field surveys were recruited and trained on the administration of the questionnaire and anthropometric measurement. Qualitative information of the study was obtained through focus group discussions (FGD). A close supervision of enumerator during the field work and administration of focus group discussions (FGD) was done.

In addition, to investigate the nutritional status of the children anthropometric measurement on height, weight, and MUAC was taken from each eligible child. Height of the child was measured using measuring board and their weight was measured using UNICEF electronic scale. While MUAC was measured using a new WHO standard MUAC tape (S0145620 MUAC, Child 11.5 Red/PAC-50). The height of infant age 6-23 months (less than 85cm) measured in recumbent position while for children age 24-59 months was measured in stand up position. Accordingly Weight of the lightly closed infants and measured to the nearest 10 g by UNICEF electronic scale for a child who stand alone and as well for not stand alone. For a child not stand alone the mother was weighted together with a child and then without the child. The difference between the two measurements was taken as the child's weight.

On the other hand, Individual Dietary Diversity Score (IDDS) was collected using standard questionnaire for both breastfeeding and not breastfeeding children. IDDS among children 6-23 months of age was an indicator of minimum dietary diversity that has been defined as the proportion of children who received food from at least 4 food groups in the previous day (24 hour recall) using a standard list of 7 food groups. This standard list of 7 food groups used to calculate the indicator are Grains, Roots and tubers (staples foods), Legumes and nuts, Diary product (milk, yogurt, cheese), Fleshed foods (meat, fish, poultry and liver/organ meats), Eggs, Vitamin-A rich fruits and vegetables and Other fruits and vegetables. Every respondent was asked about food taken by the child during 24 hours (day and night) before the survey day inside home as well as outside the home. From the 7 food group the consumption of 4 food group was calculated by adding at least one animal source food (diary and meat) and at least one fruit or vegetable in addition to stable food [21].

Data Quality Assurance

To ensure the data quality the questionnaire was developed in English language and translated to local language (Afan Oromo) and to minimize language bias the data collectors' were fluent speakers of local/Afan Oromo language. The questionnaire was adapted from EDHS instrument as well as from other similar studies. A one day intensive training was given to the data collectors on study objectives, overall survey instruments, how to administer structured questionnaires and how to take anthropometric measurements. Measurements was taken using UNICEF's standard instruments of weighting scale and height board and routinely checked and adjusted to maintain its accuracy, precision and validity. For instance every day similar weight was taken before starting weighting of child and zero reading was checked following weighing child.

Ethical Consideration

The ethical considerations were taken the relevant institution of Addis Ababa University. On the ground, the Sebeta Hawas Administration and Health office was informed about the

Table 1. *Probability proportional to sample size determination and the final sample for each small towns (Awash Bello and Boneya) of Sebeta Hawas District, 2017.*

Purposively selected small towns	Number of households with child 6-59 months	How to Compute Sample in each small town	Sample size	Not at home/refusal at three visit
Awash Bello	192	192*253/570	85	8
Boneya	378	378*253/570	168	15
Total	570		253	23
Final sample			253-23=230	

purpose of the research and permission granted. The respondents were requested to participate only on voluntary basis and informed that they should feel free not to answer any question that they were not comfortable with, however, the importance of answering all the questions were emphasized. Oral consent was obtained from research participants after explaining all the necessary information for them. In the presentation of result, the researcher has not used name in order to ensure confidentiality and anonymity of the respondents.

Data Processing and Analysis

The quantitative data collected through structured questionnaire was entered into Epi-Data version 3.1 and exported to STATA 13 for analysis. To convert the anthropometric data into Z-scores of the indices WHO Anthro version 3.2.2, 2011 software was used for stunting HAZ (Height for Age Z-score), underweight WAZ (Weight for Age Z-score) and wasting WHZ (Weight for Height Z-score) and exported STATA 13 for further analysis. Descriptive statistics such as frequency, percentage, mean and standard deviation was used to organize distribution of child demographic, household's demographic and socioeconomic, maternal and caring behavior and environmental characteristics. Bivariate and multivariate regression model were used first to identify the association between independent determinants and outcome variables. As well as used to estimate the imperative determinants that influence on nutritional status of children [22].

Statistical Model Specification

Univariate (bivariate) logistic regression and multivariate logistic regression, are approaches to develop a probability model for binary response variable having correlation. The rationale behind bivariate and multivariate logistic regression was the correlated outcome variables with their perspective independent variables were estimate in the model at one time. For instance the indicator of malnutrition such as stunting, wasting and underweight had a binary response 0 or 1 estimated within each covariate. From logistic distribution equation, $\pi(x)$ is the probability of malnourished (stunted, underweight and wasted) that depend on p covariates or independent variables. Then using logit for modelling the probability;

$$\pi(x) = \frac{e^{\beta o+\beta_1 X_1+\beta_2 X_2+\ldots\beta_p X_p}}{1+e^{\beta o+\beta_1 X_1+\beta_2 X_2+\ldots\beta_p X_p}} \quad (1)$$

