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UNDERNUTRITION AND ITS DETERMINANTS AMONG CHILDREN IN SEBETA PERI-URBAN AREAS, OROMIA SPECIAL ZONE SURROUNDING ADDIS ABABA, ETHIOPIA

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ABSTRACT

Child undernutrition is one of the most serious public health problems in Ethiopia. Hence, the study was aimed to assess the prevalence of undernutrition (stunting, wasting and underweight) and identify the major associated factors of nutritional status of under-five children in Sebeta Peri-urban areas of Oromia Special Zone Surrounding Addis Ababa, Ethiopia. A community based cross-sectional study was conducted to collect data by using structured questionnaires and anthropometric measurement from participaters of 368 households. The data was analysed using SPSS version 20 and anthropometric measurements were converted into Z-scores by WHO Anthro version 3.2.2. The findings of the analysis indicated that about 30.2%, 27.5% and 13.1% of the under-five children in the study area were stunted, underweight and wasted, respectively. In order to investigate the determinants of child undernutrition Bivariate and Multivariate logistic regression models were applied. The result of multivariate logistic regression model revealed that female children were more affected by stunting problem compered to male children. In addition to this, maternal education was negatively associated with stunting; while, age of child, lack of farm land, and diahrrea occurrence were found to be positively associated with stunting. Whereas, mother's height, mother's BMI, household's average monthly income, no exposure to urban waste disposal were negatively associated with underweight. Where as, lack of adequate information on child care, age of child and diarrhea occurrence were positively associated with underweight among under five children. The positive predictors or determinants of wasting were number of under-five children in the household, lack of adequate information on child care, lack of colustrums feeding (immediately within the first three to four days after birth) and exposure to urban waste disposal.The study area child undernutrition was high which needs timely malti-sectoral intervention by concerned governmental and non-governmental organizations.

KEYWORDS: Undernutrition, Peri-urban, Under-five, Prevalence, Determinants, BMI.

INTRODUCTION

Adequate nutrition is essential in early childhood to ensure healthy growth, proper organ formation and function, a strong immune system, and neurological and cognitive development. Economic growth and human development require well-nourished populations who can learn new skills, think critically and contribute to their communities. Moreover, malnutrition is becoming the most devastating problem, the most common cause of morbidity and mortality among children; and it also continuous to be the major public health problem worldwide especially in South East Asia and Sub-Saharan Africa (Pal *et al.*, 2016). Estimated child malnutrition, out of 667 million under five children across the world in 2014, 50 million under five children were wasted of which 16 million were severely wasted; and 159 million were stunted (UNICEF, 2015). An estimated 45%of deaths or mortality of under-five children was attributed to malnutrition (Black *et al.*, 2013).

Stunting and other forms of under nutrition are clearly a major contributing factor to child mortality, disease and disability. A severely stunted child faces a four times higher risk of dying, and a severely wasted child is at a nine times higher risk (UNICEF, 2013). The worldwide percentage of prevalence of under five children stunted trend shows the prevalence and number of children affected is decreasing starting from 1990 to 2016 which is 40% in 1990, 32.7 percent in 2000, 29.5% in 2005, 26.3% in 2010, 23.4% in 2015 and 22.9% in 2016 (UNICEF, 2017). The number of children suffering from

stunting shows a decreasing trend from time to time in every region except Africa (IFPRI, 2016). More than half of all stunted under five children lived in Asia and more than one third lived in Africa**.** Out of the five sub-regions in Africa, Eastern Africa, Middle Africa and Western Africa, have rising numbers of stunted under five children. In 2014, almost all wasted under five children lived in Asia and Africa. Low-income countries like Ethiopia and lower-middle-income countries now account for almost all stunted children worldwide; and the trend towards stunting reduction have made least progress or it didn't show fast progress (UNICEF, 2015). Child undernutrition is one of the most important health and welfare problems among infants and young children in Ethiopia (EDHS, 2016). According to Ethiopian Ministry of Health (EFMoH, 2014) the total cost of child under nutrition (education cost, health cost, and productivity cost) accounts to 55.5 billion Ethiopian birr or 16.5% of the total GDP in 2000. Out of these costs mortality costs took the highest magnitude. Severe acute malnutrition is one of the major killers of under-five children in developing countries including Ethiopia (Nebiyu, 2014). About 38% of under five children are stunted which shows the children are chronically malnourished;18% of them are severely stunted; 24% are underweight or thin for their age and about 10% are wasted or the children faced acute malnutrition, and 3% of them were severely wasted. Whereas, in Oromia Regional State the number of children under chronic malnutrition were 36.5%, severely stunted accounts to 17%, the percentage of underweight children (wasted) or under state of acute malnutrition were 10.6%; and 3.5% of them were severely wasted (EDHS, 2016).

The low nutritional status among children has compromised the health of the children in Ethiopia, exposing them to poor health and early death. Ethiopia's under-five mortality rate, which is 123 children death out of 1000 live births are among the highest in Sub-Saharan Africa; and out of these under-five death rate five percent (5%) were directly related to malnutrition (Dondi, 2011). Lower-middle income countries like Ethiopia are most likely affected by undernutrition than upper income countries. For instance, in 2016, while less than half of all children under the age of five live in lower-middle income countries, two-thirds of all stunted children and three fourth of all wasted children live in countries categorized as lower middle income (UNICEF, 2017). In Ethiopia the prevalence and trend of acute and chronic malnutrition are found to be among the highest in the world (Save the Children and Jhpiego, 2013). As child malnutrition is one of the major public health problems in Ethiopia and also in different areas or Oromia Region, it is believed that there are some major associated determining factors which can increase the incidence and aggravate its consequences of undernutrition. Even though there are few studies conductedon the determinants of nutritional status of under five children in Ethiopia and different areas of Oromia region, most of them mainly focused on either rural area in general or urban centers. That means the peri-urban areas have been insufficiently emphasized, which can in turn make interventions challenging or difficult in such circumstances (Alemu *et al.* (2014, Tadiwos and Deginet, 2013) while, the study undertaken by Sebsibe and Yinges (2014) was focusing on Urban-rural differentials in child under nutrition in Ethiopia. Specifically, the knowledge on the major determining factors associated with child undernutrition in the peri-urban areas was scarce. Therefore, the study was aimed to investigate the prevalence and the determining factors of undernutrition among under-five children in Sebeta peri-urban areas, Oromia Special Zone Surrounding Addis Ababa of Oromia Region.

Description of the Study Area and Research Methods

Description of the Study Area

Sebata Hawas District is located in Oromia Special Zone Surrounding Addis Ababa of Oromia Regional State. It is situated between 8° 44' 59.99" N latitude and 38° 39' 59.99" E longitude with a total surface area of 867.92km^2. The district has a total of forty kebeles (of which 36 are rural kebeles and 4 are urban kebeles). The total population of Sebeta Hawas district is 170,767; of which 87,520 (51%) are male and 83,247 (49%) are female (CSA, 2013). Out of the total population of the district only about 11,883 (7%) and 158,884 (93%) live in urban and rural kebeles, respectively. According to the information obtained from the district Health Office, the total numbers of under-five children in the rural kebeles of Sebeta Peri-urban areas were about 3920. Out of these kebeles three of them namely Gora Harkiso, Dima Magno and Geja Gadanba were selected for this study.

