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Journal of Food: Microbiology, Safety and Hygiene

Research Article

Statistical Analysis of Correlates of Malnutrition in Ethiopia: Children underAge Five

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ABSTRACT

Malnutrition at the early stages of life can lower child resistance to infections, increase child morbidity and mortality, and decrease mental development and cognitive achievement. Adequate nutrition is the keystone of survival, health and development not only the current generations but also the ones to come. Child malnutrition is a major public health problem in Ethiopia. The main objective of this study was investigating correlates of malnutrition on children under age five in Ethiopia, using Z-scores and multivariate logistic regression analysis. According to the data obtained from the 2014 Mini Ethiopian Demographic Health Survey (EDHS) the under-age five children were 4921 out of these we took a sample of 802 under age five children (421 male and 381 female). The study design was cross-section survey because the data were collected at a point of time. Descriptive and multivariate logistic regression model were used to estimate the respective indicators, and effects of factors on the malnutrition of the under-age five children.

Keywords: Child malnutrition; Z-scores; Multivariate logistic regression model; Under-weight ethiopia

INTRODUCTION

Malnutrition continues to be a major public health problem in developing countries especially, in Sub-Sahara countries. It is the one of the leading risk factors for the burden of disease causing about 300, 000 deaths per year directly and indirectly responsible for more than half of all deaths in children [1-4]. Malnutrition at the early stages of life can lower child resistance to infections, increase child morbidity and mortality and decrease mental development and cognitive achievement and nutritional status is the best global indicator of well-being children [5-7]. Adequate nutrition is the keystone of survival, health and development not only of current generations but also of the ones to come. Malnutrition is an underlying cause of the death of 2.6 million children each year, and one-third of the global total of children's (7.6 million child) death each year before, their fifth birthday through weakening the body's resistance to illness. Malnutrition is a silent killer that is, under reported, under addressed and, as a result, under prioritized [8-10].

Malnutrition among children is a critical problem because its effects are long lasting and go beyond childhood. It has both short-term and long-term consequences [11]. For instance, malnourished as compared to non-malnourished children are physically, emotionally and intellectually less productive and suffer more from chronic illnesses and disabilities. Malnutrition among children depends on complex interactions of various factors reflecting socio-economic and demographic, environmental, reproductive, institutional, cultural, political and regional factors. Already many studies have been conducted to identify the determinate of malnutrition and the level of the risk in Ethiopia in different regions and elsewhere. Poverty is found to be strongly associated, a number of studies have illustrated that children of poorer households tend to be more with child malnutrition.

In the world today, one child in four is stunted due to malnutrition, and in developing countries this figure is as high as one in three specifically, in Africa two out of five children's will suffer with malnutrition. Malnutrition is one of the leading causes of morbidity and mortality in children under age five years in Ethiopia.

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Received: 04-Jul-2022, Manuscript No. JFMSH-22-22789; **Editor assigned:** 06-Jul-2022, PreQC No. JFMSH-22-22789(PQ); **Reviewed:** 20-Jul-2022, QCNo. JFMSH-22-22789; **Revised:** 27-Jul-2022, Manuscript No. JFMSH-22-22789(R); **Published:** 03-Aug-2022, DOI: 10.35248/2476-2059.22.7.159

Citation: Abebe A (2022) Statistical Analysis of Correlates of Malnutrition in Ethiopia: Children under Age Five. J Food Microbiol Saf Hyg. 7:159

MATERIALS AND METHODS

Measurement of nutritional status

According to WHO report, children who fall below minus two standard deviation (-2SD) from the median of the reference population are regarded as moderately malnourished, while those who fall below minus three standard deviation (-3SD) from the median of the reference population are considered severely malnourished [12].

The height for age index provides an indicator of linear growth retardation and cumulative growth deficit in children. Children whose height for age Z-Scores is below minus two standard deviation (-2SD) from the median of the WHO reference population are considered shorter for their age (Stunted), or chronic malnourished. Children who are below minus three standard deviation (-3SD) are regarded severely stunted. Stunting reflects failure to receive adequate nutrition over long period of time and is affected by recurrent and chronic illness.