To obtain the corresponding logit function from this, we calculate (letting X represent the whole set of covariates $X1, X2, \ldots, Xp$):

$$\text{logit}[\pi(x)] = In\left[\frac{\pi(x)}{1-\pi(x)}\right] \quad (2)$$

$$= In\left[\frac{\dfrac{e^{\beta o+\beta_1 X_1+\beta_2 X_2+\ldots\beta_p X_p}}{1+e^{\beta o+\beta_1 X_1+\beta_2 X_2+\ldots\beta_p X_p}}}{1-\dfrac{e^{\beta o+\beta_1 X_1+\beta_2 X_2+\ldots\beta_p X_p}}{1+e^{\beta o+\beta_1 X_1+\beta_2 X_2+\ldots\beta_p X_p}}}\right] \quad (3)$$

$$= In\left[\frac{\dfrac{e^{\beta o+\beta_1 X_1+\beta_2 X_2+\ldots\beta_p X_p}}{1+e^{\beta o+\beta_1 X_1+\beta_2 X_2+\ldots\beta_p X_p}}}{\dfrac{1}{1+e^{\beta o+\beta_1 X_1+\beta_2 X_2+\ldots\beta_p X_p}}}\right] \quad (4)$$

$$= In\left[e^{\beta o+\beta_1 X_1+\beta_2 X_2+\ldots\beta_p X_p}\right] \quad (5)$$

$$= \beta 0+\beta 1X1+\beta 2X2+\ldots\beta pXp \quad (6)$$

So, the logit of the probability of malnourished given X covariates is a simple linear function.

Finally, the basic equation of multivariate logistic regression is:

$$\pi(x) = \frac{e^{\beta o+\beta_1 X_1+\beta_2 X_2+\ldots\beta_p X_p}}{1+e^{\beta o+\beta_1 X_1+\beta_2 X_2+\ldots\beta_p X_p}} = \beta o+\beta 1X1+\beta 2X2+\ldots\beta pXp \quad (7)$$

This is the probability of malnourished children given the covariate values such as demographic, socioeconomic, environmental characteristics, child caring practice and child health. With the assumption that the mean probabilities of each data point error term has zero and it follows binomial distribution mean $\pi(x)$ and variance $\pi(x)[1-\pi(x)]$.

Diagnostic Tests

Before the start of any model analysis it is essential to attend to the problem of multicollinearity and contingency coefficients among the selected explanatory variable [22]. The correlation of above 0.80 and below - 0.80 are used and as a critical point to indicate serious multicollinearity problem [23,24]. The coefficients of all variables in this study were found to be below 0.6220 and above -0.1302. Therefore, there was no severe multicollinearity problem among independent variables.

Hypothesis and Definition of Variables

Outcome variable

The nutritional status of children indicated by stunting (height for age), underweight (weight for age) and wasting (weight for height) was used as outcome variable.

Predictor variables

Based on available literature the following selected predictor variables influence nutritional status of children was explained and hypothesized as follows (Table 2).

Results and Discussion

The analysis and discussion of the responses gathered through the structured questionnaire and anthropometric measurement and focus group discussion. Descriptive statistics and statistical model analysis were employed. The relationship between the dependent variables (indicator of child malnutrition such as stunting, wasting and underweight) with their respective explanatory variables and the effect of the explanatory variables on the dependent variables are also presented.

Household demographic and socioeconomic characteristics

Some descriptive statistics of gender, households' size,

number of under-five children in the household, parental and maternal educational characteristics, mothers' occupation and household's income of the sampled households are summarized in the Tables 3 and 4. From complete response obtained from 230 households about 29% were female headed households and 71% were male headed households. The average household size was 5, while the minimum and maximum household size was 2 and 15 respectively. Number of children under-five years was found to be in the sampled households with means of 1.17. While minimum and maximum number of children lives within the households was 1 and 3 respectively.

Parental and maternal education level considered in both completed grade and categorical form; because the categorical form helps the investigator to capture informal education attended by the parents of the child. Thus, the parental educational level from the surveyed households 57 (24.78%) had no formal education, 19 (8.26%) were can read and write, 99 (43.04%) were attended primary education, 21 (9.13%) were attended secondary education and only 3 (1.30%) were attended higher educational level. The mean parental education was 3.80 with maximum higher degree (bachelor degree) educational level. Similarly the maternal educational level attended by the respondents were 109 (47.39%) had no formal education, 4 (1.74%) were can read and write, 95 (41.30%) were attended primary education, 19 (8.26%) were attended secondary education and 3 (1.30%) were attended technical and vocational. And the mean of maternal education was 2.97 with the maximum attainment of technical and vocational education.

The survey result shows that the main occupation of mothers involved were petty trade 107 (46.52%), 27 (11.74%) farming, 14 (6.09%) employed at self-organization or governmental organization and 2 (0.87%) hand craft whereas the rest 80 (34.78%) were housewives. The mean households' monthly income was 3,998.70ETB with minimum of 150ETB and maximum of 120,000ETB.

