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PREVALENCE AND FACTORS ASSOCIATED WITH DIARRHEA MORBIDITY IN CHILDREN UNDER THE AGE OF FIVE YEARS IN TEPI TOWN: A CROSS-SECTIONAL STUDY

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AUTHORS' CONTRIBUTIONS

The author's generated the idea and designed the study and also did statistical analysis, editing, reviewing and writing up the manuscript. The author read and approved the final manuscript

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ABSTRACT

Introduction: Diarrhea is defined as having three or more loose or liquid stools per day. The risk of a child dying before becoming five years of age remains highest in the AFRICAN Region, which is approximately seven times higher than that in the EUROPEAN Region. In Ethiopia, the prevalence rate of diarrhea was 12 % according to 2016 EDHS estimates.
Objective: The objective of this study was to assess the prevalence and associated factors with diarrhea among children under 5 years of age in Tepi town.
Methods: A community-based cross-sectional study was conducted in 133 mothers/ care takers in Tepi town, Hibret Kebele. Binary logistic regression models were used to calculate the odds ratios.
Results: The two-week prevalence of diarrhea among children under five was 24.1%. The diarrhea prevalence of female were 75.2% (OR=0.248), 95% CI: 0.084-0.738, family had 1000-2000 income per month was 39.1% (OR=0.609), 95% CI 2.351-8.682, family which had greater than 2000 income was 45.9% (OR=0.541); 95% CI: 1.025-2.134, completed primary educational levels 73.6% (OR=0.264), 95% CI: 0.075-0.932, protected source of drinking water were 67.8% (OR=0.322), 95% CI: 0.106-0.982, and no latrine were 18.8% (OR=3.188), 95% CI: 1.087-9.348 were significant predictors of diarrhea. In this study, the prevalence of diarrhea was high, which was significantly associated with sex, income of family, education level, source of drinking water, and availability of latrine. Therefore, efforts should be invested to generate a protected water sources, educate parents about the importance of using a protected and qualified water sources to reduce the exposure of children to diarrhea morbidity and mortality.

Keywords: Logistic Regression; under-five children; Diarrhea; Hibret Kebele, Southwest, Ethiopia.

1. INTRODUCTION

Diarrhea is defined as having three or more loose or liquid stools per day [1]. Diarrhea disease is the cause of death of under-five children every year, globally killing around 760,000 children and more than 90% results from contaminated food and water sources in the world [2,3] and children under the age of five have been a high risk living in low and middle income countries [4].

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Diarrheal morbidity is the leading cause of preventable death, especially among under-five children in developing countries, and is defined as caused by ingesting certain bacteria, viruses, or parasites found in fecal matter which may be spread through water, food, hands, eating and drinking utensils, flies, and dirt under fingernails [5]. In addition United Nations Children's Fund's in 2016 report indicates that diarrheal disease accounts about 8 percent of all deaths among children under the age of five years worldwide. This means that over 1,300 young children die each day, or about 480,000 children in a year, despite the availability of simple effective treatment [6].

The hazard of child death earlier than turning at five years of age stays maximum within side the AFRICAN Region (90 per 1000 live births), that is about seven instances better than that within side the EUROPEAN Region (12 per 1000 live births) [7]. More than four-fifths of all deaths amongst kids more youthful than five years vintage in 2011 happened in sub-Saharan Africa and South Asia. The trouble in Ethiopia is even worse than someplace else within side the world, with an Ethiopian toddler being 30 instances much more likely to die with the aid of on his/her 5th birthday than a toddler in Western Europe [7].

According to the 2016 Ethiopian Demographic and Health Survey (EDHS) report, the 2-week period prevalence of diarrhea amongst under- 5 children became about 12% [8], however a take-a look at performed in northwestern Ethiopia confirmed the 2 weeks duration occurrence of diarrhea amongst under-5 children in 2017 to be 20%. Similarly, a community-based cross-sectional study conducted in Jabitehnan district, West Gojjam Zone, Amhara Region, Ethiopia, reported a 21.5% two-week period prevalence of diarrhea [9,10]. However, in most remote and pastoralist areas, the prevalence is predicted to be higher due to scarcity of consuming water, poor sanitation, and low level education and consciousness levels.