The weigh for height indexes measures body mass in relation to body height: it describes current nutritional status. Children with Z-scores below minus two standard deviation (-2SD) are observed as thin (wasted) or acutely malnourished. Wasting represents the failure to receive adequate nutrition in the period immediately preceding the survey and may be the results of inadequate food intake or a recent episode of illness causing loss of weight and the onset of malnutrition. Children with a weight for height index below three standard deviation (-3SD) are perceived severely wasted. The weight for height indexes also provides data on over-weight and obesity. Children more than two standard deviation (+2SD) above the median weight for height are considered severely wasted [13-15].

Weight for age is a composite index set of height-for-age and weight for height. It takes into account both chronic acute malnutrition. A child can be under weight for his/her age because he or she is stunted, wasted, or both. Weight for age is an overall indicator of a population's nutritional health. Children with height for age below two standard deviations (-2SD) are classified as underweight. Children with weight for age is below three standard deviation (-3SD) are categorized as severely underweight.

Method of data collection and source of data

The information for this study is obtained from the 2014 Mini EDHS with reference to 5,401 children age less than five year were eligible to be weight and measured. Data are presented for 4,923 (4,921 children weights): 5 percent had missing values for height or weight and 4 percent had height measures considered to be out of the range for their ages. Out of those eligible children, about 802 of them were included in the study.

Variables considered in the study

Dependent Variable: malnutrition indicated by wasting, Stunting and underweight status in children under age five.

Independent Variables: four categories of factors were adopted:

Socio-economic and demographic variables-Age in months, sex of child, number of house hold members, partner education level, type of place of residence, Childs line number in house hold, number of living children, Total children ever born, Highest educational level, Wealth indexes, and number of children 5 and under.

Child characteristics-height, weight, and Size of child at birth

Child caring practices-Months of breastfeeding, Currently breastfeeding, Had diarrhea recently

Maternal caring and characteristics: during pregnancy given iron tablets/syrup, after birth, health professional checked health, Tetanus injections before birth, ever had vaccination.

The codes of all categorical explanatory variables used in this study were illustrated in Table 1

	Chi-square	DF	Sig.
Step	357.502	14	0
Block	357.502	14	0
Model	357.502	14	0

Table1: Omnibus Tests of Model Coefficients on Underweight.

Method of data analysis

The design was cross-sectional survey, because the data were collected at a point of time. Descriptive and multivariate binary logistic regression were used to estimate the respective indicators, and effects of factors on the malnutrition (stunted, wasted and underweight) of the under-age five children.

Chi-Square Test of Independent: This test is used to select the important variable to be included in the model at the first stage. If P-value is less than level of significance, then the variable/s will be included in the model.

Fitting Logistic Regression Model: In this study multivariate binary logistic regression model was used to examine the association between dependent variables (stunting, wasting, and underweight) where each of them has two possible outcomes (yes or ≤2 SD, no or >2 SD) and independent variables. Suppose that a sample of n independent observation [16].

RESULTS AND DISCUSSION

Descriptive statistics

From the total sample of 421 male children of which 23.3%, 16.2%, and 60.6% were severely stunting, stunting, and no stunting respectively. Out of 421 male children of which 17.8% and 82.2% were underweight and no underweight respectively. In addition to that, the prevalence rate of 421 male children were severely wasting, wasting, and no wasting 1%, 34.2%, and 68% respectively.

Likewise, out of 381 female children 26.5%, 18.1%, and 55.3% were severely stunting, stunting, and no stunting respectively. Of the total sample of 381 female children of which 6% and 94% were underweight and no underweight respectively. In the same way, the prevalence rate of female children were severely wasting, wasting, and no wasting were 0.3%, 17.6%, and 82.1% respectively.

To examine the association between the dependent and independent variables chi-Square test was adopted. The test result reveled that, residence, number of children 5 and under, currently breastfeeding, Childs line number in household, tetanus injections before birth, months of breastfeeding, after birth professional checked health, received measles, ever had vacation, age and diarrhea had statistical significant association with stunting at 5% level of significance. Correspondingly, there were an association between number of children 5 and under, currently breast feeding, tetanus injections before birth, months of breastfeeding, received measles, ever had vacation, age, had diarrhea and wealth indexes for wasting and underweight. Because, the p-value is less than 5% level of significance. Thus, those significant variables were considered at the first stage to fit the model [17-19].