Table 2. *Explanatory variables, type and expected sign, of Sebeta Hawas District, 2017.*

Explanatory Variable	Type	Expected Sign
Age of child (in months)	Continuous	+
Gender of the child (being male)	Dummy	-/+
Household size	Continuous	+
Number of children under-five	Continuous	+
No formal maternal education	Categorical	+
No formal parental education	Categorical	+
Less than1500ETB monthly income	Dummy	+
Maternal employment status	Categorical	+
Not fully vaccinated	Dummy	+
Diseases during last two weeks (diarrhea, fever, cough)	Dummy	+
Less than 4 times antenatal care visit of the mother during pregnancy	Dummy	+
Not depleting colostrums	Dummy	+
Not exclusive breast feeding	Dummy	+
Duration of breast feeding	Continuous	-
Age at start of complementary feeding	Continuous	+
Source of drinking water	Categorical	-
Latrine facility in the house	Categorical	-

Note: (+) sign indicate as the predictor variable increase the probability of being malnourished increase. (-) sign the inverse relationship between the predictors and the probability malnourished.

Table 3. *Household demographic characteristics in small towns (A/Bello and Boneya) of Sebeta Hawas District, 2017.*

Household head					
Sex	**Number**	**Percent**			
Male	196	71			
Female	34	29			
Total	230	100			
Households size					
Variable	**Obs**	**Mean**	**SD**	**Min**	**Max**
Household size	230	5	2	2	15
Number of under-five children					
Variable	**Obs**	**Mean**	**SD**	**Min**	**Max**
No under-five	230	1.17	0.39	1	3

Table 4. *Household socioeconomic characteristics in the small towns (A/Bello and Boneya) of Sebeta Hawas district, 2017.*

Parental education					
Category	**Number**	**Percent**			
No formal education	57	24.78			
Can read and write	19	8.26			
Primary	99	43.04			
Secondary	21	9.13			
Degree and above	3	1.30			
Not alive & separate	31	13.48			
Total	230	100			
Parental education (Year)					
Variable	**Obs**	**Mean**	**SD**	**Min**	**Max**
Education (year)	199	3.80	3.90	0	15
Maternal education					
Category	**Number**	**Percent**			
No formal education	109	47.39			
Can read and write	4	1.74			
Primary	95	41.30			
Secondary	19	8.26			
Technical and vocational	109	1.30			
Total	4	100			
	Maternal education (Year)				
Variable	**Obs**	**Mean**	**SD**	**Min**	**Max**
Education (year)	230	2.97	3.59	0	13
Maternal occupation					
Category	**Number**	**Percent**			
Housewife	80	34.78			
Farming	27	11.74			
Pit trade	107	46.52			
Employed	14	6.09			
Handcraft	2	0.87			
Total	230	100			
Household monthly income					
Variable	**Obs**	**Mean**	**SD**	**Min**	**Max**
Income	230	3998.70	8688.84	150	120,000
Exposure to mass media					
Category	**Number**	**Percent**			
Yes	98	42.61			
No	132	57.39			
Total	230	100			

Obs-Observation

Child demographic characteristics, maternal and child caring behaviour

For the purpose of this study children age 6-59 months were targeted and only one child in this age category was selected from each sample household. From those 230 sampled children 118 (51.30%) were male and 112 (48.70%) were female. In other word the proportion of male and female included in the sample were almost equal. The minimum and maximum age of children was 6 and 59 months respectively with mean age of 28.84 months. Similarly the mean birth order of child was found to be 2.68 with minimum 1 and maximum 10 birth order (Table 5).

As described in the Table 6, antenatal care visit by mothers during the pregnancy of selected child had mean value of 3.77 times with minimum 0 (no antenatal visit) and maximum 9 times visit. From 230 sample respondents 184 (80%) mothers provide breast immediately/ less than one hour after birth, 42 (18.26%) of them provide after one to twenty four hours after delivery and 3 (1.30%) mothers provide breast after twenty four hours. About 168 (73.04%) surveyed children fed colostrums and 62 (26.96%) of children not fed. Breast feeding is widely practiced among mothers, About 156 (67.83%) of them breast-

Table 5*. Child demographic characteristics in the small towns (A/Bello and Boneya) of Sebeta Hawas district, 2017.*

Sex of child					
Sex	**Number**		**Percent**		
Male	118		51.30		
Female	112		48.70		
Total	230		100		
Age of child (in month)					
Variable	**Obs**	**Mean**	**SD**	**Min**	**Max**
Age	230	28.84	15.45	6	59
Birth order of child					
Variable	**Obs**	**Mean**	**SD**	**Min**	**Max**
Birth order	230	2.68	1.84	1	10

Table 6. *Maternal and child caring behavior in the small towns (A/Bello and Boneya) of Sebeta Hawas district, 2017.*