Under five-child diarrheal morbidity stays a major public health problem in Ethiopia. However, information related to diarrheal disease in children under-5 in Tepi town, hibret kebele is constrained and diarrhea cannot be tackled without know how reassets this is why the study become vital to identify the principal socio-economic, demographic, nutritional and environmental factors of formative years diarrhea. Therefore, the purpose of this study was to assess the prevalence of diarrheal disease and associated factors in children under five years old in Tepi city, Hibret Kebele, south west Ethiopia. The findings will make a contribution to enhancing the lives of children under-5 years. In addition, the information may be used to develop a powerful educational programs to improve child health overall. Similarly, this study will inform policy makers and program initiators on suitable services.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in Tepi Town which is found in Southern Nations, Nationalities, and Peoples Region (SNNPR), it's around 611km far away from the Addis Ababa. This area is particularly found in Sheka Zone, Yeki woreda, which is bordered on the south by Bench Maji, on the west by the Gambela Region, on the north by the Oromia Region, and on the east by Keffa. Based on the 2007 Census conducted by the CSA, the Zone has a total population of 199,314, of whom 101,059 are men and 98,255 women; 34,227 or 17.17% are urban inhabitants. According to zonal health department, the total number of under-five children of Tepi town was 4805.There are several ethnic groups present in this Zone such as Shakacho, Amhara, Kafficho, Oromo, Bench, Sheko, Majang and etc. all other ethnic groups made up of the population.

2.2 Study Design

Study design was community-based with cross-sectional survey to assess the prevalence and factors associated with diarrheal morbidity among children less than 5 years of age.

2.2.1 Study population

The study populations are all households with mother's/care takers who have under-five children in the Hibret kebele and the study units are randomly selected households with at least one under five child in Hibret kebele.

Inclusion criteria:

- Households with at least one under five child were eligible for the study
- Families who had permanent residence in the area for at least six months

Exclusion criteria:

- Children who were chronically ill and with persistent diarrhea for greater than two weeks

2.2.2 Sample size determination and sampling procedures

There are many techniques of sampling design in statistical methods. The study was a selection based

on a simple random sampling technique, after obtaining a list of the household that had at least one under five child in Hibret kebele. The study populations are all households with mother's/care takers who have under-five children in Tepi town, Hibret Kebele.

The researchers considered 8% of the margin of error, 95% confidence level, and the proportion of the morbidity of the child with diarrhea was 0.6 which obtained from the pilot survey.

$$n_o = \frac{\left(Z_{\alpha/2}\right)^2}{d^2} * p * q$$

$n_o = \frac{(1.96)^2}{0.08^2}(0.6)\,(0.4) = 144.06$, where $p = \frac{6}{10} = 0.6, q = 1 - p\ is\ 1 - 0.6 = 0.4$
$n_o = 144.06$

$\frac{n_o}{N} = \frac{144.06}{1667} \approx 0.0864$ which is greater than alpha (0.05) since it needs adjustments.

$$n = \frac{n_o}{1+\frac{n_o}{N}} = \frac{144.06}{1+\frac{144.06}{1667}} \approx 133$$

2.2.3 Data collection tools and procedures

Data were collected from February 15-25, 2021, using a structured, pretested, and interviewer-administered questionnaires. The questionnaire was prepared based on the EDHS and other literature which is related to diarrhea among under-five children [11-13]. The instrument was prepared in English and then translated into Amharic for data collection. Respondents were mothers of eligible children, but in the absence of the mother, the next primary caregiver was interviewed.

2.3 Study Variable

Dependent Variables: the *dependent* variable of this study is the status of children under- five age having diarrhea in the two weeks prior to the survey.

$$y_i = \begin{cases} 1, & \text{if the } i^{t\square} \text{ child suffered from diaharia in the two weeks prior to the survey} \\ 0, & \text{other wise} \end{cases}$$

Independent Variables: risk factors that explain the morbidity of children with diarrhea. Some risk factors that are selected from different literatures are: socio-economic, demographic and environmental factors included as independent variables.

2.4 Methods of Data Analysis

After the data collected, the next step would be editing, analyzing, and summarizing the data in an appropriate manner and the available data would be transformed in to reliable and useful information with the help of statistical analysis procedure by using SPSS 20 version software.

2.4.1 Binary logistic regression model

Binary logistic regression is used for this study when the dependent variables are dichotomous [14]. The error terms are not normally distributed [15]. Many response variables are binary, representing the success and failure outcomes by 1 and 0, respectively. The Bernoulli distribution for Bernoulli trial specifies probabilities $P\ (Y = 1) = \pi$ and $P(Y = 0) = 1 - \pi$.

The logistic regression model is given as

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

Where: X_m is an independent variable in the model, β_0: are constant terms and β_m are the coefficient of independent variables. $P\ (Y = 1) = \pi$ is the probability of success, i.e., children are morbid by diarrhea, 1-π: is the probability of failure, i.e. the child's who is not morbid by diarrhea.

