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Prevalence of Diarrhoea and Associated Factors among Under-Five Children in Jigjiga District, Somali Region, Eastern Ethiopia

Abdiwahab Hashi[1*], Abera Kumie[2], Janvier Gasana[3]

[1]Ethiopian Institute of Water Resources, Addis Ababa University, Addis Ababa, Ethiopia
[2]School of Public Health, Addis Ababa University, Addis Ababa, Ethiopia
[3]Florida International University Stempel College of Public Health & Social Work, Miami, FL, USA
Email: *abdiwahab_2@yahoo.com, aberakumie2@yahoo.com, Janvier.Gasana@gmail.com

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Abstract

Background: Diarrheal disease is a major cause of morbidity and mortality among children in many developing countries, including Ethiopia and is a leading cause of morbidity in Pastoralist Ethiopian-Somali region. Diarrheal disease is not purely medical, but huge part of this should be traced back to the social, economic, environmental and behavioural aspects of the family. Determining these interactions is relevant to prevent and control diarrhoea. **Objective:** The objective of this study was to measure the prevalence of diarrhoea and describe associated factors relating to diarrheal disease among under-five children in Jigjiga district. **Methods:** A cross-sectional study was conducted in Jigjiga district from June 12 to 26 in 2014 using a structured and pre-tested questionnaire. A total of 1807 primary care takers were interviewed. Proportionate to size allocation was done and simple random selection was used to select sample units. Diarrheal morbidity occurred in the under-five children in the past 14 days were registered to determine prevalence. Data were entered using Epi Info version 3.5.3 and analysed in SPSS version 20. Odds ratio with 95% CI in a multivariate logistic regression was employed to control confounding factors. **Results:** The findings of this study showed that the overall two-week period prevalence of diarrhoea in under-five children was 27.3%: 95% CI (26.9%, 27.4%). Education of the primary caretaker, occupation of the father, birth order of the child, maternal diarrhoea, and hand washing during critical times, water source, type of water storage container, latrine availability, frequency of household solid waste water disposal, availability of liquid waste water drainage system and the type of the kitchen floor material showed as independent predictors of under-five child hood diarrhoea. **Conclusion:** This study revealed that diarrhoea morbidity was relatively high among children under-five years of age residing in Somali region. Efforts to reduce

childhood diarrhoea should focus mainly on water, sanitation and hygiene interventions including health education.

Keywords

Prevalence, Diarrhoea, Under-Five Children, Associated Factors, Eastern, Ethiopia

1. Introduction

Diarrhoea kills 2195 children every day—more than AIDS, malaria, and measles combined [1]. Of 7.6 million deaths in children younger than 5 years in 2010, 64% (4.879 million) were attributable to infectious causes. Diarrhoea diseases contributed to 9.9% (0.751 million) of all death. Between 2000 and 2010, the global burden of deaths in children younger than five years decreased by 2 million, of which pneumonia, measles, and diarrhoea contributed the most to the overall reduction (0.451 million, 0.363 million, and 0.359 million respectively) [1].

In Ethiopia, morbidity reports and community-based studies indicate that diarrheal diseases are a major public health problem that causes excess morbidity and mortality among children [2] [3]. Surveys conducted among under-five children in Ethiopia revealed five diarrheal episodes per child per year [2] [3] [4]. Published studies conducted between 1994 and 2000 in Ethiopia on the prevalence of under-five diarrhoea showed the variability of the diseases across the country, 11.4% to 37% [4].

Recently, high prevalence of diarrheal diseases is documented in the Eastern Ethiopia [5] and in Somali region, it is reported that diarrhoea is the first leading cause of morbidity and mortality [6].

Diarrhoea can be described as the passing of loose or liquid stools. It is generally defined as three or more loose or watery stools within a 24-hour period [7] [8] [9], or a decrease in the consistency of the stool from that which is normal for the patient [10]. In developing countries, diarrhoea is most often a symptom of gastrointestinal infection caused by bacteria, viruses or parasites. Commonly, these pathogens are transmitted via the fecal-oral route, where the pathogens are excreted from the intestinal tract of a person or animal carrying the illness and are ingested by another [10].

