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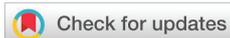***Corresponding author:** Tezera Abebe Gashaw, Department of Statistics, Wolkite University, Ethiopia, E-mail: tezera07@gmail.com

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Research Article

Prevalence and Determinate Factors of Diarrhea Morbidity among Under five Children in Shake Zone, Southwest Ethiopia, a Community Based Cross-Sectional Study

Abstract

Despite the global decline in the death rates of Under five children, the risk of a child dying before becoming 5 years of age remains highest in the African Region (90 per 1000 live births), which is approximately seven times higher than that in the European Region (12 per 1000 live births).The purpose of this study was to identify socio-economic, demographic, environmental and nutrition characteristics predictors affecting diarrheal Morbidity of under-five children in Sheka zone, South west Ethiopia. A Community-based cross-sectional study was conducted in Sheka zone, from September 1 – September 14, 2018. A Sample of 582 under-five children were selected randomly from Kebeles in the zone constituted the study population. Data were collected using structured and pre-tested questionnaire. Descriptive, Bivariate and multiple binary logistic regressions were employed for data analysis by using SPSS 20. The descriptive results showed that 21.8% of under-five children have experienced diarrhea in the two weeks prior to the time of survey. The remaining 78.2% of under-five children have no experienced diarrhea in the two weeks prior to the time of survey. In multiple logistic regression, the most important determinant factors associated with diarrhea morbidity were stunting, underweight, Child had fever, ever had Vaccination, Employment (working) status of mother, mother education level, source of water supply, and mother underweight. Therefore the Government local health organizations should provide health intervention programs and maternal health awareness (health education for mothers) to reduce under-five children diarrhea morbidity.

Introduction

Despite the global decline in the death rates of Under five children, the risk of a child dying before becoming 5 years of age remains highest in the WHO African Region (90 per 1000 live births), which is approximately seven times higher than that in the WHO European Region (12 per 1000 live births) [1].

Diarrheal disease is the most common cause of illness and the second leading cause of child death in the world. The disease accounts for 4.3% of the total global disease burden; the burden being greatest in the developing world including Ethiopia. In developing countries, a quarter of infant and childhood mortality is related to childhood disease, particularly to diarrhea. Diarrhea is 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 [2].

Globally, diarrhea is the third largest cause of morbidity and the sixth largest cause of mortality among population of all ages [3]. Two decades ago diarrhea was responsible for around 5 million deaths of children aged under-five each year. Recently, due to the joint effort of public health, it was reduced and account for less than 2 million child death a year [4]. Diarrhea is one of the leading causes of morbidity and mortality in developing countries, especially among under-five children [5].

More than four-fifths of all deaths among children younger than 5 years old in 2011 occurred in sub-Saharan Africa and South Asia. The problem in Ethiopia is even worse than elsewhere in the world, with an Ethiopian child being 30 times more likely to die by his/her fifth birthday than a child in Western Europe [1] .

According to the 2011 Ethiopian Demographic and Health

Survey [6], 13% of children in Ethiopia, both urban and rural, have experienced diarrhea in the two weeks preceding the survey. Similarly, 25.5% of children in southern Ethiopia experience diarrhea, from which 22.8% are rural and 2.7% are urban children. However, there is no study which documented the magnitude and factors associated with diarrheal disease in the study area.

In Ethiopia, morbidity reports and community-based studies have shown that diarrheal disease is a major public health problem that causes excess morbidity and mortality in children [7]. The diarrhea attributed mortality rate is about 10 per 1000 under-five populations [8]. Studies conducted in central rural Ethiopia revealed that diarrhea is one of the common causes of under-five mortality, accounting about 8.4 to 27% of all deaths [9].

Information on demographic characteristics and health indicator is crucial in planning and evaluation of health services. So, the purpose of this study is identifying the major risk factor of diarrhea morbidity and its prevalence in Sheka zone, South West Ethiopia. This again helps in preventing and treating the disease.

Those children, who have diarrhea during data collection, were given Oral Rehydration Salt (ORS) and severe cases were advised to consult the nearby health facility for better management by health worker (data collectors). Besides, it will help as an input for researchers for further study, analysis and developing appropriate intervention methods of the disease.