Maximum likelihood estimator is used to estimate the parameters of the model [16] and Hosmer–Lemeshow test is also available for model adequacy test.

3. RESULTS AND DISCUSSION

In this section, we present the results of data analysis, discussion, and interpretation. The first part presents summary statistics for the different factors considered in this study. The second part analyzed the data with the appropriate model. Then, the adequacy of the model is investigated. Finally, the results were interpreted and discussed. SPSS software were employed to analyze the data.

3.1 Descriptive Result

This study was carried out to investigate the determinant factors associated with diarrhea morbidity among under-five children through analyzing the demographic, economic, and environmental factors. Accordingly, the study used 133 samples and the two weeks prevalence of diarrhea among under-five children was about 24.1 % in Hibret Kebele, south west Ethiopia. Table 3.1 showed that, out of 133 under-five children, 49.6% and 50.4% were female and male, respectively. The prevalence of Diarrhea among males and females were 15.8% and 8.3%, respectively. Regarding the age of under five children, the prevalence of suffering from Diarrhea were 5.3%, 4.5%, 4.5%, 3.8%, 3.8%, 3% for children's whose ages are 12-23,36-47, 48-59 ,24-35,6-11 and less than 6 respectively. This show as 12-23 months children had the highest percentage of diarrhea.

The proportion of under-five children suffering from diarrhea varies with the household economic status. The highest incidence of diarrhea among under-five children was found in a low-income household (those who had less than 1000 birr per month), whereas the lowest proportion of under-five children suffering from diarrhea was recorded for those who had greater than 2000 birr income per month. Among 133 under-five children, never breast feeding children affected by diarrhea was 3.8%, ever breast feeding not currently affected by diarrhea was 10.5%, and still breast feeding children having diarrhea was 9.8%.

Additionally, the proportion of children who had diarrhea varied by the educational status of mothers. The highest proportion of children with diarrhea was observed for children whose mothers had no education (54.9%) with the prevalence of diarrhea were (9.80%) as opposed to the low prevalence of Diarrhea among under-five children, which was recorded for children whose mothers had secondary and higher educational level was (24%) with the prevalence of Diarrhea (6.8%). Similarly, Table 3.1 shows that, among 133 respondents, (71%) of them had not worked and the prevalence of diarrhea in under-five children whose mother had not wrought was (12%).

The proportion of under-five children suffering from diarrhea may also differs based on the source of water their household used. The highest prevalence of diarrhea was observed for the children whose sources of drinking water were unprotected/unimproved (15%). In addition Table 3.1 showed that the prevalence of under-five children with diarrhea varies by the number of children in the household. The highest percentage of under-five children suffering from diarrhea were observed in the household 4-6 children (10.5%).

The Bivariate association between diarrhea status of under-five children and predictors were shown in Table 1 indicating that diarrhea status was strongly associated with sex of the child, income of family per month, type of water source and availability of latrine were found to have a significant association with the two weeks prevalence of Diarrhea at the 5% significance level.

3.2 Results of Binary Logistic Regression Analysis

Results of analysis of the logistic regression model are displayed in Table 2. The results revealed that sex of the child, income of family per month, mothers educational level, type of water source, and availability of latrine were found to be significant, indicating strong effects on diarrhea of under five children.

Child sex has a significant association with the prevalence of diarrhea. The odds of prevalence of Diarrhea among under-five children for female were 75.2% (OR=0.248, 95% Confidence interval: (0.084-0.738)) times less likely having Diarrhea than male children.

The income of a family per month also showed a statistical significant association with the prevalence of diarrhea. The odds of the child having diarrhea who comes from a family having 1000-2000 income per month was 39.1% (OR=0.609) less likely than the child who comes from a family whose income per month is less than 1000 and the odds of the child having diarrhea who comes from the family had greater than 2000 income per month was 45.9% (OR=0.541) less likely than the child comes from a family whose income per month is less than 1000.

Table 1. Distribution of Demographic, Socio-economic, and environmental Factors on the prevalence of Diarrhea morbidity among under-five children in hibret kebele, south west Ethiopia, 2021