Study Design and Approach

Community based cross sectional study design was applied in order to gather data on a one-shot basis which helps to answer research questions of interest, to represent a wide target population, to generate numerical data, to provide descriptive, inferential and explanatory information, manipulates key factors and variables. In the study both qualitative and quantitative research approach was followed. The study period was from April to May, 2018.

Source Population

All under-five children in Sebeta town peri-urban areas were considered to be the source population.

Study population

The study population is those children below the age five who live in the three selected kebeles of the peri-urban areas. All houses selected out of the selected kebeles by systematic sampling method, and then those under-five children who lived in these household were considered as study unit.

Inclusion and Exclusion Criteria

Out of Children of age 0-59 months, only severely ill children were not included in the study. Only one child

from a selected household (if there are more than one under five children in that household) was qualified to be included in the study; and the mothers or care givers of the selected children should live at least for six months prior to the data collection to be included in the study.

Type and Source of Data

Both primary and secondary data sources were used to gather the information required for the study. The primary data was collected from eligible respondents (mother or caregiver of the selected/eligible child) and anthropometric measurement was applied. Secondary data however were collected from available document at SebetaHawas District Health Office, the catchment health centers and also from health posts of the study area. In addition to this, secondary data such as reports, books, and websites, journals etc. which can support the studywasalso reviewed and used as needed.

Sample Size Determination and Sampling Technique

Sample size determination

The sample size determination was applied equation of Israel (1992) to yield a representative sample for proportions, for populations that are large as follows.

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where n_0 is the sample size, e is the desired level of precision, p is the estimated proportion of an attribute that is present in the population, and q is 1-p. The value for Z (i.e, 1.96) is found in statistical tables which contain the area under the normal curve at 95% level of confidence.

Assume there is a large number of under five children in Sebeta peri-urban areas but that we do not know the variability in proportion of prevalence of malnutrition (Stunting, wasting and underweight); therefore, assume p = 0.5 and ±5% precision. The calculated $n_0 = 384$. Using finite population correction for proportions, if the population is small, then the sample size can be reduced slightly. This is because a given sample size provides proportionately more information for a small population than for a large population (Israel, 1992). If the sample size proportion for the population is greater than 5%, finite population correction factor can be applied. Thus, the sample size (n_0) can be adjusted using the formula:

$$\mathbf{n} = \frac{`n_0}{1+(`n_0-1)/N} \approx 350$$

So, the necessary adjusted sample size (n) will be about 350**.** Where n is the sample size and N is the population size, which is the total population size of under-five children in Sebeta peri-urban areas (i.e. about 3920). Non-response (5%), the calculated sample size was:

$$n \approx \mathbf{368}$$

Sampling Technique and Procedure

The study area is purposively selected based on solid and/or liquid wastes disposed to the nearby peri-urban areas had adversly affected the nutritional status of under-five children in the area in one way or another. Three kebeles were selected using simple random sampling method because it is believed that three out of ten kebeles (30%) can be considered to be a representative sample, as Sebeta Peri-urban areas have relatively homogenous socio-economic characteristics and climatic conditions. To generate a sampling frame for each selected eligible kebeles proportionate to population size is presented in the following table 1.

Table 1: Sample size distribution across the selected three kebeles.

Name of study Kebeles	Number of under-five children in each kebele	Proportion in percent	Sample size
GejaGadanba	426	41.2	152
GaraHarkiso	362	35	129
Dima Manyo	245	23.8	87
Total	**1033**	**100**	**368**

Tools and Techniques of Data Collection

Structured questionnaire was administered for the qualified respondents and also anthropometric measurements (Weight and height measurement) was undertaken by qualified enumerators having similar experience in the field of survey for the eligible under five children to gather quantitative data. The weight of the child was measured by Electronic digital weight scale. Children above the age of two years were standing alone on the scale and their weight was taken accordingly. In case of children whose age below two years and those who were unable to stand alone, their weight was obtained from the difference between weights of mother as she holds the child and the weight of the mother alone. On the other hand, to take length of child less than two years or 24 months, horizontal wooden length board was used and vertical height board was used for those aged 24-59 months.

Key informant interview and focus group discussion were also conducted to collect qualitative data. To gather primary data from identified target population, structured questionnaires was prepared considering all required variables of the study. Before undertaking final survey, pretest of the prepared questionnaires was conducted none eligible kebeles to check their clarity for the respondents and whether all required data can be sufficiently gathered using this data collection

instrument. The pretest covered about 5% of the sample population. Based on the results of the pretest, the researcher adjusted and refined all questionnaires for the final survey. Appropriate check lists were also prepared to conduct both key informants and focus group discussions. Individuals from different institutions (Sebeta Hawas District Health Office, Gora Harkiso Health Center, and Health Posts at the study kebeles) who have adequate knowledge about children nutrition status and factors associated to it were contacted and interviewed. Moreover, three focus group discussions with different women groups was also conducted at each study kebeles to gather collective information on nutritional status and its determinants among the under five children. Each of the focus group discustion held was consisting of six respondents (two from lactating mothers, two from mothers of under-five children and two from child care givers).

Further, Individual Dietary Diversity Score (IDDS) was collected using standard questionnaire for both breastfeeding and not breastfeeding children. According to WHO (2010) minimum individual dietary diversity score (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 four food groups in the previous day (24 hours 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 & Vegetables and Other fruits & vegetables (WHO, 2010). So, 24 hours dietary history of the child was gathered from the respondents based on the standard list of 7 food groups. Out of the 7 food groups 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 staple food (USAID, 2015).

Techniques of Data Analysis

The data were entered in to SPSS version 23 and exported to STATA 13 for analysis. WHO Anthro software version 3.2.2, 2011 was applied to convert the anthropometric data into Z-scores of the indices such as HAZ (Height for Age Z_score), WAZ (Weight for Age Z_Score), and WHZ (Weight for Height Z_score). Descriptive statistics such as frequency, percentage, mean and standard deviation minimum and maximum values were used. Whereas, the logistic regression models (bivariate and multivariate logistic regression models) were employed for further analysis to estimate the association between the dependent and independent variables and also to estimate the determinants of nutritional status of under-five children.