Diarrheal disease is not purely medical, but huge part of this should be traced back to the social, economic, environmental and behavioral aspects of the family. In Ethiopia, studies conducted in other regions documented many factors associated with under-five diarrheal disease. Socioeconomic factors such as overcrowding and low maternal education, poor sanitation, contaminated water, failure to continue breast feeding until one year of age, using infant bottles which are difficult to clean, storing food at room temperature, failure to wash hands, failure to dispose of feces hygienically and inadequate food hygiene were associated with a high incidence of diarrheal diseases [5] [11]-[20].

Despite the report of the Ethiopian-Somali Regional Health Bureau about childhood

diseases which documented diarrhoea as the first leading cause of morbidity and mortality in the region [21], studies from this largely pastoralist region with low socioeconomic development compared to other regions in Ethiopia are generally rare.

This study is aimed to assess the magnitude of diarrheal diseases and describe associated factors which are not to our knowledge yet studied except the EDHS survey of 2011 [22]. The results of this study will contribute to the child health care planning and hopefully will improve child survival in Somali region.

2. Methods

This study was conducted in Jigjiga district of Ethiopian-Somali Regional State (ESRS) in the Eastern Ethiopia in June 2014. The ESRS is one of the nine regional states that constitute the Federal Democratic Republic of Ethiopia. Jigjiga district is one of the 68 districts of the region, part of Fafan zone, with a total population of 277,560 according to 2007 census conducted by the Central Statics Agency of Ethiopia [23].

A community based cross-sectional study design with quantitative method was used. The sample size was calculated using single proportion formula, $n = z_{\alpha/2}(p(1-p)/d^2$ where z value is 2.76: p is the prevalence of diarrhoea in Somali region among under five children that was assumed to be 19.5% [22] and d is the margin of error 3%. By considering the design effect of the sampling technique of 2% and 10% non-response rate, the final sample size was approximately 1807 primary care takers and index under-five children living in the study area. This sample size was adequate for a multivariable regression analysis.

A two staged stratified multistage sampling technique was used to select the study units (households). There are 4 urban and 30 rural Kebele in the district. Among this, 2 urban Kebele and 10 rural Kebele were randomly selected. The number of under-five children in each Kebele was proportionally allocated according to under-five children population size (**Figure 1**). Simple random sampling method was used to select the eligible household in each selected Kebele from the sampling frame for the actual data collection. Ten data collectors who were preparatory students were involved in the data collection process. Three-day training was given to the data collectors prior to the start of the data collection process.

The outcome variable of the study was the occurrence of diarrhoea in the preceding 2 weeks period prior to data collection. In this study demographic and socioeconomic variables (sex, age, religion, monthly income, occupation, educational status, marital status etc), child variables (age of the child, birth order, breast feeding, maternal diarrhoea, etc) and environmental variables (water source, solid waste disposal, liquid waste water drainage system, availability of latrine, floor material of the kitchen, etc) were included. The data was entered and cleaned in Epi info version 3.5.3 and analyzed using SPSS for windows version 20. To describe the study population in relation to relevant variables frequency distribution, percentages, and summary statistics were used. Odds ratio with 95% CI was computed to assess the presence and degree of association between dependent and independent variables. Multivariable logistic regression analysis