Variables	Categories	Had diarrhea			P-value
		No%	Yes%	Total	
Sex of child	Female	55(41.4%)	11(8.3%)	66(49.6%)	0.048*
	Male	46(34.6%)	21(15.8%)	67(50.4%)	
Current age of child in months	<6 months	14(10.5%)	4(3.0%)	18(13.5%)	0.951
	6-11 months	13(10.5%)	5(3.8%)	18(13.5%])	
	12-23 months	16(12.0%)	7(5.3%)	23(17.3%)	
	24-35 months	18(13.5%)	5(3.8%)	23(17.3%)	
	36-47 months	25(18.8%)	6[4.5%]	31(23.3%)	
	48-59 months	15(11.3%)	5(4.5%)	20(15.0%)	
Income of family per month	<1000	35(26.3%)	19(14.3%)	54(40.6%)	0.046*
	1000-2000	42(31.6%)	8(6.0%)	50(37.6%)	
	>2000	24(18.0%)	5(3.8%)	29(21.8%)	
Duration of breast feeding	Never breast feeding	14(10.5%)	5(3.8%)	19(14.3%)	0.559
	Ever breast feeding, not currently	55(41.4%)	14(10.5%)	69(51.9%)	
	Still breast feeding	32(24.1%)	13(9.8%)	45(33.8%)	
Mothers educational level	No education	60(45.1%)	13(9.8%)	73(54.9%)	0.122
	Primary	26(19.5%)	10(7.5%)	36(27.1%)	
	Secondary and above	15(11.3%)	9(6.8%)	24(18.0%)	
Mothers currently working	Not Working	55(41.4%)	16(12.0%)	71(53.4%)	0.660
	Working	46(34.6%)	16(12.0%)	62(46.6%)	
Number of living child	1-3	47(35.3%)	12(9.0%)	59(44.4%)	0.455
	4-6	32(24.1%)	14(10.5%)	46(34.6%)	
	6 and above	22(16.5%)	6(4.5%)	28(21.1%)	
Type of water source	Not improved	80(60.2%)	20(15.0%)	77(75.2%)	0.049*
	Improved	21(15.8%)	12(9.0%)	33(24.8%)	
Availability of latrine	No	50(37.6%)	9(6.8%)	59(44.4%)	0.034*
	Yes	51[38.3%)	23(17.3%)	74(55.6%)	

The odds of maternal education level have a significant association with diarrhea. The odds of under-five children developing diarrhea among mothers who completed primary educational level to have diarrhea was 73.6% (OR=0.264) times less likely than under-five children affected by diarrhea as compared with children whose mothers' had no education.. This means that a children whose families are not educated were mostly affected by diarrhea.

This study also revealed that the source of drinking water has a significant effect on diarrhea. The odds of children using a protected source of drinking water were 67.8% (OR=0.322) less likely than having diarrhea as compared with a child using an unprotected source of drinking water. The odds of under-five children whose family had no latrine were 18.8% (OR=3.188) times more likely to experience Diarrhea than who used latrines.

4. DISCUSSION

This study was intended to identify factors associated with the prevalence of diarrhea morbidity among under-five children. The finding of this study revealed that the two weeks' period prevalence of diarrhea among under-five years of age children was 24.1%; this was in line with the study conducted in Benna Tsemay District, South Omo Zone, Southern Ethiopia, 23.5% [17], in Eastern Ethiopia (22.5%) [4], SNNPR (25%) [18], Sheka Zone, Southwest Ethiopia (21.8%) [19], and which is relatively high when compared with 12% reported by Ethiopian Demographic and Health Survey in 2016 [8]. This change may be due to seasonal trends in diarrhea disease or differences in years and age of the study participants as well as differences in the study design and data collection.

Factors that were statistically significant predictors of childhood diarrhea were sex of the child, income of the family per month, maternal education level, type of water source, and availability of latrine were found to be significant.

This study revealed that the prevalence of diarrhea was higher in males than in females, which was consistent with the study from Woloyita Soddo [20], Northwest Ethiopia [10], and West Africa [21]. However, the study result was in contrast with the study from Tanzania [22] and Arbamich [23].

