

A Cross Sectional Study on the Incidence and Risk Factors of Diarrheal Illness among Children Under-five Years of Age in Debre Berhan Town, Ethiopia

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Abstract

Diarrheal diseases are important causes of mortality and morbidity globally among children under 5 years of age. In Ethiopia, only few studies have been carried out to investigate the incidence and risk factors of diarrheal illness among children under- five years of age. Therefore, the objective of this study was to determine the prevalence and risk factors of diarrheal illness among children under-five years of age in Debre Berhan town, Ethiopia. A community based cross sectional study was conducted to assess the incidence and risk factors associated with diarrheal illness. Pre-tested structural questionnaire and observational check lists were used to collect data on the incidence and risk factors of diarrhea. Data was analyzed using SPSS software version 18. Adjusted odds ratio (AOR) test was employed to assess the associations between variables. Mothers/guardians of children with diarrhea were asked to provide detailed information about the incidence and factors associated with diarrheal illness. A total of 312 children were participated in the study, of which 38 were suffering from diarrhea, thus giving a two-week prevalence of 12.2%. The main risk factors for diarrheal illness were found to be lack of hand washing habits after latrine usage (OR = 0.51, 95% CI: 0.29 - 0.87), household storage of water in a pot (OR = 0.32, 95% CI: 0.16 - 3.08), observation of feces on the slab/latrine hole (OR = 3.13, 95% CI: 1.51 - 6.48), lack of maternal education (OR = 2.61, 95% CI: 1.28 - 5.08), age of mothers younger than 35 years (OR = 0.39, 95% CI: 0.19 - 0.78) and age of children being 3 to 5 (OR = 2.53, 95% CI: 1.07 - 5.93). The findings showed that there is a high prevalence of diarrheal illness associated with various factors. Therefore, creating community awareness about diarrheal illness through addressing these risk factors should be prioritized.

Keywords: Diarrhea; Risk factors; Under five children

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Introduction

Diarrheal illness remains one of the major causes of child morbidity and mortality in the world [1]. It kills an estimated 2.5 million people each year, with about 60-70% of them being children under five years of age. Most of these deaths occur in developing countries where an estimated 25% of under-five mortality is directly attributed to diarrheal disease [2-4].

Diarrheal disease has a detrimental effect on growth and predisposes children to malnutrition and other infections [5-8]. It has been reported that about 10% and 0.5% of children

with diarrheal illness severely dehydrated and die, respectively [5]. Moreover, about 25% of the growth differential between children in developed and developing countries can be attributed to diarrhea [9,10].

A wide variety of bacterial, viral and protozoan pathogens excreted in the feces of humans and animals are known to cause diarrhea [5]. Over 90% of deaths from diarrheal diseases due to unsafe water and sanitation occur in children under 5 years old in the developing world [11]. Risk factors for diarrhea are multi-factorial (vary by context) and it is widely recognized that the occurrence of diarrhea is affected by several socio-economic, environmental

and behavioral factors [12]. For instance, maternal education, source of water, habit of washing hands after the use of toilet, availability of latrine facilities, living in a house with a number of children, and age of the child are suggested to be the main determinants of diarrhea in children living in Ethiopia [9,13,14].

In Ethiopia, few studies were conducted to determine the incidence and risk factors of diarrheal illness. It has been estimated that the prevalence of diarrheal illness in Ethiopia varied from 11.4% to 37% [15]. Moreover, yearly childhood deaths due to diarrheal illness in Ethiopia is estimated to be 95,000 based on an overall under-five mortality rate of 170 deaths/1000 and the assumption that 20% of those are caused by diarrhea [11-15]. Knowledge of risk factors have important implications for developing appropriate strategies to reduce the burden of the disease [16]. The objective of this study was, therefore, to determine the incidence and risk factors of diarrheal illness among children under- five years of age in Debre Berhan town, Ethiopia.

Materials and Methods

Study area

Debre Berhan town is found in North Shoa Zone, Amhara Regional state, 130 km away from Addis Ababa. The town is divided into 9 Kebeles (small administrative units) and it has a total area of 18,081.95 hectares. According to the central statistics agency (CSA), Debre Berhan town has a population of 95,908. Of which 7792 were under five children and 10,000 were households. The population is multiethnic, Amhara constituting the majority.

Study design and population

A community-based cross sectional study was conducted from February to March, 2011. Children under-five years of age were enrolled in the study after being selected at random among those who lived in Debre Berhan town, Ethiopia. Mothers / guardians of the children were asked about the occurrence of diarrheal illness on the day of the visitation or within two weeks prior to the day of the visitation.

