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Prevalence and factors of Diarrhea among under-five children in Ethiopia

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Abstract

Background: The World Health Organization defines diarrhea as the passage of three or loose, or watery stools within a day or unusual frequency of diarrhea episodes. The goal of the study was to evaluate the prevalence and factors associated with diarrhea among children of age under-five in Ethiopia.

Methods: Association between outcome and independent variables was done using Pearson's chi-square test. To control for possible confounding, binary logistic regression was applied and analyzed using Stata version 14. This was asystematic literature review. A systemic search of articles was done on PubMed, TRIP, EPPI COVID Living Map, Web of Science, and medRxiv databases until 2020 using the keywords "COVID-19", "SARS-CoV-2", "coronavirus", "hydroxychloroquine", and "mortality". Relevant articles were chosen for further evaluation based on a review of their titles and abstracts. *In vivo* and *in vitro* studies were included assessing the safety and effectiveness of Azithromycin and 4-aminoquinline for treatment of COVID-19 pregnant mothers.

Results: Based on this study, the prevalence of diarrhea was 15.5% of children under the age of five. The expected value of the prevalence of diarrhea among under-five children from Amhara, Oromia, and Southern nations, nationalities, and people's region was 0.47, 0.77 and 0.72 times lower than the occurrence of diarrhea among the ages of under-five children in Tigray, respectively, controlling for the other variables in the model. When we look at the source of drinking water, the odds of the prevalence of diarrhea among under-five children were 0.78 times lower than children taking protected water as compared to unprotected water. In addition, the odds of the prevalence of diarrhea among under-five children from a child's lives with others were 5.95 times higher than the prevalence of diarrhea for a child who lives with the respondents.

Conclusion: Region, child living with whom and source of water are the significant factor of the prevalence of diarrhea among under-five children.

Keywords: Diarrhea • Prevalence • Risk factors • Under five children

Introduction

Diarrhea is defined as the passage of three or loose or watery stools within a day or unusual frequency of diarrhea episodes. Diarrhea disease is the cause of the death of under-five children, children every year globally killing around 760, 000, and above 90% consequences for polluted nutrition and water sources in the world and Diarrhea is also the major causes of child mortality, mostly in children less than five years of age living in low and middle-income countries. The risk of a child dying before becoming the age of under-five children was highest in the World health organization African Region (90 per 1000 live births), which is approximately seven times higher than that in the World health organization European Region (12 per 1000 live births). Diarrhea kills an estimated 1.8 million, people every year, among the ages of under-five children in developing countries, diarrhea accounted for 21% of all deaths, diarrhea was also responsible for 25 to 75% of all childhood diseases (accounted for about 14% of outpatient visits and 16% of hospital admissions). Of the estimated total of 10.6 million deaths among children younger than five years of age worldwide, 42% occurred in the African region. Ethiopia is one of the sub-Saharan African countries sharing the high burden of diarrhea mortality due to living conditions, high prevalence of the disorder, lack of safe intake water,

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and hygiene; as well as poorer overall health and nutritional status. Twelve percent of children under five had diarrhea two weeks before the survey. More than four out of 10 children under five (44%) who had diarrhea sought treatment. Among children under five with diarrhea, 46% received some form of oral rehydration salts, while 39% received Oral rehydration salts or increased liquids. The diarrhea rate is still high, it continues to be a burden to Ethiopia population and diarrhea is the main problem not only the age of under-five children but also for all populations. Therefore, the study aims were to consider the existence and risk factors of diarrhea under the age of five children in Ethiopia [1].

Materials and Methods

Source of the data

The source of the data in this study is from the 2016 Ethiopia demography and health survey. In this study, a datum set consisting of 5,335 children was used. Association between outcome and independent variables was done using Pearson's chi-square test. To control for possible confounding, binary logistic regression was applied and analyzed using Stata version 14 [2].

Variables of the study

The dependent variable is the prevalence of diarrhea among the ages of under-five children and explanatory variables are region, types of place of residence, source of drinking water, ages of households, currently pregnant of mothers, a child lives with whom, types of toilet facility [3].

Sampling design

The sample was selected by stratified sampling methods and designated in two stages. In the first stage, a total of 645 enumeration areas (202 enumeration areas in urban areas and 443 enumeration areas in rural areas) were selected with probability proportional to the enumeration area size (based on the 2007 Population and housing census) and with independent selection in each sampling stratum. In the second stage, a fixed number of 28 households per cluster were selected with an equal probability systematic selection from the newly created household listing [4].