Model Specification

Suppose there are explanatory variables *X1…. Xn*, which were quantitative. For a binary response variable *Y i.e the probability of stunting, wasting and underweight*, *P(x)* denotes the probability in favor of stunting, wasting or underweight at value *X*. While, 1-P is the opposite.

$$\mathbf{Y(X) = Pi = \frac{e^{\beta 0+\beta 1X1+\beta 2X2+\beta 3X3+\beta 3X3....+\cdots \beta nXn}}{1+e^{\beta o+\beta 1X1+\beta 2X2+\beta 3X3..+\cdots \beta nXn}}}$$

The above equation represents logistic distribution function where Pi ranges between 0 and 1 and non-linearly related to both Xi and βs (Gujirat, 2003). Now Pi / (1− Pi) is simply the odds ratio in favor of malnourished children in a given household. That was the ratio of the probability of malnourished to none malnourished child. The logit model is therefore, the natural log of this odd ratio as stated below.

$$\mathbf{Li = Ln(\ P/1\text{-}P) =}$$

$$\boldsymbol{\beta o + \beta 1X1 + \beta 2X2 + \beta 3X3 \ldots. + \cdots \beta nXn} \mathbf{+ Ui}$$

Where, L is Logit, p is the probability ofmeasuring nutrition status (stunting, wasting, underweight) defined as dependent variable and X1……Xn represents explanatory variables listed in table 2 below; while $\beta o \ldots . \beta n$ denotes the parameters to be estimated and Ui is error term.

Diagnostic Tests of Multicollinearity

Multicollinearity is a statistical phenomenon in which there exists a perfect or exact relationship between the predictor variables. When there is a perfect or exact relationship between the predictor variables, it is difficult to come up with reliable estimates of their individual coefficients. This finally results in incorrect conclusions about the relationship between outcome variable and predictor variables. There are several ways of diagnosing the presence of multicollinearity: Examination of Correlation Matrix, Variance Inflation Factor (VIF) and Eigen system Analysis of Correlation Matrix. The simplest one is the examination of correlation matrix. By the rule of thumb is that if the correlation coefficient between two explanatory variables is high, say, in excess of 0.8 and below -0.8, then multicollinearity is a serious problem (Gujarati, 2004). With this approach correlation coefficient between two explanatory variables found to be by far below 0.8 in absolute terms indicating no serious problems of muticollinarity in our variables.

Dependent Variables

The dependent variable was undernutrition among under five children, which can be indicated by Stunting (Height- for- Age), Underweight (Weight- for- Age), and Wasting (Weight- for -Hight).

Independent Variables

The explanatory variables which were assumed to influence or determine the nutritional status of under-five children were socio-economic and demographic factors, maternal and child care factors, water and sanitation factors, child breastfeeding practice factors and individual children Dietary Diversity Score (DDS) as indicated in Table 2.

Table 2: Type of explanatory variables and expected signs.

Explanatory variable	Type of variable	Expected sign
Demographic and socio-economic factors		
Age of child (in months)	Continuous	+
Sex of child	Dummy	-/+
Mothers BMI	Catagorical	-
Maternal education	Categorical	-
Maternal employment status	Categorical	-
Maternal control over resource	Dummy	-
Household size	Continous	+
Household average monthly income	Continous	-
Household access to agricultural land	Dummy	-
Child health and Sanitation		
Source of drinking water	Categorical	-
Latrine facility in the household	Dummy	-
Exposure to urban waste disposal	Dummy	+
Diseases during last two weeks (diarrhea, fever, cough)	Dummy	+
Child vaccination	Dummy	-
Child care and Breastfeeding practice factors		
Exclusive breast feeding for six months	Dummy	-
Duration of breastfeeding	Continuous	-
Depleting colostrum	Dummy	-
Age at start of complementary feeding	Continuous	+/-
4 Food Groups Dietary Diversity Score	Continuous	-

(+) sign indicate as the independent variable increase the probability of being malnourished increase. (-) sign the inverse relationship between the independent variable and the outcome (malnutrition), BF: Breastfeeding, BMI: Body Mass Index

Limitation of the Study

The study was limited to cross-sectional in design; it neither represented seasonal variation of nutritional outcomes particularly to the wasting status nor established causal relationship. The study was questionnaire based; questions that required a good memory (for instance dietary diversity score) were vulnerable to recall bias.

Data Validity and Reliability

To keep the reliability and validity of the data, four trained/experienced enumerators of B.Sc. degree holders in nursing were assigned. The developed structured questionnaires were translated to the local language (Oromifa). The questionnaire was pretested and continuous supervision had been conducted by the principal investigator during the survey. The pretest covered about 5%of the sample population. Based on the results of the pretest, the researcher adjusted and refined all questionnaires for the final survey. Generally, the principal investigator was also committed for keeping data validity and reliability in every aspect as much as possible.

Ethical Consideration

The study was reviewed and approved by Ethical Review Committee of Center for Food Security Studies, Addis Ababa University. All the research participants included in this study were appropriately informed about the purpose of the research and their willingness and acceptance was secured before the commencement of distributing questionnaire and asking interview questions. Concerning the right to privacy of the respondents, the study maintained the secrecy of the identity of each participant. In all cases, names were kept secret thus collective names like respondents were used.

Operational Definitions

Nutritional Status - defined as the growth or micronutrient status of an individual. Nutritional status is the result of multifaceted interactions between food consumption and the overall status of health and health care practices (EDHS, 2011).

Malnutrition - is a state in which the physical function of an individual is impaired to the point where he or she can no longer maintain adequate bodily performance process such as growth, pregnancy, lactation, physical work and resisting and recovering from disease (WFP, 2008).

Under nutrition - refers to the outcome of insufficient food intake and repeated infectious diseases.It includes being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (wasted), and micronutrient malnutrition (UNICEF, 2012).

Stunting - can be defined as having below minus 2 standard deviations from median height-for-age of a reference population. This Chronic malnutrition or stunting is a form of growth failure which develops over a long period of time due to inadequate nutrition over

long periods of time (including poor maternal nutrition and poor infant and young child feeding practices) and/or repeated infections (UNICEF, 2012).

Wasting - defined as low weight for height or the presence of edema. It can be moderate Acute Malnutrition (MAM) or Severe Acute Malnutrition (SAM) and occurs as a result of recent rapid weight loss, malnutrition, or a failure to gain weight within a relatively short period of time. It is an acute malnutrition with below minus 2 standard deviations from median weight-for-height of a reference population (UNICEF, 2012).

Severe acute malnutrition - defined as the percentage of children aged 6 to 59 months whose weight for height is below minus three standard deviations from the median of the WHO Child Growth Standards, or by a mid-upper-arm circumference less than 115 mm, with or without nutritional oedema (UNICEF, 2013).

Underweight - is a composite form of under nutrition that includes elements of stunting and wasting. It is defined as the percentage of children aged 0 to 59 months whose weight for age is below minus two standard deviations (moderate and severe underweight) and minus three standard deviations (severe underweight) from the median of the WHO Child Growth Standards (UNICEF, 2013). It denotes Weight-for-age Z-score below -2SD from the median of WHO reference population (WHO, 2009).

Anthropometry - is the use of body measurements such as weight, height and mid-upper arm circumference (MUAC), in combination with age and sex, to gauge growth or failure to grow. This index was based on Z-score below-2 standard deviations of the WHO median reference for height-for-age, weight-for-age and weight-for-height which are defined as stunted, underweight and wasted respectively (WHO, 2009).

Dietary Diversity Scores (DDs) - are defined as the number of foods or food groups consumed by an individual (IDDS) over a reference time period. The recommended reference time period is the last 24 hours. Food grouping can be different according to objectives, putting emphasis on energy-dense foods or micronutrient-rich foods (WFP, 2008).