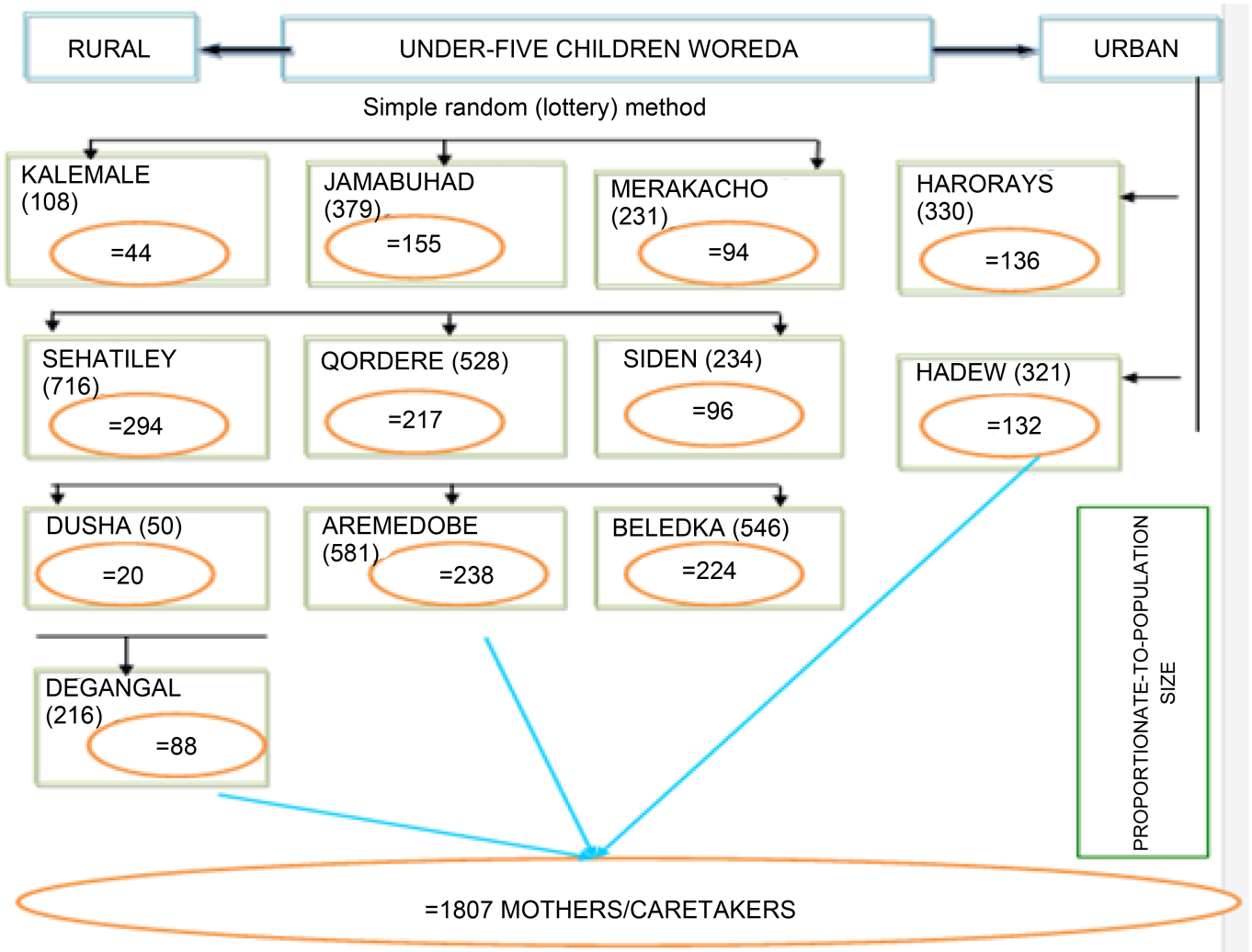

Figure 1. Sampling technique of the study.

was performed to assess the relative effect of the explanatory factors on the outcome factor. Only variables reached a p-value less than 0.05 in the univariate analysis were kept in the subsequent analyses. Variance inflation factor was done to assess multi co-linearity of variables.

Ethical clearance was obtained from the ethical clearance committee of Jigjiga University. Consent of the respondent formal letter of permission was obtained from administrative bodies of the zone to the district and then from the respective Kebele. Finally, before the interview, the respondents were asked for their verbal consent in view of respecting their rights to be involved in this study.

3. Results

3.1. Magnitude of Diarrhoea

A total of 1807 households were interviewed yielding a response rate of 100%. Out of these, 493 children had diarrhea two weeks before the interview. The overall two-week

prevalence of diarrhoea in under-fives was 27.3%: 95% CI (26.9%, 27.4%) (Figure 2).