Material and Methods

Study area

Sheka is a Zone in Ethiopian, Southern Nations, Nationalities and Peoples Region (SNNPR), 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. The administrative center of Sheka is Masha. It is the western part of former Keficho Shekicho Zone. 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. The seven largest ethnic groups reported in this Zone were the Shakacho (32.41%), the Amhara (22.17%), the Kafficho (20.16%), the Oromo (7.39%), the Bench (5.23%), the Sheko (4.24%), and the Majang (1.73%); all other ethnic groups made up 6.67% of the population. Shakacho is spoken as a first language by 33.44%, 26.98% speak Amharic, 20.15% Kafa, 6.54% speak Oromiffa, 5.24% Bench, and 4.35% Sheko; the remaining 3.3% spoke all other primary languages reported. 39.93% were Protestants, 39.39% of the population said they practiced Ethiopian Orthodox Christianity, 15.09% were Muslim, and 3.51% practiced traditional beliefs.

Sheka zone has three Weredas (Anderacha, Masha and Yeki) and two city administrative centers (Masha and teppi) with a total population of about 250,971. According to zonal health department, total number of under-five children of Anderacha, Masha, Yeki, Masha town, and Tepi town was 4768, 6673, 21517, 1414 and 4805 respectively.

Study design

A community-based cross-sectional study was conducted in south west Ethiopia September 1-septamber 14, 2018 to assess magnitude and factors associated with diarrhea in under-five children. The source populations were all mothers/caretakers in the household, who has under-five children, who lived in the study area for at least six months prior to data collection. The Study population were include all children under the age of five years living in Sheka Zone south west Ethiopia. According to zonal health department population of Sheka Zone in 2017 is 250971 of which 39,177 are children under five years of age. The sample size is determined on the bases of national under five diarrhea prevalence (25.5%) [6]. It was calculated using formula for the minimum sample size needed for an interval estimate of a population proportion. Formula for sample size calculation.

$$n = \frac{Z^2_{\alpha/2}PQ}{d^2} * DEFF$$

Where, Z=95%confidence interval under normal curve (1.96), d= precision required (allowable error) (5%).

P=expected prevalence or proportion (25.5%) [6], DEFF= 1.8=The design effect (DEFF) is a "correction factor" to account for the heterogeneity between clusters with regard to the measured indicator [10]. n = sample size = 292 Total samples. Considering design effect of =292*1.85 = 540.2 and allowance for possible non-response rate of 10% makes the final sample size; 540.2+54.02= 594.22≈595.

The study was employ multi-stage sampling scheme using stratified, cluster and simple random sampling. After designing stratification as stratum one (urban) and stratum two (rural) then in stratum one we have three Weredas which can be classified as cluster and in strata two we have two city administrative center which can also classified as cluster. Five Kebeles from each rural Wereda and city administration are selected using simple random cluster sampling. The size of the sample in each stratum was determined by the number of sample size allocation to each stratum. In this study the sample is proportionally distributed to the selected Kebeles according to their population size.

Mothers/care- givers were interviewed in their homes using a structured questionnaire that had been pre-tested. If there is more than one child of under five years in the household, mothers were asked about the last child. Respondents were not including in the survey if there are not at home up to three times when the interviewers went to the house.

Data were collected using a structured questionnaire which was translated into Amharic by fluent speaker of both languages to ensure its validity and consistency, and again back translated to English. To assess the physical growth and nutritional status of the children, measurements of height and weight were taken. These measurements were taken during the home visit. Salter hanging spring scales with graduations of 100g and a capacity for 26 kg was utilized for measuring the

weight of the children with minimum clothing and no shoes to the nearest 0.1kg. Recumbent length measurement was take for children under two years of age while for children above two years stature was measure in a standing position in centimeters to the nearest of 0.1cm.