Peri-Urban Areas - are those areas on the edges of towns, are areas of transition. Peri-urban areas have a dual identity: their residents are dependent on the town for employment opportunities and services, yet they retain close links with rural areas for social contact, often sending money to relatives in rural areas, and receiving foods and other materials from rural areas (Smith et al., 1998).

RESULT AND DISCUSSION

Demographic Characteristics of Respondents

The result Tabe 3 showed all the selected study participant participated in the study with 100% response rate. In addition to this, all of the respondents were mothers of the child for study subjects in this study. Descriptive analysis of the data as indicated in the above table shows that out of 368 sample children, 190 (51.63%) of the children were female and 178 (48.37%) of them were male which shows there was relatively similar proportion of male and female.

Table 3: Demographic characteristics of the households in Sebeta Peri-urban areas, Sebeta Hawas District, Oromia region, Ethiopia, 2018.

				Number	Percent
Sex of child					
Female				190	51.63
Male				178	48.37
Total				368	100
Age of child in months					
(0-5)				29	7.88
(6-11)				24	6.52
(12-23)				86	23.37
(24-35)				92	25.00
(36-47)				86	23.37
(48-60)				51	13.86
Total				368	100
	Total obs	**Mean**	**SD**	**Min**	**Max**
Current age of mother	368	28.5	6.22	17	45
Preceding birth interval	368	35.8	28	0	149
Mother's BMI	368	20	2	14.8	25.7
Total no. of hhs member	368	5.5	1.8	2	11

The result also shows that the average age of children became 28.59 months, the minimum age was 1 month and the maximum age was 59 months. As per the age category of children indicated above, about 25 % of the children were found between the age ranges of (24-35) months; while children below the age of six months were only about 7%. With regard to preceding birth interval, the descriptive analysis result indicated that 35.8 months was the average preceding birth interval of the total observation. The minimum preceding birth interval was 0 months. Children having 0 preceding birth intervals in this study were first born children. Whereas, the maximum preceding birth interval was 149 months.

Concerning maternal factors, the average age of mothers became 28.5 years, with 6.22 standard deviation, the minimum age of mother was reported to be 17 years and the maximum age was 45 years which indicates that all of the mothers were found in the reproductive age group. In addition to this the result shows the average body mass index (BMI) of mothers involved was 20, with 2 standard deviation which is found in the normal range of mothers' body mass index; and the minimum mothers' body mass index was 14.8 which indicates severe wasting and underweight and the maximum was 25.7 which is in the range of being overweight according to WHO standard. The findings of the survey result also show that the average number of household members was 5.5. The minimum number of household members was observed 2 and the maximum family size was accounted to be 11 members.

Socio-economic Characteristics of Respondents

Tabele 4 showed the parent level of education percentage values were 61.41 and 50.54 % uneducated children's mothers and fathers, respectively. The percentage of mothers who could read and write was accounted to be 5% and those of fathers became 5.7%. But the number of mothers who attended formal education, primary and secondary was 27.47 and 6%, respectively. While the percentage of fathers who attended primary school was 34.24% and 9.5% of them were attended secondary school.This shows fathers were relatively more educated than mothers. The finding also revealed that the main income source of about 86.6 % of the households were agricultural activities. The mean average monthly income of the households was 1978.64 birr with 838.7 birr standard deviation; while the minimum average monthly income was 553 birr and the maximum monthly income was 5417 birr which shows there was wide income disparity among the households. On the other hand, according to the monthly average income category more than half of the households which is about 206 (55.89%) of the households earn less than 2000 birr per month, whereas the rest 162(44.02%) of the households earn more than or equal to 2000 birr ie average monthly income.

Table 4: Socio-economic characteristics of the households in Sebeta Peri-urban areas, Sebeta Hawas District, Oromia region, 2018.

				Number	Percent
Mother education level Illiterate				226	61.41
Read and write				19	5.16
Primary				101	27.45
Secondary				22	5.98
Total				368	100
Fathers' education level					
Illiterate				186	50.54
Read and write				21	5.71
Primary				126	34.24
Secondary				35	9.51
Total				368	100
Access to agricultural land					
Owned				227	61.88
Not owned				141	38.32
Total				368	100
Mother's control over hh resource					
Yes				145	39.40
No				223	60.60
Total				368	100
Average monthly income (category)					
<2000				206	55.89
≥2000				162	44.02
	Total obs	**Mean**	**SD**	**Min**	**Max**
Average monthly income(continous)	368	1978.64	838.7	553	5417
Land holding size (hec)	368	0.70	0.78	0	4

The result also showed that out of the total 368 households, 227(61.88%) own their own agricultural land and the rest 141 (38.32%) households did not have their own agricultural land, so as they were managing their livelihoods by other means like renting land, share cropping and the like to undertake their agricultural activities and also, they were participating on different off farm activities. Concerning the land holding size of the households, on the average the households own only about 0.70 hectare of agricultural land. The maximum land holding size was observed to be 4 hectares; and the minimum land holding size was 0 which means having no agricultural land at all. On the other hand, the number of mothers who had control over the household resource or autonomous mothers was only about 145 (39.4%).

Child Care and Breast-Feeding Practice of Mothers

The result Table 5 showed about 239 (64.95%) children fed colostrum (the first yellow breast milk) after birth, but the rest did not feed colostrums. With regards to exclusive breast feeding about 57.07% of the children fed breast exclusively for the first six months; and about 35% of them introduced liquid or solid foods before six months. In addition to these, the average age at which children start complementary feeding was 4.8 months. The minimum age at which they start complementary feeding was 0 months (early before one month) and the maximum age at which children started complementary food was 12 months. Further, the percentage of households who had access to adequate information on child care from different sources and improved their level of awareness on how to feed and care their children about 65(17.66%) of the total respondents. While majority the mothers, 303(82.34%) did not get any adequate information or awareness creation on how to improve their child care and their child feeding practices.

Child Health and Environmental Sanitation Condition

The result in Table 6 indicated the majority of the households, 229 (62.23%) had toilet facility. About 222 (60.3%) of the households utilize toilet properly; and 139 (37.77%) of them had no toilet facility. Out of 139 (37.77%) households who had no toilet facility, 135(36.68%) households had been using open defecation; and 11 (2.99%) of them had been sharing from neighbors. Approximately 222 (60.33%) households were exposed to solid and/or liquid waste desposed from different sources from the urban center (Sebeta town) to their surrounding and affected their livelihoods. These respondents were complaining that there was liquid and solid waste of different factories from the urban centre dumped to their nearby surrounding rural kebeles and was in turn affecting the health of their children as it pollutes the environment due to poor waste management.

Table 5: Child care and breastfeeding practice of the respondents in Sebeta Peri-urban areas, Sebeta Hawas District, Oromia region, Ethiopia, 2018.