Antenatal visit during pregnancy					
Variable	Obs	Mean	SD	Min	Max
Antenatal	230	3.77	1.80	0	9
Initiation of breast feeding					
Category	**Number**	**Percent**			
Immediately\<1hr	184	80			
After 1 to 24hr	42	18.26			
After 24hr	3	1.30			
Not given at all	1	0.43			
Total	*230*	100			
Feeding colostrums'					
Category	**Number**	**Percent**			
Yes	168	73.04			
No	62	26.96			
Total	230	100			
Exclusive breastfeeding					
Category	**Number**	**Percent**			
Yes	156	67.83			
No	74	32.17			
Total	230	100			
Current breast feeding					
Category	**Number**	**Percent**			
Yes	139	60.43			
No	91	39.57			
Total	230	100			
Duration of breast feeding (in month)					
Variable	**Obs**	**Mean**	**SD**	**Min**	**Max**
Duration breast	230	23.67	12.05	0	54
Initiation of complementary feeding					
Category	**Number**	**Percent**			
At 6 months	118	51.30			
At < 6 months	56	24.35			
At > months	53	23.04			
Not yet start	3	1.30			
Total	230	100			
Vaccination					
Category	**Number**	**Percent**			
Completed BCG-vitamin	88	38.26			
Not completed BCG-vitamin	125	54.35			
Not completed b/c age (6-9m)	14	6.09			
Not vaccinated at all	3	1.30			
Total	230	100			

fed their child exclusively for six months and 74 (32.17%) not exclusively fed their child. And about 139 (60.43%) of child fed breast during the survey. The mean value of duration of children breast feeding was 23.67 months with minimum of 0 and maximum of 54 months.

The survey result also shows that about 118 (51.30%) of children fed complementary foods at the age of six months while 56 (24.35%) before six months and 53 (23.04%) after six months of age and only 3 (1.30%) of children had not started complementary foods. From the total 230 of children only 88 (38.26%) were fully vaccinated while 125 (54.35%) children were not fully vaccinated and 14 (6.09%) were not completed their vaccination because of their age lies from 6-9 months. Similarly 3 (1.30%) children were not vaccinated at all by any means (Table 7).

Disease incidence for child morbidity that occur during the last two weeks before the survey period result revealed that out of 230 children about 40 (17.39%) children were affected by diarrhea, 85 (37%) children were affected by respiratory infection disease, 53 (23%) children had fever and only 5 (2.2%) of children had vomiting in the last two weeks before survey.

Household environmental health situations

Environmental characteristics were one detrimental factors of child malnutrition. Thus, the survey result show that from 230 surveyed households only 15 (6.52%) households were used pipe water as main source of drinking water while 96 (41.74%) used public tap and 91 (39.57%) used protected dug well whereas 23 (10%) of households used unprotected dug well and the rest households used bottled water and unprotected spring. Regarding toilet facility about 81 (35.22%) had no toilet facility they used field or bush. While 30 (13.04%) households used pit latrine with slap and 119 (51.74%) of them used pit latrine without slap. Out of 230 sampled households 21(9.13%) had only a place for hand wash. Table 8 also indicates that 168 (73%) of the households were disposed waste in the field while 47 (20.43%) were disposed in pit dump and 15 (6.52%) burn the waste.

Table 7. *Child health situations during the last two weeks before survey in the small towns (A/Bello and Boneya) of Sebeta Hawas District, 2017.*

Diarrhoea		
Category	**Number**	**Percent**
Yes	40	17.39
No	190	82.61
Total	230	100
Cough		
Category	**Number**	**Percent**
Yes	85	37
No	145	63
Total	230	100
Fever		
Category	**Number**	**Percent**
Yes	53	23
No	177	77
Total	230	100
Vomiting		
Category	**Number**	**Percent**
Yes	5	2.2
No	225	97.8
Total	230	100

Children's nutritional status

To assess nutritional status of children in the selected small towns of Sebeta Hawas district the anthropometric measurement of 230 children were collected. The most key indicators of nutritional status of children for both chronic and acute malnutrition were considered. Those indicators was height for age (stunting) which resulted from the effects of chronic malnutrition, weight for age (underweight) and weight for height (wasting). Additionally to strength the result of acute malnutrition MUAC measurement were also collected.

The anthropometric measurement was calculated using WHO Antro software according to the WHO [25] international growth standards. This software produces sex and age specific estimates for the prevalence of under nutrition, mean and SD of the z-scores for each indicator. Indices are expressed as standard deviation from the median reference group. According to this standard the cut point to be stunted, wasted or underweight (<-2SD) while severely stunted, wasted or underweight (<-3SD) from the median of the reference population (Table 9).

It indicates that the prevalence of overall malnutrition in the small towns was found to be high rate. From the total 230 sampled children 106 (46.0%) were malnourished and 25 (10.9%) were severely malnourished. Specifically, 52 (22.6%) children were stunted and 14 (6.1%) children were severely stunted. While 37 (16.1%) of children were underweight and 7 (3%) were severely underweight. Though the prevalence of wasting among those sampled children were 17 (7.4%) and 4 (1.7%) were severely wasted.