Binary logistic regression model

Binary logistic regression is used for this study when the dependent variables are dichotomous. The error terms are not normally distributed. The logistic regression model is given as:

$$\pi(x)=\frac{\exp(\beta_0+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_m X_m)}{1+\exp(\beta_0+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_m X_m)}$$

Methods of parameter estimation

Suppose y_i represents the value of a dichotomous outcome variable, x_i is the value of the explanatory variables and assume y_i ~ Bernoulli (1,π(x_i)), i= 1, 2... n.

The log likelihood (L) is defined as.

$$L(\boldsymbol{\beta})=\sum_{i=1}^{n}\{y_i\ln(\pi(x_i))+(1-y_i)\ln(1-\pi(x_i))\}$$

β would be obtained by maximizing log-likelihood using iterative algorithm method. π^ is a maximum likelihood estimator, we can use a Wald confidence interval for π_i:

β would be obtained by maximizing log-likelihood using iterative algorithm method. is a maximum likelihood estimator, we can use a Wald confidence interval for:

$$\hat{\pi}_i \pm Z_{1-\alpha/2}\sqrt{\frac{\hat{\pi}_i(1-\hat{\pi}_i)}{n}}$$

Model adequacy test

The Hosmer-Lemeshow test statistic (H) is given by

$$H=\sum_{i=1}^{g}\left(\frac{(O_i-E_i)^2}{n_i\hat{p}_i(1-\hat{p}_i)}\right)$$

Where Oi, Ei, ni, and (p i)^ symbolize the observed events, expected events, observations, and predicted risk for the it risk deciles group. The P-value of Hosmer-Lemeshow goodness-of-fit test is greater than the level of significance; we conclude that the model estimates are adequate to fit the data [5,6].

Results

The prevalence of diarrhea among the ages of under-five children was a total of 5,335 children in Ethiopia and out of these, 15.5 % of children with diarrhea. 7.8%, 2.8%, 1.8% and 2.9% of children in Tigray, Amhara, Oromia, and Southern nations, nationalities, and people's regions were the prevalence of diarrhea among the ages of under-five children, respectively. In addition, 12.1% and 3.4% of children living with respondents and others were prevalence of diarrhea, respectively. Similarly, 7.7% and 7.8% of a child was the prevalence of diarrhea by taking unprotected and protected water, respectively. Based on the chi-square test; region (p-value=0. 000), currently pregnant mothers (p-value=0. 009), child lives with whom (p-value=0. 000) and source of drinking water (p-value=0. 000) were significantly associated with the prevalence of diarrhea among the ages of under-five children (Table 1) [7-10].

Table 1. Frequency, percentage and chi square test of independent variables related to occurrence of diarrhea among under five children in Ethiopia.

Variable	Category	Occurrence of diarrhea		Total	Chi square test (p-value)
		no	yes		
Region	Tigray	1776 (33.3%)	416 (7.8%)	2192 (41.1%)	0
	Amhara	1260 (23.6%)	150 (2.8%)	1410 (26.4%)	
	Oromia	521 (9.8%)	99 (1.8%)	620 (11.6%)	
	SNNP	953 (17.9%)	160 (2.9)	1113 (20.8%)	
Types of place of residence	urban	1369 (25.7%)	242 (4.5%)	1611 (30.2%)	0.557
	rural	3141 (58.9%)	583 (10.9%)	3724 (69.8%)	
Source of drinking water	Unprotected	1967 (36.9%)	415(7.7%)	2382 (44.6%)	0
	Protected	2543 (47.7%)	410 (7.8%)	2953 (55.4%)	
Age of households	Less than 20	57 (1.1%)	8 (0.15%)	65 (1.25)	0.023
	20-40	2312 (43.3%)	383(7.2%)	2695 (50.5%)	
	More than 40	2141(40.1%)	434 (8.1%)	2575 (48.2%)	
Currently pregnant	no	2132 (40%)	349 (6.5%)	2481 (46.5%)	0.009
	yes	2378 (44.6%)	476 (8.9%)	2854 (53.5%)	
Child live with whom	respondents	4289 (80.4%)	644 (12.1%)	4933 (92.5%)	0
	others	221 (4.1%)	181(3.4%)	402 (7.5%)	
Types of toilet facility	No facility	1131 (21.2%)	192 (3.6%)	1323 (24.8%)	0.27
	facility	3379 (63.3%)	633 (11.9%)	4012 (75.2%)	