Inferential statistics

The likelihood ratio test for stunting was 635.515 with degrees of freedom 25 with the corresponding p-value 0.00 was less than at 5% level of significance this implies that the null hypothesis was rejected. As a result, residence, number of children 5 and under, currently breastfeeding, Childs line number in household, tetanus injections before birth, months of breastfeeding, after birth professional checked health, received measles, ever had vacation, age, had diarrhea and stunting were well fitted the model.

The likelihood ratio test for wasting and underweight were 234.835 and 357.502 respectively with degrees of freedom 14 with the corresponding p-value 0.00 was less than 5% level of significance. This also indicate that the null hypothesis was rejected. As a result, number of children 5 and under, currently breastfeeding, tetanus injections before birth, months of breastfeeding, received measles, ever had vacation, age, had diarrhea and wealth indexes were well fitted the model for wasting and underweight.

Hosmer-Lemeshow test

It was employed in order to assess goodness of fit for logistic regression model or it is used to test whether the predicted values close to observed values.

H_0: The predicated value close to the observed values of the data

H_1: The predicated value is not close to the observed values of the data

The p-value of Hosmer-Lemeshow test for stunting, wasting, and underweight were 0.189, 0.52, 0.868 respectively with their factors showed that we didn't reject the null hypothesis at 5% level of significance. As a result, the observed values of stunting, wasting, and underweight were closed to their predicated values.

Wald test

Wald test was used to assess the association between each explanatory variable with their corresponding response variables.

Based on the analysis results, the p-values for age, hadn't diarrhea recently, live in rural, months of breast feeding less than six and no education were 0.00, 0.001, 0.139, 0.054, and 0.131 respectively. This reveals that, we can reject the null hypothesis at 15 % level of significance with their reference categories by controlling other variables. Hence, these variables were significant for stunting based on Wald statistic.

As well as, the p-values for ever had not vaccination, age, months of breastfeeding less than six, and months of breastfeeding 12-23 were 0.037, 0.001, 0.137, and 0.126 respectively. This shows that, the null hypothesis was rejected at 15 % level of significance with their reference categories keeping other variables constant. Then, these variables were significant for predicting wasting based on Wald statistic.

The p-value of the variable age was 0.00 for the outcome variable of underweight. Thus, age was the only variable that was significantly associated with underweight.

Estimated model for stunting

As indicated in the model above, odds of being stunting among children who had not diarrhea recently was 0.411 times less than that of children who had diarrhea. The likelihood of being stunting under age five children living in rural area was 2.301 times higher than that of the reference category (living in urban). The chance of being stunting among children who had good breast feeding currently was 0.564 times less than children who had not good breast feeding currently. Likewise, the odds of being stunting for children who had less than six months of breast feeding and not educated partner were 5.689 and 6.577 times more than children who had 6-11 months of breast feeding and partner with higher education level, respectively. As children's age increase by one year, the likelihood of being stunting will decrease by 0.812, controlling other variables [20].

Although, the estimated model coefficients of wasting and underweight can be discussed by pursuing similar way of explanation used for stunting model. The estimated models for wasting and underweight are depicted below.

CONCLUSION

The objective of this study was to identify main factors of malnutrition on children under age five in Ethiopia using multivariate logistic regression model. According to the findings, the prevalence of stunting was higher in female children than male but, the reverse is true for wasting and underweight. Factors like no diarrhea, good currently breast feeding, increase age of children, live in urban, increase education level of partners and increasing months of breast feeding were crucial in minimizing the prevalence of stunting. As shown the result, was concluded that not taking vaccination increase age of children and minimum months of breast feeding were increased the risk level of wasting. The finding of this study is increase the age of children was decreased the prevalence of underweight and also observed from the 3 different types of multiple logistic regression models age was significant factor associated with malnutrition. The prevalence of stunting, wasting, and underweight were 42.05, 26.5, and 11.9 percent, respectively. This value showed that the prevalence of stunting and underweight were decreased as compared to 2011 EDHS.

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