Dependent variable

The response variable of this study is status of children under- five ages having diarrhea in the two weeks prior to the survey. So, the response variable of the ith children Y_i is measured as a dichotomous variable with possible values.

$$Y_i = \begin{cases} 1 & i^{th}\ children\ had\ diarrhea \\ 0 & i^{th}\ children\ had\ no\ diarrhea \end{cases}$$

Explanatory variables/factors

Since the child morbidity status is expected to be affected by several factors, the predictor variables/factors that were analyzed in this study as possible determinants of child morbidity were grouped as socioeconomic, demographic, health and environmental related factors. Anthropometric indicators such as weight-for-height (wasting), height-for-age (stunting) and weight-for-age (underweight) are important in evaluating the health and nutrition status of children in low income countries where malnutrition is still a large public health problem. Height-for-age and weight-for-height Z-scores which give information about long and short term malnutrition status of child, and used as measure of health outcomes respectively. In this study, height and weight measurements of children, taking age into consideration, were converted into Z-scores based on the National Center for Health Statistics (NCHS) reference population recommended by the World Health Organization (WHO). Thus, those below -2 standard deviations of the NCHS median reference for height-for-age, weight-for-height, and weight-for-age are defined as stunted, wasted, and underweight respectively.

The study was approved by the Ethics Committee at Mizan –Tepi University. Mothers or caregivers of children were informed about the study and its objectives before enrollment. A written informed consent was obtained from the mother or caregiver. All collected records were kept confidential

Results and Discussions

Results of descriptive statistics

From a total of 595 questioners, 582 questioners were collected due non response and inappropriate answer. From table 1 Out of 582 sampled children, the two weeks prevalence of diarrhea among under-five children was about 127 (21.8%) were as 455(79.2) have no diarrhea in Sheka zone at the time of survey. The result of table 1 also reveals that 48.3% and 51.7% were females and males, respectively. The prevalence of diarrhea among females and males were 21.3% and 22.4%, respectively.

Table 1 also reveals that the association between the outcome variable and other predictor variables, which are done

Table 1: Demographic variables associated with diarrhea among children under five years of age in Sheka Zone (2018).

Variable	Categories	Diarrheal Morbidity		Total		Pearson Chi-Square		
		Yes (%)	No (%)	N	%	Value	Df	p-value
Child sex	Male	21.3	78.7	301	51.7	0.114	1	0.764
	Female	22.4	77.6	281	48.3			
Child age	0-5	0	100	3	0.005	9.214	4	0.056*
	6-11	20.3	79.3	74	12.71			
	12-23	30.8	69.2	130	22.33			
	24-35	21	79	181	31.27			
	36-59	17.5	82.5	194	33.33			
Birth order of a child	First birth	18.6	81.6	201	34.5	2.181	3	.536
	2-3	23.1	76.9	225	38.7			
	4-5	24.3	75.7	111	19.1			
	6+	24.4	75.6	45	7.7			
Maternal age	<25 years	25.5	74.5	98	16.8	3.16	2	0.26
	25-34 years	23.3	76.3	301	51.7			
	35+	17.5	82.5	181	31.1			
Number of family in the household	<3	19.1	80.9	309	53.1	2.873	1	0.09*
	>=3	24.9	75.1	273	46.9			

by cross tabulation of the dependent variable, had diarrhea to the other variables independently. Chi-square analysis is done for 23 variables and 20 of them are significant at 25% significant level (p<0.25) which is important for diarrhea morbidity.

Table 2 also showed that, among 582 respondents, 11.5% of children were partially vaccinated and the prevalence of diarrhea in under-five children who partially vaccinated was 37.7%. The percentage of mothers who deliver at home and health sector was 33% and 67% respectively. Similarly The prevalence of diarrhea morbidity under five children who had fever were the largest (44%) than children who had no fever(16.1%).

Under-five children whose mothers were underweight have the largest proportion of diarrhea (41.2%) than children whose mothers were normal. The nutritional status of under-five children was determined by using anthropometric measurements such as underweight and stunting. The result indicates, 30.2% of under-five children were stunted, and 37.3% under-five children were underweight. The prevalence of diarrhea in under-five children with chronic malnutrition (stunting), and underweight (have low weight-for-age) were 31.2%, and 33.6% respectively.

Among 582 respondents, 87.6% were Wash their hands usually before eating and feeding their Child, the remaining 12.4 % were Wash their hands sometimes Before eating and feeding your child. Under-five children whose mothers were Wash their hands usually Before eating and feeding their child had the prevalence of diarrhea (20.2%) and the prevalence of diarrhea Under-five children whose mothers were Wash their hands Sometimes Before eating and feeding their child was 33.3%. Among 582 respondents(Mothers) , 50.2% were wash their hands only by water, 48.2% were wash their hands

water with soap, the prevalence of diarrhea morbidity among children were 28.1% and 15.1% respectively.