Table 2. Results of binary logistic regression analysis

Explanatory variables	Categories	Coefficient	S.E.	Wald	Df	P-value	Exp(B)	95% C.I (EXP(B))	
								Lower	Upper
Sex of child	Male	Ref.							
	Female	-1.394	0.555	6.313	1	0.012 *****	0.248	0.084	0.736
Current age of child in months	6 months	Ref.		1.745	5	0.883			
	6-11 months	-0.851	1.083	0.617	1	0.432	0.427	0.051	3.568
	12-23 months	-0.719	1.118	0.414	1	0.520	0.487	0.054	4.355
	24-35 months	-0.120	0.949	0.016	1	0.899	0.887	0.138	5.695
	36-47 months	-0.507	0.878	0.334	1	0.563	0.602	0.108	3.363
	48-59 months	-0.898	0.855	1.102	1	0.294	0.408	0.076	2.178
Income of family per month	<1000	Ref.		6.494	2	0.039			
	1000-2000	-0.495	0.715	4.374	1	0.036 *****	0.609	2.351	8.682
	>2000	-0.614	0.731	0.148	1	0.021*	0.541	1.025	2.134
Duration of breast feeding	Never breast feeding	Ref.		0.761	2	0.683			
	Ever breast feeding, not currently	-0.774	0.944	0.672	1	0.412	0.461	0.072	2.934
	Still breast Feeding	-0.489	0.742	0.433	1	0.510	0.614	0.143	2.627
Mothers educational level	No education(ref)			6.887	2	0.032 *****			
	Primary	-1.330	0.643	4.283	1	0.039 *****	0.264	0.075	0.932
	Secondary and above	0.151	0.725	0.044	1	0.835	1.163	0.281	4.821
Mothers currently working	Not Working	Ref.							
	Working	-0.235	0.505	0.216	1	0.642	0.791	0.294	2.128
Number of living child	1-3	Ref.		3.010	2	0.222			
	4-6	-0.158	0.739	0.046	1	0.831	0.854	0.201	3.633
	6 and above	0.820	0.746	1.209	1	0.271	2.271	0.526	9.798
Type of water source	Not improved	Ref.							
	Improved	-1.133	0.569	3.966	1	0.046*****	0.322	0.106	0.982
Availability of latrine	Yes	Ref.							
	No	1.159	0.549	4.462	1	0.035 *	3.188	1.087	9.348
Constant		.131	1.389	.009	1	.925	1.140		

**C.I: Confidence Interval: Standard Error; D.F: Degrees of Freedom*

The results of this study showed that children from households who use unimproved water sources had higher odds to suffer from diarrhea compared with children from households who use improved water sources, which is consistent with previous studies done in Jigjiga District, Somali Region, Eastern Ethiopia [24] and in Medebay Zana District, Northwest Tigray, Ethiopia, Bahir Dar Zuria District, and in Benna Tsemay District, South Omo Zone, Southern Ethiopia [25,9,17]. This is due to unimproved water sources are highly likely to be polluted and to predispose children to diarrhea.

The income of a family per month also showed a statistical significant association with the prevalence of diarrhea. The odds of the child having diarrhea who comes from household, their income per month is 1000-2000 was less likely than the child comes from their income is less than 1000, and the odds of the child having diarrhea who comes from their family income per month is greater than 2000 was less likely to experience diarrhea than the child comes from their income is less than1000 it is consistent with [26,27]. This may be due to families with high socioeconomic status, are supposed to drink more piped water, and use hygienic toilets. Additional, this finding revealed that children from households with higher socioeconomic status were more likely to be taken to a health facility or to be taken to a hospital than those of low socioeconomic status.

The results of this study revealed that the education status of mothers/caregivers had a significant contribution to preventing diarrheal morbidity. Children whose mothers had primary education were less likely to experience diarrhea compared to children whose mothers had formal education. Results from Ghana and Nigeria also showed that the prevalence of diarrhea varies according to education status. These studies reported that diarrhea was higher among children whose mothers have no formal education [28-30]. This is also similar to previous studies conducted in Jigjiga, Somalia region [24]; Hadaleala district, Afar region, northeast Ethiopia [31]; in rural areas of North Gondar Zone, Northwest Ethiopia [32]; and Sheko district, southwest Ethiopia [33], This could be due to the fact that education is likely to increase household health and sanitation practices. Education can enhance awareness about the transmission and prevention methods of diarrhea.

Children living in households without latrine facilities were 3.188 times more likely to develop diarrhea than children living in households with such facilities. This finding is consistent with a study conducted in Tanzania [34]. Different studies also reported that the absence of latrine facility was strongly associated with the occurrence of diarrheal disease [35,36].

5. CONCLUSIONS

The findings of this study showed that the prevalence of diarrhea was 24.1%. The occurrence of diarrhea was positively associated with sex of the child, income of the family per month, maternal education, type of water source, and availability of latrine. Therefore, the outcomes in this study have important policy implications for health intervention and support the view that investing in mothers' education may have substantial benefits for child health. At least primary education should be achieved to reduce childhood diarrhea. Therefore, advising the mother to return to the health facilities is very crucial for the control and prevention of the disease. The Kebele administration and partners' shall work towards strengthening environmental health packages for improving drinking water sources and sanitation to tackle childhood diarrhea. A child taking protected water, latrines and a child living with a family had high income highly appreciated for reducing the prevalence of diarrhea among the ages of under-five children.

ETHICAL CLEARANCE

The ethical clearance of the study was taken from Mizan Tepi University, Department of Statistics.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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