All variables are not significant, the most appropriating variables are selected by using the back-ward selection method. Based on the data, the calculated p-value of the Hosmer-Lemeshow goodness-of-fit test statistic (p value=0.055) is greater than 0.05, we conclude that the model is adequate. The level of significance (α) for this study was set at 0.05. The outcomes of this study showed that the region had a significant factor in the prevalence of diarrhea among the ages of under-five children. The expected value of the occurrence of diarrhea among under-five children from Amhara, Oromia, and Southern nations, nationalities, and people's region were 0.47, 0.77 and 0.72 times lower than the occurrence of diarrhea among the ages of under-five children in Tigray, respectively, controlling for the other variables in the model. When we look at the source of drinking water, the odds of the occurrence of diarrhea among under-five children was 0.78 times lower than children taking protected water as compared to unprotected water. In addition, the odds of the occurrence of diarrhea among under-five children from a child's lives with others were 5.95 times higher than the occurrence of diarrhea for the child lives with the respondents (his or her family) (Table 2) [11,12].

Table 2. Binary logistic regression analysis for factors found to be associated with the occurrence of diarrhea among the age of fewer than five children in Ethiopia.

Had diarrhea recently		Odds ratio	Std.err	z	p>|z|	95% Confidence interval
Region	Region 1					
	Region 2	0.4687015	0.0500394	-7.1	0	0.3802074 0.5777929
	Region 3	0.7732906	0.1042603	-1.91	0.047	0.5937148 1.007181
	Region 4	0.7294543	0.0773537	-2.97	0.003	0.5925622 0.8979708
Source of drinking water	Unprotected					
	protected	0.7759161	0.0641573	-3.07	0.002	0.6598305 0.9124249
Age of households	<20 (Ref)					
	20-40	1.21048	0.4782584	0.48	0.629	0.5580197 2.625825
	>40	0.4782584	0.5591397	0.88	0.378	0.6532947 3.070437
Child lives	Respondent					
	others	5.951375	0.664595	15.97	0	4.781486 7.407501
	constant	0.1697513	0.0669248	-4.5	0	0.0783836 0.3676217

Discussion

This study identified the risk factors associated with diarrhea among under-five children in the study area using the 2016 Ethiopia demography and health survey. This result indicated that the occurrence of diarrhea was observed in the Tigray region, 7.8% followed by Southern nations, nationalities, and people's region, Amhara and Oromia regions, 2.9%, 2.8%, and 1.8%, respectively. The odds of the occurrence of diarrhea among the ages of under-five children from Amhara, Oromia, and Southern nations, nationalities, and people's regions were less than as comparing to the Tigray region. This is inconsistent with findings from other studies. The present study found that the odds of diarrhea status of children for taking protected water were lower than unprotected (unsafe) water. A similar study in Ethiopia found that drinking unprotected water tends to increase the occurrence of diarrhea among the ages of under-five kids. Another study in sub-Saharan African, Indonesia and Malaysia also stated that the dominance of diarrhea among the ages of under-five youngsters for taking unprotected water is higher than drinking protected water. The child living with who is one of the major factors for determining the prevalence of diarrhea disease under-five children. According to the results of this study, it was found that the odds of prevalence of diarrhea in child lives with others were higher than that of children live his or her families. This may be due to misconception, and the negative attitude of the caregivers toward the causes of diarrhea. A study conducted in Ethiopia found that children living with others were more probable to the prevalence of diarrhea as linked to broods living with the respondents. Another study in Kenya and Nigeria also found that children living with others were at a high risk for the prevalence of diarrhea [13].

Conclusion

This study used data from the 2016 Ethiopia demography and health survey. Region, child lives with whom and source of drinking water were statistically significant factors for the prevalence of diarrhea under the age of under-five children. A child taking protected water, and a child living with his or her family is highly appreciated for reducing the prevalence of diarrhea among the ages of under-five children. In addition, planning for better access to health facilities for each region.

Conflicts of Interest

The author declares no competing interests.

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