				Number	Percent
Fed colostrums					
Yes				239	64.95
No				129	35.05
Total				368	100
Exclusive breast fed (6ms)					
Yes				210	57.07
No				158	42.93
Total				368	100
Access to information on child care					
Yes				65	17.66
No				303	82.34
	Total obs	**Mean**	**SD**	**Min**	**Max**
Age at which complementary feeding started	368	4.8	2.1	0	12
Number of meal times within a day	368	5.1	1.44	0	9

In addition to this about 65(17.66%) of the children were affected by diarrhea before the last two weeks during the survey.On the other hand, out of the respondents the number of children who were not vaccinated became 30(8.15%); while the rest 338(91.85%) children have completed vaccination. Out of the respondents a total of 251(68.48%) have got access to potable water such as tapped water, protected spring water and protected hand dug well. There were also a total of about 117(31.52%) households who have no access to potable water and relied on unprotected hand dug well and unprotected spring water.

Table 6: Child health and environmental factors in Sebeta Peri-urban areas, Sebeta Hawas District, Oromia region, 2018.

	Number	Percent
Access to toilet		
Yes	229	62.23
No	139	37.77
Total	368	100
Toilet Utilization		
Properly utilized	226	61.41
Not properly utilized	142	38.59
Total	368	100
Hhs exposure to urban waste disposal		
Exposed	222	60.33
Not exposed	146	39.67
Total	368	100
Vaccination		
Yes	338	91.85
No	30	8.15
Total	368	100
Diarrheal episode		
Yes	65	17.66
No	303	82.34
Total	368	100
Source of water		
Protected spring water	8	2.17
Tapped water	233	63.59
Un protected hand dug well	105	28.26
Un protected spring water	12	3.26
Protected hand dug well	10	2.72
Total	368	100

Nutritional Status of Under-five Children

The most widely used anthropometric indicators like height/length for age; weight for age and weight for height were applied to assess the nutritional status such as stunting, underweight, and wastingamong under five children respectively. Accordingly,the nutritional status (stunting, underweight and wasting) of about 368 under five children in the three kebeles of the study area namely Geja Gadanba, Gora Harkiso and Dima Magnokebeles of Sebeta peri-urban area, SebetaHawas district, were assessed using the three anthropometric indices. Hence, according to WHO growth standard, children whose height-for-age, weight-for-age and weight-for-height Z-score is below minus two standard deviations (-2 SD) from the median of the reference population are considered to be stunted, underweight and wasted respectively. Likewise, Children whose weight-for-age Z-score is below minus three standard deviations (-3 SD) from the median are considered to be severely malnourished (severely stunted, wasted, and underweight). So, to compute the data collected through anthropometric measurement as a tool and estimate the magnitude and prevalence of stunting, wasting and underweight; and also, to compute the mean and standard deviation of the Z-score for each index, WHO Antro software was applied which revealed the results indicated in the following Tables 7.

Table 7: The overall prevalence of stunting, underweight and wasting in the studied three kebeles of Sebeta peri-urban areas, Oromia region, 2018.

Malnutrition	% < -3SD	% < -2SD	Mean	SD
Stunting	11.3	30.2	-1.3	1.59
Underweight	7.6	27.5	-1.27	1.34
Wasting	5	13.1	-0.75	1.25

The findings of the cross-sectional study conducted in the three kebeles (Gora harkiso, Dima Magno and Geja Gadanba) of Sebeta peri-urban areas, Sebeta district as indicated in the above table 7 showed that about 111 (30.2%) of the sample children were chronically malnourished or stunted and 42 (11.3%) children were severely stunted. Whereas, the number of under-five children who were under state of both acute and chronic malnutrition or who were underweight became 101(27.5%) of which 28(7.6%) of them were severely underweight. Furthermore about 48(13.1%) of the children were acutely malnourished or wasted and

19(5%) of them were severely wasted. The result of the study indicated that magnitude of underweight and wasting in the study area was very high according to WHO cut off point; and also,when compared to the national and regional prevalence of stunting, wasting and underweight.

Table 8: The Prevalence of stunting by sex and age in the studied three kebeles of Sebeta peri-urban areas, Oromia region, 2018.

Sex of child	Total Number	% < -3SD	% < -2SD	Mean	SD
Male	177	13.1	27.4	-1.29	1.53
Female	191	9.5	32.8	-1.31	1.65
Total	368	11.3	30.2	-1.3	1.59
Age of child (in months)					
(0-5)	28	0	3.4	0.83	1.62
(6-11)	24	4.2	8.3	-0.05	1.66
(12-23)	86	12.8	37.2	-1.62	1.28
(24-35)	92	10.9	29.3	-1.43	1.48
(36-47)	88	18.1	39.8	-1.75	1.37
(48-60)	51	8	30	-1.56	1.36
Total (0-60)	368	11.3	30.2	-1.3	1.59

As shown in the above Table 8 the study result revealed that the prevalence of stunting among female under five children is higher than those of male children; as the number of female children under chronic malnutrition accounted to be 121 (32.8%) when compared to those of male childrenwho are suffering from stunting which is 101(27.4%). However, the magnitude of male children who are severely stunted (13.1%) is greater than those of severely stunted female children (9.5%). The result of the study also revealed that out of the given age group, children whose age lies between 36 and 47 months (36-47) were relatively more affected by stunting than the rest; and is followed by children whose age lies between (12-23) months. Whereas the problem of stunting is not as such sever among children below the age twelve months according WHO cut off point for public health significance.

Table 9: The Prevalence of underweight by sex and age in the studied three kebeles of Sebeta Peri-urban areas, Oromia region, 2018.

Sex of child	Total Number	% < -3SD	% < -2SD	Mean	SD
Male	177	6.8	27.1	-1.25	1.31
Female	191	8.4	27.9	-1.29	1.37
Total	368	7.6	27.5	-1.27	1.34
Age of child (in months)					
(0-5)	28	0	3.6	0.45	1.33
(6-11)	24	8.3	12.5	-0.82	1.47
(12-23)	86	9.3	29.1	-1.39	1.43
(24-35)	92	6.5	28.3	-1.41	1.03
(36-47)	88	11.6	34.9	-1.54	1.32
(48-60)	51	3.9	31.4	-1.51	0.9
Total (0-60)	368	7.6	27.5	-1.27	1.34

As depicted in the table 9 the proportion of male and female children who were under a state of chronic and acute malnutrition or underweight were relatively similar.While as age increases from zero to forty-seven (0-47) months, the likelihood of a child to be underweight increases and then after decreases in the age range of forty-eight to sixty (48-60) months. In addition to these the children who were mostly affected by underweight were children whose age lies between (36-47) months unlike those children below the age of six months.

The result in the Table 10 indicated that the number of children who were suffering from acute malnutrition or wasting accounted to be 13.1% which means about 48 under five children out of 368 children and 5% of the children were severely wasted. Children within the age range of (6-23) months were more likely wasted than the rest under five children. The prevalence of wasting among four to five years old children (48-60 months) was relatively minimal.

Table 10: The prevalence of wasting by sex and age in the studied three kebeles of Sebeta peri-urban areas, Oromia region, 2018.