3.2. Determinants of Childhood Diarrhoea

In this study all most all of the respondents were real mothers (94.5%), the mean age of the respondents was 29.1 (SD = 7.13) years. Majority of the primary caretakers (44.3%) were in the age group of 25 - 34 years old, married (79.2%), and housewife by occupation (80.5%). Only 15.8% of the mothers had formal education. Educational level of the primary caretaker showed significant association with childhood diarrhoea (see Table 1). The distribution of prevalence of diarrhoea by socio-demographic characteristics is shown in Table 1.

Age, birth order, breastfeeding history, sex of the child, birth place, maternal diarrhoea, measles vaccination, maternal diarrhoea and hand washing at critical times were included in the child factors. According to the finding of this study the mean age of the children was 16.8 months. Majority of the children included in this study (56.2%) were in the age group 12 - 59 months and males 55.3% and in the second birth order (36.6%). All most all of the children (84.4%) were not exclusively breastfed in the first 6 months of their life. With regards to hand washing during critical times, more than half (57.1%) of the primary caretakers don't wash their hands.

Birth order of the child, maternal diarrhoea and hand washing during critical times were significantly associated with childhood diarrhoea (see Table 4). The distribution of prevalence of diarrhoea by child related factors is shown in Table 2.

Nearly half of the respondents drink water from unprotected source 777 (43%). Majority of the households don't have latrine 1110 (61.5%).

Majority of the households 1151 (63.7%) collect and store water by using locally available Jericans. Nearly half of the households 869 (48.1%) don't have any drainage system of domestic liquid waste water. The distribution of prevalence of diarrhoea by environmental factors is shown in Table 3.

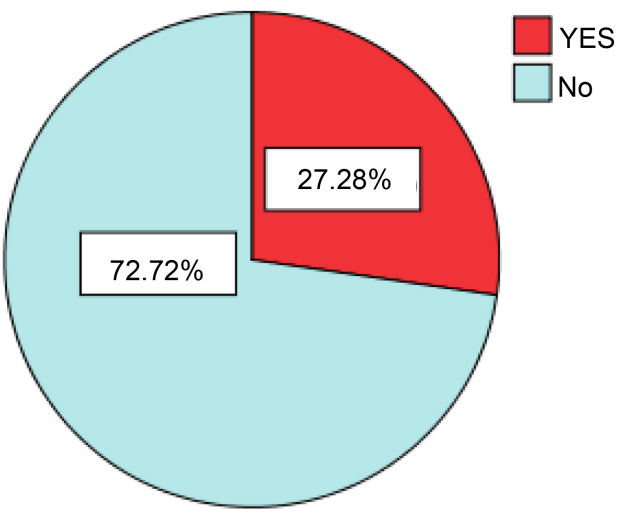

Figure 2. Magnitude of under-five diarrhoea in Jigjiga district.

Table 1. Relationship between socio-demographic factors and diarrheal disease, Jigjiga district, June 2014.

Characteristics	Diarrhoea (N = 1807)		Crude OR (95 CI)
	Yes	No	
Age of the primary caretaker			
14 - 24	100	295	1.0
24 - 34	222	578	0.88 (0.67, 1.16)
>34	170	440	0.87 (0.66, 1.17)
Marital status of the primary caretaker			
Married	414	1015	1.0
Divorced	51	234	1.87 (1.35, 2.58)*
Widowed	27	64	0.96 (0.61, 1.53)
Educational level of the primary caretaker (N = 1226)			
Formal education	187	446	1.0
Read and write	108	205	0.79 (0.59, 1.06)
Read only	11	100	3.81 (1.99, 7.27)*
No formal education	30	139	1.94 (1.26, 2.98)*
Occupation of the primary caretaker (N = 1787)			
Housewife	385	1054	1.0
Government employee	63	218	1.26 (0.93, 1.71)
Private gainful work	17	23	0.47 (0.25, 0.90)*
Livestock and farm related	25	3	0.04 (0.13, 0.14)*
Educational level of the father			
Formal education	59	226	1.0
Read and write	40	105	0.68 (0.43, 1.09)
Read only	16	71	1.07 (0.58, 1.96)
Neither	376	912	0.63 (0.46, 0.86)
Occupation of the father (N = 1263)			
Government employee	136	479	1.0
Merchant	89	159	0.51 (0.37, 0.70)*
Farmer	45	102	0.64 (0.43, 0.95)*
Livestock	72	181	0.71 (0.51, 0.99)*
Radio ownership			
Own radio	274	902	1.0
Do not own radio	214	408	0.57 (0.46, 0.71)*