Table 3 showed that, Among 582 respondents, 64.9% consumed water from unprotected source, and the remaining 35.1% used protected sources of water supply. Under-five children whose mothers used unprotected source of water had the prevalence of diarrhea (25.9%) and Under-five children whose mothers used protected source of water (14.2%). Similarly the coverage of toilet facilities among mothers having Under-five children during the time of survey was 90.4%. The remaining 9.6% of mothers had no private or shared toilet facility, and had higher prevalence of diarrhea (32.1%) compared to mothers with toilet facility (20.7%).About 76.3% of under-five children whose mothers were resided in rural area and had higher prevalence of diarrhea (24.3%) as compared to under-five children whose mother lived in urban

area 23.7% having the prevalence of diarrhea (13.8%). The prevalence of diarrhea Under-five children whose mothers delivered at home was 28.1% were as mothers delivered at health sector was 18.7%.With regard to Had fever in the last two weeks, among 582 children, 80.1% had no fever were as 19.9% had fever in last two weeks at the time of survey.

Result displayed in table 4 also showed that, among 582 respondents, 20.8% of them had work and the prevalence of diarrhea in under-five children whose mothers had work were 35.5%. Table 5 also reveals that diarrhea morbidity varies by their educational status of women: 69.7% of under-five children were from uneducated mothers with 15.7% prevalence of diarrhea, 25.4% of under-five children were from mothers with primary education and had 16.5% diarrhea cases, and the remaining 4.9% were from mothers with secondary and higher education and had 12.2% diarrhea case.

Table 2: Health and Nutrition Related variables associated with diarrhea among children under five years of age in Sheka Zone (2018).

Variable	Categories(levels)	Diarrheal Morbidity		Total		Pearson Chi-Square		
		Yes (%)	No (%)	N	%	Value	Df	p-value
Child feed	Low(<6 times	10.4	89.6	154	26.5	16.419	2	0.001*
	Medium(7-9times)	26.4	73.6	371	63.7			
	High(10-12times)	22.8	77.2	57	9.8			
Had vaccination	Partially	37.3	63.4	67	11.5	10.65	1	0.001*
	Yes fully	19.8	80.2	515	88.5			
Had fever	No	16.1	83.9	466	80.1	44.94	1	0.000*
	Yes	44.8	55.2	116	19.9			
Stunting	No	17.7	82.3	406	69.8	13.14	1	0.00*
	Yes	31.2	68.8	176	30.2			
Underweight	No	14.8	85.2	365	62.7	28.334	1	0.00*
	Yes	33.6	64.4	217	37.3			
Duration of breast feeding	Never breast feeding	58.3	41.7	12	2.1	17.499	2	0.00*
	Ever breast feeding, not currently	25	75	344	59.1			
	Still breast feeding	15	85	226	38.8			
Wash your hands after going to toilet	Some times	34.7	65.3	101	17.4	11.796	1	0.001*
	Usually	19.1	80.9	481	82.6			
Wash your hands Before eating and feeding your child	Some times	33.3	66.7	72	12.4	6.383	1	0.012*
	Usually	20.2	79.8	510	87.6			
How do you wash your hands	Water only	28.1	71.9	292	50.2	13.465	1	0.00*
	Water with soap	15.5	84.5	290	49.8			
Mother under weight	No	20	80	531	91.2	12.275	1	0.00*
	Yes	41.2	58.8	51	8.8			

Table 3: Environmental and Related variables associated with diarrhea among children under five years of age in Sheka Zone (2018).

Variable	Categories	Diarrheal Morbidity		Total		Pearson Chi-Square		
		Yes (%)	No (%)	N	%	Value	Df	p-value
Source of water supply	Protected	14.2	85.8	204	35.1	10.65	1	0.01*
	unprotected	25.9	74.1	378	64.9			
Toilet facility	No	32.1	67.9	56	9.6	3.689	1	0.049*
	Yes	20.7	79.3	526	90.4			
Place of residence	Rural	24.3	75.6	444	76.3	6.866	1	0.009*
	Urban	13.8	86.2	138	23.7			
Place of delivery	Home	28.1	71.9	192	33.0	6.67	1	0.01*
	Health sector	18.7	81.3	390	67.0			

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Table 4: Socio-economic and Related variables associated with diarrhea among children under five years of age in Sheka Zone (2018).