	Total Number	% < -3SD	% < -2SD	Mean	SD
Sex of child					
Male	177	5.2	13.3	-0.8	1.21
Female	191	4.8	12.8	-0.71	1.28
Total	368	5	13.1	-0.75	1.25
By age group (in months)					
(0-5)	28	3.6	14.3	-0.13	1.77
(6-11)	24	17.4	17.4	-0.66	1.7
(12-23)	86	6	16.7	-0.72	1.34
(24-35)	92	4.3	10.9	-0.9	1.03
(36-47)	88	4.8	14.5	-0.81	1.14
(48-60)	51	0	6	-0.85	0.95
Total (0-60)	368	5	13.1	-0.75	1.25

Determinants of Undernutrition among Under-five Children

In this study econometrics analysis was applied as it helps to make quantitative analysis of actual socio-economic phenomena based on the concurrent development of theory and observation, related by appropriate methods of inference. In order to identify relevant and significant determinant factors of malnutrition for sample children under study, two steps were followed. In the first step a bivariate regression analysis using a logit model was conducted to select potential predicators of child malnutrition that will be refined in the second step of multivariate logistic analysis. The possible variables that were gathered from cross-sectional survey has passed through bivariate logistic regression analysis and screened by their level of significance for the subsequent multivariate regression analysis. According to study conducted by Berhanu et al. (2017) variables those with statistical significance level of 20 percent and less were selected using bivariate logistic regression to be further investigated in multivariate analysis. This relatively high level of risk was considered not to exclude potential determinant variables at onset of the analysis. Discussions on determinants of child malnutrition has based on results obtained from multivariate logistic regression analysis.

Bivariate Logistic Regression Analysis

After running several General Structural Equation Models linked to logistic regression, variables listed in the table 11 and 12 below were identified. Bivariate regression procedures were followed where each potential determinant factors of child malnutrition were regressed against each indicators of malnutrition: Stunting, Underweight and Wasting. With this approach a total of 17 variables were identified as independent variables that could explain variations in the indicators of child malnutrition.

Table 11: Bivariate logistic regression analysis result for stunting, underweight and wasting for selected kebeles of sebeta peri-urban areas, Oromia region, 2018.

Explanatory variables	Indicators of Malnutrition		
	Stunted	Underweight	Wasted
Sex of child			
Male (Rf)	1.00		
Female	0.26(0.23)		
Age of child in months			
(0-5) (Rfc)	1.00	1.00	
(6-11)	1.72 (1.16)	1.39(1.19)	
(12-23)	2.96***(1.04)	2.38**(1.05)	
(24-35)	2.5**(1.04)	2.66**(1.04)	
(36-47)	2.96***(1.04)	2.71***(1.04)	
(48-60)	2.36**(1.06)	2.26**(1.07)	
Mother's hight		-0.10***(0.02)	
Mother's education			
Illiterate (Rfc)	1.00		
Read and write	-1.00*(0.58)		
Primary	-1.42***(0.31)		
Secondary	-1.98***(.75)		
Father's education			
Illiterate (Rfc)	1.00		
Read and write	-0.57(.51)		

Primary	-0.99***(0.27)		
Secondary	-1.04**(0.45)		
Average monthly income group (Birr)			
≥ 2000 (Rfc)	1.00	1.00	
< 2000	0.37* (0.23)	0.74 ***(0.25)	
No. of under five children in the hh			0.61**(0.27)
Access to agricultural land(land ownership)			
Yes (Rfc)	1.00		
No	0.92**(0.23)		-0.57*(0.33)
Access to toilet			
Yes (Rfc)	1.00	1.00	
No	0.76*** (0.23)	0.46**(0.24)	
Diarrhea occurrence			
No (Rfc)	1.00	1.00	
Yes	0.61*(.28)	0.69*(0.29)	
Access to information on child care			
Yes (Rfc)		1.00	
No		1.99***(0.53)	1.03*(0.54)
Mother's body mass index		-0.08 (0.06)	
Current breast-feeding status			
Yes (Rfc)			1.00
No			-0.52 (0.32)
Number of meal times			-0.20*(0.11)
Duration of breast feeding		0.02(0.01)	
Colostrum feeding No			0.77**(0.30)
Exposure to urban waste disposal No		-0.49**(0.24)	-.75**(0.34)

Figure in the parenthesis is standard error, statistical significance is denotedat *** p<0.01, ** p<0.05,*p<0.10, coefficients without asterisk lies between p<0.20 and p>0.10, Rfc: indicates reference category.

As it can be observed from the table 11 except for Sex of child, Mother's body mass index, Current breast-feeding Status and duration of breastfeeding, all of the rest of variables are statistically significant at 10% or less risk level. When seen against each indicator of child malnutrition, 8 potential determinant factors for Stunting were identified namely: Sex of child, Age of child, Mother's education, Father's education, Average household monthly income, Access to agricultural land (land ownership), Access to toilet and Diarrhea occurrence. Whereas, Age of child, average household monthly income,access to toilet, diarrhea occurrence, mother's body mass index, mother's height, access to information on child care, duration of breastfeeding and exposure to urban waste disposal were identified as potential candidate for predicators of underweight. Similarly, the independent variables that would explain variations in child Wasting were identified as number of under-five children in the household, access to agricultural land (land ownership), Access to information on child care, Number of meal times, Current breast-feeding status, Colostrum feeding, and Exposure to urban waste disposal.

Multivariate Logistic Regression Analysis

All explanatory variables identified under bivariate logistic regression analysis were brought to this multivariate logistic regression model and inferences were made using STATA 13 software. Accordingly, only significant determinant variables of child nutrition status with 10% or less risk level were presented in the table 12 below.

Determinants of Stunting

Multivariate logistic regression outputs have depicted that Sex of child, Age of child, Mother's education, Access to agricultural land, and Diarrhea occurrence were significant predicators of child stunting for the study area.

Sex of child: As shown in the Table 12 below, female children had significantly and positively associated with stunting at 10% statistical significance level (when compared to their male counterpart). The gender variable revealed that female children are more likely to be stunted compared to their male counterpart. This perhaps attributed to parent bias against their female children in providing adequate food and health care when compared with their male children. This finding is consistent with study result conducted by Stalin et al. (2013) in Indian Rural Area. On the contarary, studies conducted by Beka et al. (2009); Misgan et al. (2016) showed that male children were more likely to be stunted compared to their female counter part.

Age of Child: the results revealed that age ofchild is positively associated tochild stunting. As clearly presented in the table, higher child age groups (>12months)increasingly and significantlyshowed high risk of being stunted as compared to lower age group.Thisfinding is plausible considering that many of the youngerchildren are still been breastfed, and chronic malnutrition sets in only after weaning. The finding is supported by studies conducted by Akombi et al. (2017); Das and Gilshan (2017).

Mother's education: This study demonstrated that there is significant associationbetween mother's education and stunting. The level of significance increased with level of education.

Table 12: Multivariate logistic regression analysis result for stunting, underweight and wasting for selected kebeles of sebeta peri-urban areas, Oromia region, 2018.