Table 8. *Household environmental health situations in small towns (A/Bello and Boneya) of Sebeta Hawas district, 2017.*

Main source of drinking water		
Category	**Number**	**Percent**
Pipe water	15	6.52
Public tap	96	41.74
Protected dug well	91	39.57
Unprotected dug well	23	10.00
Un protected spring	1	0.43
Bottled water	4	1.74
Total	230	100
Toilet facility		
Category	**Number**	**Percent**
Pit latrine with slap	30	13.04
Pit latrine without slap	119	51.74
No facilities or bush/field	81	35.22
Total	230	100
Place of hand wash		
Category	**Number**	**Percent**
Yes	21	9.13
No	209	90.87
Total	230	100
Waste disposal		
Category	**Number**	**Percent**
Field	168	73.04
Pit dump	47	20.43
Burn	15	1.52

Stunting refers chronic malnutrition resulted from a cumulative and long term effect of inadequate nutrition, food shortages, frequent illness in the childhood. The consequence of to be stunted was mental retardation, low school performance, and reduce working capacity at adult age. The study result shows that the prevalence of stunting still high in the study area and the proportion stunted male children was higher compared to female children.

As indicated in the Table 10, the prevalence of stunting was found higher in children age group from 36-47 months 16 (32.70%) and lower at age group 6-11 months 2 (6.50%); severity of to be stunted also increase at age of 24-35 months by 9.80%.

Underweight is a result of chronic malnutrition or/and acute malnutrition. The study result revealed that the prevalence of underweight in the study area were higher in female children 22 (19.9%) compared to than male children 15 (12.7%) with mean value -0.62 and -0.57 respectively. Although the severity also higher to same extent in the female children 4 (3.6%) than male children 3 (2.5%).

As described in Table 11 from 41 children's belongs to age group 24-35 months the prevalence of Underweight in the study area was higher 9 (22%) and also severe 5 (12.2%) in this age group with mean value of -1.19. While lower in the age 6-11 months 2 (6.5%). Wasting is an indicator of acute malnutrition and shows the current nutritional status of children. Thus, the study result indicates from 230 selected children 17 (7.4%) were wasted. While 4 (1.7%) were severely wasted. Though male children 10 (8.5%) were wasted than female children 7 (6.3%).

It has been showed that the prevalence of wasting by age group was higher in the children age 36-47 months 7 (17.10%) with mean value -0.80 while lower in the children age 48-59 months with mean value of -0.53 (Table 12).

The MUAC measurement result is also an indicator of immediate acute malnutrition for children age 6-59 months. To vigor the results of weight for height Z- score (wasting) MAUC for age Z-score (MUACZ) was estimated. Therefore, children affected by acute malnutrition were slightly higher than the result observed in the weight for height measurement.

Determinants of child malnutrition

For the purpose of these study demographic factors such as sex, age and birth order of child and sex of household head; socioeconomic factors such as parental and maternal education, maternal main occupation, household monthly income, number of children under-five years in the household and household size; child caring practice behavior such as antenatal visit during pregnancy, colostrums' feeding, exclusive breast feeding,

Table 9. *Overall prevalence of malnutrition, stunting, underweight and wasting in the small towns (A/Bello and Boneya) of Sebeta Hawas district, 2017.*

Indicators	< -3SD		< -2SD		Mean	SD
	Number	Percent	Number	Percent		
Overall Malnutrition	25	10.9	106	46.0	-0.79	1.23
Stunting	14	6.1	52	22.6	-0.87	1.52
Underweight	7	3.0	37	16.1	-0.91	1.12
Wasting	4	1.7	17	7.4	-0.60	1.06

Table 10. *Prevalence of stunting by sex and age group in the small towns (A/Bello and Boneya) of Sebeta Hawas district, 2017).*

		<-3SD		<-2SD		MEAN	SD
Sex		**Number**	**Percent**	**Number**	**Percent**		
Males	118	8	6.80	27	22.90	-0.91	1.53
Females	112	6	5.40	25	22.30	-0.82	1.52
Total	230	14	6.10	52	22.60		
Age group in month n=230							
6-11	31	0	0.00	2	6.50	0.10	1.16
12-23	72	5	6.90	11	15.30	-0.50	1.73
24-35	41	4	9.80	12	29.30	-1.21	1.67
36-47	49	3	6.10	16	32.70	-1.38	1.12
48-59	37	2	5.40	11	29.70	-1.31	1.05
Total	230	14	6.10	52	22.60	0.10	1.16

Table 11. *Prevalence of underweight by sex and age group in the small towns (A/Bello and Boneya) of Sebeta Hawas district, 2017.*

		<-3SD		<-2SD		Mean	SD
Sex		**Number**	**Percent**	**Number**	**Percent**		
Males	118	3	2.50	15	12.70	-0.57	1.08
Females	112	4	3.60	22	19.60	-0.62	1.04
Total	230	7	3	37	16.10		
Age group in month n=230							
6-11	31	1	3.20	2	6.50	-0.45	1.08
12-23	72	0	0	9	12.50	-0.63	1.13
24-35	41	5	12.20	9	22.00	-1.19	1.27
36-47	49	0	0	9	18.40	-1.21	0.85
48-59	37	1	2.70	8	21.60	-1.14	0.85
Total	230	7	3	37	16.10		

duration of breast feeding, vaccination; environmental factors such as source of main drinking water, availability of latrine, environmental conditions and disease during the last two weeks before the study and personal factors such as information or mothers exposure to mass media discussed in examining factors for child malnutrition (Table 13).