*$p < 0.05$.

3.3. Multivariable Logistic Regression

In this study, education of the primary caretaker [AOR: 3.02, 95% CI: (1.56, 5.83)],

Table 2. Relationship between under-five child related factors and diarrheal disease, Jigjiga district, June 2014.

Characteristics (n = 1807)	Diarrhoea		Crude OR (95 C.I)
	Yes	No	
Age of the child			
<6 months	99	331	1.46 (1.12, 1.89)*
6 - 11 months	85	276	1.41 (1.07, 1.87)*
12 - 59 months	309	707	1.0
Gender of the child			
Male	291	707	1.0
Female	201	607	1.24 (1.01, 1.53)*
Birth order of the child			
First	63	217	1.0
Second	185	473	0.74 (0.53, 1.03)
Third	51	224	1.27 (0.84, 1.92)
Fourth and above	189	396	0.61 (0.43, 0.84)*
Maternal diarrhoea			
Yes	42	27	1.0
No	451	1287	4.44 (2.70, 7.28)*
Child breastfeeding			
Yes	101	181	1.0
No	391	1133	1.62 (1.23, 2.12)*
Measles vaccination			
Yes	315	869	1.0
No	178	445	0.91 (0.73, 1.12)
Hand washing by the primary caretakers during critical times			
Yes	292	483	1.0
No	201	831	2.49 (2.02, 3.08)*

*$p < 0.05$.

occupation of the father[AOR: 0.44, 95% CI: (0.23, 0.84)], Birth order [AOR: 2.22, 95% CI: (1.22, 3.97)], maternal diarrhoea [AOR: 2.79, 95% CI: (1.27, 6.15)], and hand washing during critical times [AOR: 2.59, 95% CI: (1.86, 3.60)], drinking water source [AOR: 1.60, 95% CI: (1.14, 2.24)], type of water collection and storage container [AOR: 15.7, 95% CI: (3.02, 82.5)], latrine availability [AOR: 4.16, 95% CI: (2.94, 5.89)], frequency of household solid waste disposal [AOR: 3.00, 95% CI: (1.88, 4.79)], availability of liquid waste water disposal drainage system [AOR: 2.03, 95% CI: (1.35, 3.05)], and the type of the kitchen floor material [AOR: 5.13, 95% CI: (2.08, 12.6)] showed as independent predictors of under-five child hood diarrhoea. Summary of the multivariable logistic regression analysis is shown in Table 4.

Table 3. Relationship between environmental conditions related factors and diarrheal disease, Jigjiga district, June 2014.