Explanatory variables	Indicators of Malnutrition		
	Stunted	Underweight	Wasted
Sex of child			
Male (Rfc)	1.00		
Female	0.47* (0.26)		
Age of child in months			
(0-5) (Rfc)	1.00	1.00	
(6-11)	1.76 (1.18)	1.18 (1.21)	
(12-23)	2.98***(1.07)	1.86*(1.07)	
(24-35)	2.44**(1.07)	2.32**(1.05)	
(36-47)	3.14***(1.07)	2.30**(1.05)	
(48-60)	2.40**(1.10)	1.70(1.08)	
Mother's education			
Illiterate (Rfc)	1.00		
Read and write	-1.12*(0.61)		
Primary	-1.34***(0.35)		
Secondary	-2.13***(0.80)		
Mother's BMI		-0.13*(0.07)	
Mothers Height		-0.10***(0.03)	
Average monthly income group(birr)			
≥2000 (Rf)		1.00	
<2000		0.6 *(0.27)	
No. of under five children in the hh			0.53*(0.29)
Access to agricultural land ownership			
Yes (Rfc)	1.00		
No	0.82*** (0.26)		
Diarrhea occurrence			
No (Rfc)	1.00	1.00	
Yes	0.55*(0.32)	0.54*(0.33)	
Access to information on child care			
Yes (Rfc)		1.00	
No		1.87***(0.55)	0.98*(0.55)
Colostrum feeding No			0.89***(0.32)
Exposure to urban waste disposal No		-.55**(.28)	-0.94***(0.36)

Figure in the parenthesis is standard error, statistical significance is denoted at *** p<0.01, ** p<0.05, *p<0.10, Rfc: Reference category.

Children whose mother's education level at read and write, primary and secondary had negatively associated with stunting at 5%, 1% and 1% significance level, respectively. This finding is in line with study results obtained by Ramos et al. (2014) which were conducted in Brazil and the study undertaken by Gezae and Nigatu (2014) in Ethiopia. The inverse relationship of mother's education and stunting could be explained that educated mothers are more conscious about their children'shealth; child nutrition, and they tend to look after their children in a better way.

Access to agricultural land ownership: as indicated in the above Table 12 the multivariate analysis shows that access to farm land or agricultural land was strongly associated with stunting. This study is in line with the study conducted by Tadiwos and Deginet (2013). Agricultural land or farm land is one of the important

factors of production especially for rural households and also it is an indicator of wealth**.**The study indicated that the likelihood of being stunted found to be high among children whose parents who do not have their own agricultural land. This variable was significant at 1% risk level. The positive association of lack of access to agricultural land and child malnutrition could be explained by the fact this variable plays a vital role in ensuring food security of rural households as it is instrumental for food production and livestock husbandry. Households who have no access to agricultural land may not produce adequate food for their children and as a result exposed to malnutrition.

The Focus Group Discussion (FGD) participants during the survey mentioned that, one of the major causes of malnutrition in their areas was lack of access to farm land. As it was pointed out by the respondents, *"It was difficult to improve our livelihood sustainably and to improve the nutritional status our children. Because due to the urban expansion many of us have no farm land at all; and some of us own very small farm land size, which implies low crop and livestock production for our family as a whole and specifically it was one of the major factors for our children to be malnourished as it affects availability and access to food in the household.*"

Diarrhea occurrence: As indicated in the table above, children who were not affected bydiarrheal diseases two weeks prior to the data collection (as it could be proxy indicator of diarrhea morbidity in children earlier time) were inversely related to stunting at 10% significant level. Similarly, study conducted by Desalegne *et al*., (2016) in Gojam, Ethipia, revealed that diarrheal disease occurrence was identified as one of the main determining factors of stunting among under-five children. This could be due to the fact that, children affected by diarrhea might face chronic infection which can contribute to malnutrition. In turn malnutrition makes children vulnerable to diarrheal infection. So, diarrhea and malnutrition feed off each other in a vicious cycle that can lead to long term consequences. In addition to this the key interview conducted during the survey also supports this result. As per the information obtained from the key informant interview, diarrhea was one of the five top diseases affecting a number of under five children in their kebeles. One of the key informants explained that*"children frequently affected by diarrhea episode were more vulnerable to malnutritionbecause of loss of nutrients from their body, exposed to infection, loss appetite".* Similarly, the FGD respondents also mentioned that*"our under five children are frequently affected by diarrhea and it is one of the common children health problem in our community".*

Determinants of Underweight

As summarized by multivariate logistic regression results, major predicators of child underweight in the study area were identified as Age of child, Household income, Access to information on child care, Diarrhea occurrence, Mothers BMI and Mother's Height (Table 12).

Age of child: the finding showed that the probability of child to be underweight is significantly higher among children who are relatively aged. In particular, as childage increases the probability of being normal in nutrition status among under-five children decreases. The plausible reason forth could be parents give priority care relatively for infants whenever they face scarcity of food within a household, as a result relatively aged children may suffer from the food shortage and exposed to underweight. The study was in line with, the study conducted by Akombi et al. (2017) on 'Stunting, Wasting and Underweight in Sub-Saharan Africa , which showed one of the most consistent determining factors associated with underweight in Sub Saharan Africa (SSA) was increasing child's age.

Household income: Income is a central variable in models of the determinants of child health and nutrition outcomes. As clearly indicated in the above Table 12, children whose parents earn an average income less than 2000 ETB per month were positively and statistically significant at (10% risk level) as compared to parents who earn average monthly income greater than 2000 ETB. The study reported by Deneke et al. (2017) in Ethiopia indicated that house hold income was found to be one of the significant predictors of underweight among children below the age of five.

Diarrhea occurrence: Diarrhea episode in the last two weeks prior to the data collection was identified as one of the positive significant determinant factor of underweight among under-five children at 1% level of statistical significance($p<0.05$). The result of this study in line with the result of the study undertaken in Bule Hora district of Southern Ethiopia (Mandefro *et al*., 2015). The correlation between diarrhea morbidity 2 weeks prior the survey and underweight (a combination of acute and chronic malnutrition) was that diarrhea morbidity within this short period of time could be a proxy indicator of diarrhea morbidity in the children's earlier time. In addition to this, malnourished children have high risk of being frequently affected by diarrhea as the problem of diarrhea and malnutrition has vicious circle.

Access to information on child care: It has been learnt from this study that limited access to information on child care has adversely affected nutritional status of the area. The regression result revealed that limited access to information on child care and feeding practices was positively and significantly associated with underweight at 1% level of significance ($p<0.05$). It was expected that due to their proximity, Sebeta peri-urban dwellers could benefit from awareness creation and profession knowledge dissemination at the town health facilities especially about improved nutrition, child and mothers health cares. Moreover, health extension workers

assigned to the study area expected to provide basic knowledge and skill on improved child nutrition for the communities under study. However, the FGD respondents indicated that *"although there were some attempts made to improve our awareness on how to care and feed our children especially through health extension workers, it was not adequate and we have no access to get adequate awareness creation and knowledge disseminations conducted through different sources like mass media to improve our knowledge on child care and breast feeding practices".*

Maternal Body Mass Index (BMI): in this study maternal BMI was found to be negatively associated with child underweight at 10% level of significance. This could be explained by the fact that undernourished mothers can have low body mass index (BMI< 17.5) which is one of the indications of maternal malnutrition. Having low body mass index can inturn increase the chance of the fetus to have poor growth which leads to giving birth to small birth size and low birth weight (< 2.5kg). So children with small birth size and low birth weight have poor immunity; and have higher chance of being affected by infectious diseases which are said to be the postnatal causes of under nutrition such as underweight. The study conducted by Das and Gulshan (2017) supports this finding as it revealed that mothers BMI have significant association with child malnutrition.