Variable	Categories	Diarrheal Morbidity		Total		Pearson Chi-Square		
		Yes (%)	No (%)	N	%	Value	Df	p-value
Religion of a woman	Orthodox	23.6	76.4	191	32.8	6.852	2	0.033*
	Muslim	33.3	66.4	331	56.9			
	Protestant	18.7	83.3	60	10.3			
Women's Education level	None	35.3	64.7	218	37.5	37.48	2	0.00*
	Primary	13.2	86.8	302	51.9			
	Secondary and higher	21.8	782	62	10.7			
Respondents work Status	Not working	18.2	81.8	461	79.2	1.846	1	0.000*
	Working	35.5	64.5	121	20.8			
exposure to any media	No	31.4	68.6	140	24.1	9.974	1	0.002*
	Yes	18.8	81.2	442	75.9			

*Significant at 5%

Table 5: Maximum Likelihood Estimates for multiple binary logistic regression of predicting diarrhea morbidity among under- five children. (<59months age).

Covariate	Categories	B	S.E.	Wald	Df	P-value.	OR	95% C.I.for OR	
								Lower	Upper
Stunting	No	-.821	.257	10.237	1	0.001**	.440	.266	.728
	Yes(ref.)								
Underweight	Yes	1.143	.249	21.112	1	0.000**	3.136	1.926	5.107
	No(ref.)								
Child feeding status(daily)				8.452	2	.015*			
	Low(0-6times)	-.843	.564	2.235	1	.135	.430	.142	1.300
	Medium(7-9times)	.275	.425	.420	1	.517	1.317	.573	3.026
	High(9-12times)(ref.)								
Had fever	No	-1.227	.270	20.573	1	.000**	.293	.173	.498
	Yes(ref.)								
Ever had vaccination	Yes-partially	.723	.359	4.067	1	.044*	2.061	1.021	4.162
	Yes-fully(ref.)								
employment status of mother	Not working	-.793	.276	8.290	1	.004*	.452	.264	.776
	Working(ref.)								
Mother education level				31.725	2	.000**			
	No education	1.359	.448	9.212	1	.002*	3.893	1.618	9.365
	Primary education	-.108	.448	.058	1	.809	.898	.373	2.159
	Secondaryand above(ref.)								
Source of water supply	Protected	-1.105	.296	13.908	1	.000**	.331	.185	.592
	Unprotected(ref.)								
Motherunder weight	No	-1.751	.387	20.456	1	.000**	.174	.081	.371
	Yes(ref.)								
	Distance to health	-.171	.088	3.769	1	.052	.843	.709	1.002
	Constant	1.829	.756	5.851	1	.016	6.225		

**Significant at1%,
*Significant at 5%

Discussions of Results

This study revealed that the two weeks prevalence of diarrhea among under-five children was about 21.8% in Sheka zone consistent with recent with the findings in Eastern Ethiopia (22.5%), [11]. SNNPR (25%) [12], Mecha district, West Gojjam (18%) as well as reported in [13], report (18%).

Although the significance disappeared in the multiple logistic regression analysis, breastfeeding status, place of delivery, place of residence, washing before going to after going to toilet, washing hand before and after eating food, birth order, toilet facility number of family in the household, religion, maternal age, birth order, the number of under-five children in a household, and sex of child and toilet facility were significantly associated with the occurrence of diarrhea in the bivariate analysis. This might be due to methodological differences, study area and time gap between the current and earlier surveys. But further studies are required to confirm these findings.