Statistical analysis

To identify significant and independent determinants of child malnutrition statistical analyses were carried out at two stages. Firstly, bivariate logistic regression was performed to identify the variables that affect child malnutrition on bivariate level. Secondly, the most important variables that determine nutritional status of children age 6-59 months were estimated by employing multivariate logistic regression analysis. The predictors found associated with child malnutrition status in the bivariate analysis at 10% levels of significance were considered as candidate variables for the multivariate analysis.

Bivariate logistic regression analysis

The bivariate analysis (crude analysis) was conducted to find out the independent effect of each explanatory variable on the binary outcome variables. It helps to identify potential variables for the multivariate analysis. The variables associated at 10% level of significance were taken into account in order to not exclude potential determinants from the analysis at early stage. As shown in the Table 14, the number of children under-five in the household, parental education, maternal education and household monthly income were found statistically significant predictors of wasting in the bivariate analysis. Incidence of diseases during last two weeks before the study, exclusive breastfeeding and birth order of child were not found as significant predictors of wasting.

Correspondingly, as indicated in the Table 15, child age, parental education, maternal education, monthly income, mothers antenatal care visit during pregnancy, household waste disposal were identified as significant predictors for stunting in the bivariate analysis. Sex of child and exclusive breastfeeding practice were not statistically significant predictors for stunting. Similarly, for underweight age of child, parental education and monthly income and waste disposal practice of the household were found to be statistically significant predictor in addition to vaccination. On other hand variables such as, current breastfeeding and exclusive breastfeeding were not significantly associated with underweight.

Table 12. *Prevalence of wasting by sex and age group in small towns (A/Bello and Boneya) of Sebeta Hawas district, 2017.*

Sex		<-3SD		<-2SD		Mean	SD
		Number	Percent	Number	Percent		
Males	118	2	1.70	10	8.50	-0.57	1.08
Females	112	2	1.80	7	6.30	-0.62	1.04
Total	230	4	1.70	17	7.40		
Age group in month n=230							
6-11	31	1	3.20	4	12.90	-0.60	1.28
12-23	72	1	1.40	3	4.20	-0.50	1.01
24-35	41	1	2.40	7	17.10	-0.80	1.30
36-47	49	0	0	2	4.10	-0.61	0.80
48-59	37	1	2.70	1	2.70	-0.53	0.98
Total	230	4	1.70	17	7.40		

Table 13. *Prevalence of acute malnutrition result from MUAC for age Z-score in small towns (A/Bello and Boneya) of Sebeta Hawas district, 2017.*

	Number	Percent
Severe acute malnourished (MUACZ<-3SD)	12	5.21
Acute malnourished (MUACZ<-2SD)	22	9.57

Table 14. *Bivariate analysis result for wasting in the small town (A/Bello and Boneya) of Sebeta Hawas district, 2017.*

Child malnutrition Indicator	Explanatory variables	Coefficient	95% CI
Wasting		1* (0.51)	-0.01 2.00
	Birth order	-0.21 (0.15)	-0.50 0.07
	Parental education Formal[rc] No formal	1.24** (0.53)	0 .20 0 .27
	Maternal education Formal[Rc] No formal	1.89*** (0.65)	0.62 3.17
	Monthly income ≥ 1500[rc] <1500	1.79*** (0.55)	0 .70 2.87
	Exclusive breastfed Yes[rc] No	0 .51 (0.55)	-0.57 1.58
	Disease last two weeks Yes[rc] No	0 .45 (0.60)	-0.73 1.62

***significant at 1%, **significant at 5% * significant at 10%, unmarked not significant; - reference category; the number in the bracket indicates Standard error; CI-confidence interval.

Multivariate logistic regression analysis

Multivariate logistic regression analysis was conducted to identify the independent predictor variables that affect child malnutrition. All explanatory variables included in the bivariate analysis were analyzed in the multivariate model to find out the imperative determinants of child malnutrition. The table shows the estimated coefficients of explanatory variables along with the 95% confidence interval.

As displayed in Tables 16 and 17 above, the multivariate analysis were identified number of children age 6-59 months, birth order of child, maternal education and monthly income as significant determinants for wasting. While for stunting, child age, parental education, and monthly income, mother antenatal care visit during pregnancy and household waste disposal practice were found as independent and statistically significant determinants. Similarly, age of child, parental education, and monthly income were found statistically significant determinants of underweight in addition to vaccination and exclusive breastfeeding.

Discussion on the Determinants of Child Malnutrition

Wasting

Number of under-five children in the household: The study finding show that the higher the number of under-five children in the household, the greater the chance of being wasted. However the result is significant only at 10% significance level. This might be the care and treatment decrease as the number of children under-five increases in the household. This finding is consistent with previous studies [26] which found rather than household size number the under-five children per household was critical and significant determinant in aggravating wasting.

Birth order: The birth order of child is found to be a statistically significant determinant of wasting. The negative coefficient indicates inverse relationship that's as birth order of child increase the child has less probability of being wasted at 5% significance level. For instance, if we compare the first and second birth order the child in the second birth order has less likely to be wasted than the first. This result is in harmony with finding [27] which found birth order was the most important determinants of children nutritional status in Ethiopia.