Mother's Height: the findings of the study also showed that maternal hight was one of the important pridictors of underweight. Hence this study was found to be in line with the study conducted by Cesare et al. (2015). In the analysis of DHS for 54 countries, found that a 1cm decrease in height was associated with an increased risk of underweight and stunting (Elias and Amare, 2016).

Determinants of Wasting: Determinant factors for wasting include: number of underfive children in the Household, access to information, colostrum feeding, and exposure to urban waste disposal**.** The fist variables was found to be significant at 5 percent while the second variable was significant at 10%; where as the last two variables (colostrums feeding and exposure to waste disposal) were statistically significant at 1% level of significance ($p<0.05$).

Number of Under Five Children in the Household: the regression coefficient of this particular variable is positive implying, the likelihood of being wasted increases with increased number of under five children within a household**.** However, the study conducted by Zeritu et al., (2017), identified the number of under-five children living in the household as significant predictor of stunting. Obviously with higher number of under-five children in a given household, the chance of proper care and treatment diminishes, it can also reduce family resource; and hence increase the risk of being affected by infection which can leads to malnutrition.

Colostrum's feeding: the finding depicted lack of colostrum feeding had positively and significantly associated with wasting**.** Children whose mothers had provided them with first yellow breast milk (colostrum) had low risk to be wasted as compared to those devoid of colostrum feeding. This study is supported by the research result obtained by Misagan et al., (2016). It is obvious that colostrums feedingis one of the crutial breast feeding practices inorder to improve health and nutritional status of under five children. This could be due to the fact that colostrum is a rich source of nutrients and contains several biologically active molecules, which are essential for specific functions. In addition to this it has the potential to help reconstitute the immune system while enhancing cell growth and tissue repair; and is an outstanding nutritional supplement, a food that protects and promotes health (Uruakpa et al., 2002). Furthermore UNICEF proved that colostrum is the perfect first food for a baby.

Exposure to urban waste disposal: not direct, Sebeta town wastes were reported to be adversely affected the nutritional status of under-five children in the peri-urban areas through depleting their income and exposing their children to waste related diseases. During the survey key informant interviews and focus group discussions result showed that significant number of respondents have serious complain on the negative impact of Sebeta town wastes on their well being.

A child's mother (out of the FGD respondents during the survey) explained that, liquid wastes drained to their nearby rivers from sebeta town have polluted their environment, and hence adversely affected the nutritional status of under-five children in our areas. This is due to the solid wastes from the urban center and liquid wastes released from different factories in the town dumped to the nearby directly exposed us and our children to different type of infectious diseases. In addition to this they were describing that these solid and liquid wastes dumped from the urban center to their surrounding had also affected their livestock which adversely affected their income and wealth. Most of the respondents have also stated turn by turn that they have stopped providing cow milk for their children due to fear of the pollution due to the wastes that could create health hazardous (Source: field survey).

Hence, this variable can affect the nutritional status among children under the age of five through affecting their health and reducing households' income.

Minimum Individual Dietary Diversity Score

Minimum dietary Diversity is one of the core indicators for assessing infant and young child feeding practice; and it is also said to be a proxy for adequate micronutrient-density of food (WHO, 2010). The 7 food groups which are included in the Infants and Young children feeding Minimum Dietary Diversity are the food groups such as grains, roots and tuber; legumes and nuts;

dairy products, flesh foods, eggs, vitamin A rich fruits and vegetables; and also other fruits and vegetables (FAO and FHI, 2016).

Apart from showing a proxy for adequate micronutrient density of foods, there are empirical evidences which show Individual Dietary Diversity Score (IDDS) has association or can be one of the determining factors of nutritional status of under-five children after controlling cofounding socioeconomic factors. Accordingly, in this study it was tried to see the association between minimum dietary diversity and child malnutrition indicators (like stunting, underweight and wasting). However, the result of the bivariate and multivariate logistic regression analysis revealed that there was no significant statistical association between minimum dietary diversity and the dependent variables in the study area ($p>0.05$). But the following table simply indicates the proportion of under-five children, especially (6-23) month's age children consuming at least 4 food groups and less than 4 food groups within a day.

Table 13: Individual dietary diversity score by age group for selected kebeles of sebeta peri- urban areas, Oromia region, 2018.

Age of child	<4 Food Groups	≥4 Food Groups	Total
(0-5) months	29	0	29
(6-23) months	94	16	110
(24-59) months	206	23	229
Total	329	39	368

As per the formula and definition of WHO (2010) for Minimum Dietary Diversity:

Proportion of children 6-23 months of age who received foods from ≥ food groups =

$$\frac{\text{Children 6 – 23 months who recieved food from} \geq \text{4 food groups during the previous day}}{\text{children 6 – 23 months of age}}$$

$$= \frac{16}{110} = 0.15$$

This result reveals that the proportion of children who consume at least four food groups within a day or 24 hours became 0.15 (15%) of the total children whose age lies between (6-23) months.

CONCLUSION

The study examined the prevalence and determinants of child undernutrition from sampled 368 under-five children showed that 30.2% of the under five children were chronically malnourished or stunted and 11.3% of them were severely stunted. Under-five children who were under state of both acute and chronic malnutrition (underweight) found to be 27.5% of which 7.6% of them were severely underweight. Similarly, it was inferred that 13.1% of the children were acutely malnourished (wasted) where as 5% of them were severely wasted. Hence, it reveals that the magnitude of undernutrition in the study area is high. The of multivariate regression analysis showed that Sex of child (female children), Age of child (> 12 months), no access to adequate information, household monthly income <2000 ETB, lack of farm land, Diarrhea occurrence, and not feeding colostrum were found to be positive and statistically significant determinants of undernutrition among under-five children in the study area (at p value <1%, 5% and 10%). While, Mother's education, Mother's height, Mother's body mass index,Number of under five children in the household,and No exposure to urban waste disposal were identified as negative and statistically significant determinants of undernutrition among children in the area (at p value <1%, 5% and 10%). The factors associated with undernutrition are multifactorial and interdependent. Hence, there is a need to adopt a multi-strategy community-based approach that targets the immediate, underlying and basic determinants of child undernutrition. Such approach should include counselling sessions for mothers with the aim of improving breastfeeding practices and maternal nutrition, public health campaigns to increase awareness on the importance of proper sanitation and hygiene practices.

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