This study found that prevalence of diarrhea was significantly associated with nutritional status of under-five children. The prevalence of diarrhea was higher in underweight under-five children. Under-five children who were underweight (have low weight-for age) were 3.136 (OR: 3.136, 95% CI for OR (1.926, 5.107) more likely to experience diarrhea than children who were not underweighted. This study is consistent with a study in Ghana which showed that diarrhea was significantly higher for those children who were underweight. Under-five children who were not stunting (chronic malnutrition) were 56% (0.44-1, OR: 0.44, 95% CI for OR (0.266, 0.728)) less likely to experience diarrhea than children who were stunted. This finding is supported by a study done in Zimbabwe and Bangladesh that showed severely stunted children were more likely to had diarrhea than children of normal height and which had not severe malnutrition [14,15]. Under-five children whose mothers were not underweight were 82.6 % (0.174-1, OR: 0.174, 95% CI for OR (0.084, 0.371)) less likely to experience diarrhea than children who were underweight.

Under-five Children whose mothers had not work were 54.8 %(0.452-1 OR: 0.452, 95% CI for OR (0.264, 0.776)) less likely to experience diarrhea than under-five children whose mothers had work. These findings contradict those found in Egypt where diarrhea was significantly higher among children having mothers with lower education or not working. This might have mothers working status affect length of breastfeeding. Under-five Children who were not fever in the last two week during the time of survey were 70.7 % (0.293-1, OR: 0.293, 95% CI for OR (0.173, 0.498)) less likely to experience diarrhea than children who were fever in the last two week during the time of survey. The study revealed that Children who were partially vaccinated were 2.061(OR: 2.061, 95% CI for OR (1.021, 4.162)) more likely to experience diarrhea than children who were fully vaccinated.

Under-five children whose mother education level were no education were 3.893((OR: 3.893, 95% CI for OR (1.618, 9.365, P-value: 0.002)) more likely experience diarrhea than children whose mothers education level were secondary and above. This study is in line with a study done in India showed that maternal education had a significant negative association with the two-week risk of diarrhea, that is, infants from illiterate mothers were at higher odds of experiencing diarrhea compared to infants from literate mothers and a study in Ethiopia Mecha district using multivariate logistic regression model found that low educated mothers' children had more than five times higher odds of having diarrhea than those children having higher educated mothers by [16].

On the other hand under five children who use protected water were 66.9 %(0.331-1, OR: 0.331, 95% CI for OR (0.185, 0.592, P-value: 0.000)) less likely to experience diarrhea than children who use protected water this study is in line with a study done in Gondar, Northwest Ethiopia, by [17], revealed that the use of unprotected water sources was significantly associated with diarrheal morbidity. Also a study done in Kefa-Sheka Zone, Southwest Ethiopia, showed that children coming from households that obtain water from protected sources

were less likely to have diarrhea as compared to those who get their water supply from unprotected sources.

Conclusions and Recommendations

Conclusions

The descriptive results showed that 21.8% of under-five children have experienced diarrhea in the two weeks prior to the time of survey. In multiple binary logistic regression, the most important determinant factors associated with prevalence diarrhea morbidity were stunting, underweight, Child had fever, Ever had Vaccination, Employment (working) status of mother, mother education level, source of water supply, and mother underweight.

➢ Under-five children who were not stunting (chronic malnutrition) were 56% (0.44-1, OR: 0.44, 95% CI for OR (0.266, 0.728)) less likely to experience diarrhea than children who were stunted.

➢ The study revealed that Children who were partially vaccinated were 2.061more likely to experience diarrhea than children who were fully vaccinated.

➢ Under-five children whose mother education level was no education were 3.893 more likely experience diarrheas than children whose mothers' education level were secondary and above.

➢ Under-five children whose mothers were not underweight were 82.6% less likely to experience diarrhea than children who were underweight.

➢ Under-five children whose mother education level were no education were 3.893 ((OR: 3.893, 95% CI for OR (1.618, 9.365, P-value: 0.002)) more likely experience diarrhea than children whose mothers education level were secondary and above

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Recommendations

Based on the findings of this study we forward the following recommendations:

➢ Government local health organizations should provide health intervention programs, and maternal health awareness (health education for mothers), in order to reduce the diarrhea morbidity such as use of safe water sources and good food and promoting hand washing with soap before eating or preparing food.

➢ The occurrence of diarrhea was positively associated with mother education level, therefore, the findings in this study have important policy implications for health intervention and support the view that investing in

girls' education may have substantial benefits for child health

➢ Improve maternal nutrition is crucial for improving children's health to protect children against diarrhea.

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