Maternal education: Maternal education was found to be statistically significant factor and that determines wasting. The positive value shows that a child whose mother had no formal education has higher probability to be wasted compared to a child whose mother attended formal education. This finding in line with the previous studies [28] which found out children from mother which has higher education level attainment was less chance to be being wasted. This is might be because of

Table 15. *Bivariate analysis result stunting and underweight in the small towns (A/Bello and Boneya) of Sebeta Hawas District, 2017.*

Child malnutrition indicator	Explanatory variables	Coefficient	95% CI
Stunting	Child sex Male[rc] Female	0.02 (0.31)	-0.60 0.63
	Child age	0.03*** (0.01)	0.01 0.05
	Parental education Formal[rc] No formal	1.83*** (0.34)	1.15 2.50
	Monthly income ≥1500[rc] <1500	1.85*** (0.34)	1.18 2.51
	Antenatal care visit ≥ 4 times[rc] <4 times	1.89*** (0.35)	1.21 2.57
	Exclusive breastfed Yes[rc] No	0 .23 (0.32)	-0.41 0.86
	Waste disposal Dump pit/burn[rc] Field	0.73** (0.36)	0.02 1.44
Underweight	Age of child	0 .02* (0.01)	-0.01 0 .04
	Parental education Formal[rc] No formal	2.38*** (0.45)	1.50 3.30
	Monthly income ≥1500[rc] <1500	2.33*** (0.42)	1.50 3.15
	Vaccination Complete[rc] Not complete	2.72*** (0.55)	1.64 3.80
	Current breastfeed Yes[rc] No	0 .05 (0.37)	-0.67 0.77
	Exclusive breastfed Yes[rc] No	0.39 (.038)	-0.36 1.13
	Waste disposal Dump pit/burn[rc] Field	0.94** (0.45)	0.06 1.81

as mothers attend formal education or have a higher level of education they offer appropriate care for their child.

Monthly income: As hypothesized, household monthly income was found to have a positive coefficient and significant factor at 10% level on wasting. Children from the households who had less than 1500 ETB monthly income are more likely to be wasted compared to children of household with higher monthly income (equal or greater than 1500 ETB monthly income). This result conformity with studies by [29] implies that monthly household income was highly associated with wasting.

Stunting

Child age: As expected, this result revealed that age of child

Table 16. *Multivariate logistic regression estimates for wasting in the small towns (A/Bello and Boneya) of Sebeta Hawas district, 2017.*

Child malnutrition indicator	Explanatory variables	Coefficient	95% CI
Wasting	Number of children under-five in the household	1.03* (0.60)	-0.15 2.20
	Birth order	-0.38** (0.18	-0.74 -0.03
	Parental education Formal[rc] No formal	-0.37 (0.73)	-1.81 1.06
	Maternal education Formal No formal	1.20** (0.90)	0 .21 3.73
	Monthly income ≥1500[rc] <1500	1.08* (0.65)	-0.20 2.35
	Exclusive breastfed Yes[rc] No	0.79 (0.60)	-0.38 1.20
	Disease last two weeks Yes[rc] No	-0.10 (0.70)	-1.46 1.27

***significant at 1%, **significant at 5% * significant at 10%, unmarked not significant; -reference category; the number in the bracket indicates Standard error; CI-confidence interval.

Table 17. *Multivariate logistic regression estimates for stunting and underweight in the small towns (A/Bello and Boneya) of Sebeta Hawas district, 2017.*

Child malnutrition indicator	Explanatory variables	Coefficient	95% CI
Stunting	Child sex Male[rc] Female	0.13 (0.37)	-0.61 0.86
	Child age	0.03** (0.12)	0.01 0.05
	Parental education Formal[rc] No formal	1.18*** (0.41)	0.37 1.20
	Monthly income ≥1500[rc] <1500	1.17*** (0.39)	0.40 1.93
	Antenatal care visit ≥ 4 times[rc] <4 times	1.10** (0.42)	0.24 1.89
	Exclusive breastfed Yes[rc] No	0.63 (0.39)	-0.13 1.39
	Waste disposal Dump pit/burn[rc] Field	-0.04 (0.44)	-0.91 0 .83
Underweight	Child age	0.02* (0.01)	-0.01 0 .05
	Parental education Formal[rc] No formal	1.42*** (0.53)	0.38 2.46
	Monthly income ≥1500[rc] <1500	1.44*** (0.48)	0 .50 2.37
	Vaccination Complete[rc] Not complete	1.63** (0.65)	0.35 2.90
	Exclusive breastfed Yes[rc] No	0.91* (0.46)	-0.01 1.81
	Waste disposal Dump pit/burn[rc] Field	0.01 (0.56)	-1.08 1.09

***significant at 1%, **significant at 5% * significant at 10%, unmarked not significant; -reference category; the number in the bracket indicates Standard error; CI-confidence interval.

had a positive coefficient and significant at 5%. This implies that as age of the child increases the child has higher risk of being stunted. This result is similarity with previous studies [14,15] which revealed that the risk of being stunting to be increase as the age of a child increase. It might be because of stunting is a cumulative effect of long term food deficient, care and exposure to chronic diseases.