Characteristics (n = 1807)	Diarrhoea		Crude OR 95.0% C.I.
	Yes	No	
Water source			
Protected source	300	730	1.0
Unprotected source	193	584	1.24 (1.01, 1.54)*
Type of water collection and storage container			
Jeri can	316	835	1.0
Plastic container	61	216	1.34 (0.98, 1.83)*
Iron container	4	38	3.59 (1.27, 10.1)*
Pot	107	200	0.71 (0.54, 0.92)*
Latrine availability			
Yes	311	385	1.0
No	181	929	4.15 (3.33, 5.16)*
Frequency of household solid waste disposal			
Once a week	388	851	1.0
Twice a week	66	349	2.41 (1.80, 3.22)*
Three times a week	35	71	0.92 (0.61, 1.41)
Availability of drainage system of domestic liquid waste water			
Yes/present	275	638	1.0
No/absent	216	653	1.30 (1.06, 1.61)*
Fuel used in cooking the food			
Cooking by charcoal	443	1115	1.0
Cooking by wood	49	198	1.60 (1.15, 2.24)*
Type of floor material of the living room			
Mud	358	762	0.78 (0.58, 1.06)
Wood	58	350	2.23 (1.52, 3.28)*
Cement	74	200	1.0
Type of floor material of the kitchen			
Mud	244	444	0.81 (0.57, 1.16)
Earth ground	166	699	1.87 (1.3, 2.7)*
Wood	23	47	0.85 (0.47, 1.54)
Cement	54	121	1.0
Number of sleeping rooms/traditional homes			
1 room/household	55	134	1.0
More than 2 rooms/household	438	1179	1.10 (0.79, 1.54)

*$p < 0.05$.

Table 4. Multivariable logistic regression analysis of the relative effect of socioeconomic, child and environmental factors on the prevalence of childhood diarrhoea, Jigjiga district, June 2014.

Risk factors	Model I AOR 95 C.I	Model II AOR 95 C.I	Final model AOR 95 C.I
Marital status of the primary caretaker			
Married	1.0		1.0
Divorced	1.19 (0.73, 1.95)		1.06 (0.59, 1.91)
Widowed	2.19 (0.69, 6.95)		3.81 (1.04, 13.8)*
Education of the primary caretaker (n = 1226)			
Formal education	1.0		1.0
Read and write	1.40 (0.98, 2.00)		1.36 (0.81, 2.28)
Read only	8.48 (4.08, 17.6)*		5.90 (2.52, 13.8)*
No formal education	3.60 (2.08, 6.30)*		3.02 (1.56, 5.83)*
Occupation of the father (N = 1263)			
Government employee	1.0		1.0
Merchant	0.47 (0.32, 0.68)*		0.26 (0.14, 0.47)*
Farmer	0.47 (0.28, 0.80)*		0.17 (0.83, 0.38)*
Livestock	0.50 (0.32, 0.79)*		0.44 (0.23, 0.84)*
Radio ownership			
Own radio	1.0		1.0
Do not own radio	0.45 (0.32, 0.63)*		0.81 (0.52, 1.27)
Age of the child			
<6 months	1.0		1.0
6 - 11 months	1.67 (1.15, 2.42)*		1.36 (0.89, 2.08)
12 - 59 months	1.21 (0.83, 1.77)		0.77 (0.50, 1.19)
Gender of the child			
Male		1.0	1.0
Female		1.11 (0.80, 1.52)	1.25 (0.85, 1.84)
Birth order of the child			
First		1.0	1.0
Second		1.15 (0.73, 1.82)	1.30 (0.78, 2.15)
Third		1.45 (0.81, 2.62)	1.82 (0.87, 3.79)
Fourth and above		1.15 (0.73, 1.84)	2.20 (1.22, 3.97)*
Maternal diarrhoea			
Yes		1.0	1.0
No		2.94 (1.49, 5.81)*	2.79 (1.27, 6.15)*
Child breastfeeding			
Yes		1.0	1.0

Continued

No	0.78 (0.51, 1.18)	0.72 (0.44, 1.21)
Hand washing by the primary caretakers during critical times		
Yes	1	1.0
No	2.46 (1.84, 3.31)*	2.59 (1.86, 3.60)*
Water source		
Protected source		1.0
Unprotected Source		1.60 (1.14, 2.24)
Type of water collection and storage container		
Jeri can		1.0
Plastic container		1.13 (0.70, 1.81)
Iron container		15.7 (3.02, 82.5)*
Pot		0.83 (0.52, 1.33)
Latrine availability		
Yes		1.0
No		4.16 (2.94, 5.89)*
Frequency of household waste water disposal		
Once a week		1.0
Twice a week		3.0 (1.88, 4.79)*
Three times a week		0.77 (0.37, 1.59)
Availability of drainage system of domestic		
Yes/present		1.0
No/absent		2.03 (1.35, 3.05)*
Type of floor material of the living room		
Mud		2.22 (1.38, 3.56)*
Wood		1.11 (0.51, 2.39)
Cement		1.0
Type of floor material of the kitchen		
Mud		5.13 (2.08, 12.6)*
Earth ground		8.89 (3.73, 21.2)*
Wood		9.99 (2.79, 35.7)*
Cement		1.0

*$p < 0.05$.