Parental education: Parental education was found as statistically significant predictor having an influence over stunting. The result show that children born from father with no formal education is more likely to be stunted compared to children whose father had a formal education at 1% level of significance. This in line with the previous studies [30] parental education was the positive effect on nutritional status of children. The potential reason might be as the fathers attend a formal education they acquire knowledge and information on child nutrition. In contrast, the means of household income also diversified and amplified which affect directly child malnutrition.

Monthly income: Stunting is also influenced by household monthly income with a statistically significant positive coefficient indicating children from a household with less than 1500ETB monthly income has higher likelihood of being stunted compared to those from greater or equal to 1500ETB household monthly income. This finding is similar to previous works [29,31] showed that the monthly family income was the noteworthy determinant of stunting.

Antenatal care visit: Antenatal care visit of mother during pregnancy is another factor that affected stunting. The result corroborates the fact that children born to mothers who attended less than four times antenatal care visit during their pregnancy were more likely to being stunted compared to children born to mothers with an ANC visit greater or equal to four times antenatal care visit. This finding conformity with [32] shows that children whose mother attended antenatal care (ANC) service during their pregnancy less than four times more likely to be affected by stunting. This might be the advice they obtain during antenatal visit helps them to take care of their children. Although the vaccination and medicine they take from the service delivery helps the children resistant to disease. Moreover, during focus group discussion conducted in the study area, members of the group explained that the major challenges that hinder the antenatal care visit are lack of information and availability of the service provider.

Underweight

Resembling to stunting, age of a child, parental education, and monthly income are found statistical significant determinants at 10%, 1% and positive coefficient of 0.02, 1.42 and 1.63, respectively.

Vaccination: Child vaccination is found as an important factor for underweight. Children who were not fully vaccinated were more likely affected by underweight compared to those children fully vaccinated. This result is alike with previous outcome of [32,33] which revealed that postnatal care visit like, vaccination were significantly associated with Underweight. It might be the child who receives the complete vaccination has the likelihood of improved resistant to disease. This might be minimizing the risk of being underweight. The result from focus group discussions indicates that the members explained that they didn't have clear information on the follow up and completion of child vaccination.

Moreover, during focus group discussion conducted in the study area, members of the group explained that the major challenges that hinder the antenatal care visit are lack of information and availability of the service provider.

Exclusive breastfeeding: Not exclusive breastfeeding showed an effect on underweight. The positive coefficient values of 0.63 indicates children who were not fed breast exclusively were more likely affected by underweight compared to those children who fed breast exclusively but the result is significant only at 10% level of significance. Similar finding was reported by [34] not exclusive breastfeeding practice was greatly associated with underweight. The potential reason might exclusive breast feeding reduces the risk of being affected by disease such as diarrhea, asthma and other infectious diseases. This is leading cause to underweight.

Individual Dietary Diversity Score (IDDS)

In addition to showing a proxy for adequate micronutrient density of foods IDDS has been shown to be association with nutritional status of individuals (under-five children) after controlling cofounding socioeconomic factor. In this study the bivariate logistic regression result revealed that there is statistical significant association with malnutrition while in multivariate logistic regression there is no statistical significant association shown in Table 18.

According to WHO (2010) formula for minimum dietary diversity score: [35]

Proportion of children 6-23 months of age who received foods from 4 or more food groups =

$$\frac{Children\ 6-23 months\ of\ age\ who\ recieved\ food\ from \geq 4 food\ groups\ the\ previous\ day}{Children\ 6-23\ months\ of\ age} = \frac{38}{103} = 0.37$$

This indicates that from the total children of 103 ages 6-23 months only 0.37 proportions were get at least 4 or more foods group.

Conclusion

In study area, from sampled 230 children included in the

Table 18. *Individual dietary diversity score by age group in small towns (A/Bello and Boneya) of Sebeta Hawas district, 2017.*

	Food group eaten in 24 hours before the study	
	At least four or more food group	Less than four food group
Age group		
6-23 months	38	65
24-59 months	41	86
Total	79	151

study the overall prevalence malnutrition was identified. Thus, 46% children were malnourished and 10.9% were severely malnourished. More specifically, 22.6%, 16.1% and 7.4% children were stunted underweight and wasted, respectively. Though, 6.1%, 3% and 1.7% children were severely stunted, severely underweight and severely wasted, respectively. The multivariate logistic regression indicated that the potential determinants from independent variables included in bivariate logistic regression in the beginning. So, age of child, number of children under-five in the household, no formal parental education, no formal maternal education, monthly income less than 1500ETB, antenatal care visit less than four times during the pregnancy of mothers, not fully vaccination and not exclusive breast feeding were found positive and statistically significant determinants for child malnutrition (more likely affect child malnutrition) in the study area at ($p<1\%$, 5% and 10%). Additionally birth order of child was negative and significant determinant for child malnutrition (less likely affect child malnutrition) at ($p< 5\%$). Income generating activities should be weighted and enhanced through providing priority to households who has limited income source by Sebeta Hawas district Finance and Development Office as well as by Sebeta Hawas district Small-scale Enterprise Office and NGO's.

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