4. Discussion

The overall two-week prevalence of diarrhoea in this study was 27.3% 95% CI (26.9, 27.4) which is higher than the prevalence of diarrhoea in Somali region observed in 2011 Ethiopian Demographic and Health Survey (19.5%) [22].

This high prevalence of diarrhoea is also higher compared to other studies done in other different parts of Ethiopia: 22.5% in neighboring Eastern area [5], 18% in West Gojam [18], 15% in North Gondar zone [24], and other studies conducted in Ethiopia [14] [25] [26]. The reason of this high occurrence of diarrhoea may be the pastoralist way of living in Somali region and the low socio-economic development compared to other regions and indicates the need for more attention in reducing child morbidity and mortality in the region.

The study found that the odds of diarrheal diseases of children whom mothers can't read and write were higher than children whose mothers has some level of education. This is similar with other studies [12] [27] [28]. Mothers' level of education may help to access health care information and may have an awareness of diarrhoea prevention and control. Maternal diarrhoea and lack of hand washing during the critical times also acted independent predictors of diarrhoea. Hand washing with soap can reduce micro-organism level close to zero and can interrupt the transmission of fecal-oral microbes in the domestic environment [29] [30].

Mainly this study found environmental factors as crucial contributors to high prevalence of diarrheal diseases. The study found that unprotected water source is independent predictor of diarrheal diseases. This is in similar with other studies that show diarrhoea occurrence to be more associated with unsafe/unprotected water sources e.g. ponds, wells, rivers, lakes [5] [18] [27] [31] [32]. The explanation of this may be that contaminated water may have microorganism from human and animal faeces.

Moreover, solid waste disposal system used by the household and absence of drainage system of liquid waste disposal were significantly associated with the occurrence of diarrhoea. This could be the reason that solid and liquid waste disposal provides breeding for various insects which may carry diarrhoea pathogen from the refuse to food and water.

Latrine availability was independent predictor of diarrheal diseases occurrence in this study. The odds of diarrhoea were 4 times if the household had no latrine facility. This is in agreement with studies [12] [33] [34] [35]. The availability of latrine in the household is a notion of the sanitary conditions and as such an indication of the possibility of transmission of the pathogen through fecal contamination [36].

The type of the drinking water collection and storage container was found to be the largest diarrheal disease contributor of this study showing nearly 16 times odds of diarrhoea if the house hold use iron container than Jeri-cans. In Somali region, people usually collect and store drinking water by Jeri-cans. Jeri-cans can easily be cleaned regularly than iron containers.

The floor type in the kitchen showed significantly association to the occurrence of childhood diarrhoea in this locality. This indicates the occurrence of childhood diarr-

hoea in Somali region is due to the sanitation facilities of the households. Sanitation facilities of a home may impact the microbial load found on floors, contributing to the potential for household floors to serve as an indirect route of fecal pathogen transmission to children [37].

5. Conclusion

From this study, we conclude that the prevalence of diarrhoea in Somali region is very high currently compared to other parts of the country. Therefore reducing diarrheal diseases in this pastoralist region should involve mainly providing better water, hygiene and sanitation services including health education.

Limitation of the Study

The limitation of this study is the difficult to entertain the seasonal differences that may happen in the occurrence of childhood diarrheal diseases.

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Competing Interests

The authors declare that they have no competing interests.

Authors' Contribution

All authors participated from the conception to the final write up of the study. All authors read and approved the final manuscript.

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