Sampling techniques and sample size determination

Three of the nine Kebeles (smallest administrative unit), Kebele (2,6,9) were selected using a lottery method. That is, the names of 9 kebeles were written in number on a piece of paper. Then, putting them in a container, mixed and picked up three kebeles blindly one by one and taken up for sampling.

In Kebele [2,6,9], there were a total of 3517 households. After clustering each kebele into a small group called 'Ketena', 997 households having under five children (U5C) were registered through house-to-house survey by trained enumerators. Then, households with U5C were allocated to each Kebele proportional to size via stratified random sampling techniques. Hence, a total households of 123, 155 and 34 were taken from kebele 02, kebele 06, and kebele 09, respectively. The first household from each kebele registry was selected randomly and the rest subjects were included through systematic sampling techniques.

The two-week period prevalence of diarrhea (28.9%) ($P = 0.289$) among U5C reported in Nekemte town, Ethiopia was taken to calculate the sample size [17]. The sample size (n) was determined using the following single population proportion formula based on the assumptions of design effect 2, desired precision 5%, confidence level 95% and an anticipated non-response rate 5%. A total of 312 sample size was determined.

$$n = \frac{Z^2 P(1-P)}{d^2} = \frac{(1.96)^2 \times (0.289)(1-0.289)}{(0.05)^2} = 312$$

Considering none response rates, the required sample size was calculated to be 328, but only 312 of them were considered for data analysis.

In case, where there were more than one U5C in the same household, only the youngest child was considered. Mothers/ Care givers of U5C who had critical health problem, and those who did not live at least six months in the town prior to the survey were excluded.

Methods of Data Collection

Pre-test structured questionnaires and observation checklists were used to collect data on the incidence and risk factors of diarrhea. Eight data collectors who had Technical and Vocational Education and Training (TVET) were recruited and basic training was given for one day prior to data collection by investigators.

The study participants were visited by members of the research team who inquired their mothers or guardians about the occurrence of diarrheal illness on the day of the visitation or two weeks prior to the day of the visitation. Data about the demographic characteristics of children and their family was collected at the beginning of the study. Occurrence of diarrhea is defined as having loose or watery stools at least three times in 24 hours period as reported by the mother/caretaker of the children under-five years of age in the house within two weeks period prior to the survey. Only two weeks situation was taken to avoid loss of memory of events as well as misinterpretation for respondents. The presence of feces on latrine/slab hole, cover of latrine opening, hand washing facilities near toilet and the location of latrine were registered.

Data analyses

Data was sorted and checked for cleanness, quality and validity. Then the data was analyzed using SPSS software version 18. Adjusted odds ratio (AOR) multiple logistic regressions test was employed to assess the association between the variables with 95% confidence interval (CI). Values were considered to be statistically significant when P-values are less than 0.05.

Ethical considerations

The study was reviewed and approved by Debre Berhan University, Department of Biology Ethical review committee. Written consent was obtained from mother/guardians of children. Confidentiality

and privacy of information was ensured. Advising about home-made therapy or appointment to bring children to health posts was made when children with diarrheal illness were found during data collection.

Results

A total of 312 children under-five years of age were participated in the study, of which 38 children had diarrheal illness, thus giving a prevalence of 12.2%. Most of the mother's/guardians of the children were greater than 35 years of age (64.4%), illiterate (79.5%), had more than or equal to five children (65.1%) and married (70.2%). Thirty eight children had diarrheal illness, thus giving a prevalence of 12.2% (Table 1).

The incidence of diarrhea was 0.4 times higher among children whose mother/guardian aged 18-35 years than those with mother/guardian aged greater than 35 years (AOR = 0.39, 95% CI: 0.19 - 0.78, P = 0.007). Children with illiterate mother/guardian had diarrhea 2.6 times more often than those with literate mother/guardian (AOR = 2.61, 95% CI: 1.28 - 5.08, P = 0.006). Moreover, the incidence of diarrhea was 2.5 times higher in children aged 3-5 years than one year old (AOR = 2.53, 95% CI: 1.07 - 5.93, P = 0.03) (Table 1).

Incidence of diarrhea was significantly associated with household storage of water (AOR = 0.32, 95% CI: 0.16 - 3.08, P<0.01), hand washing habits after latrine usage (AOR = 0.51, 95% CI: 0.29 - 0.87, P = 0.013) and observation of feces on the slab/latrine hole (AOR = 3.13, 95% CI: 1.51 - 6.48, P = 0.001). However, the presence of

hand washing facilities near toilet, availability of latrine, location of latrines and the presence of cover for latrine opening were not significantly associated with incidence of diarrhea (P>0.05) (Table 2).

Discussions

In this study, the two-week prevalence of diarrheal illness among under five children was found to be 12.2%. The prevalence of diarrheal illness among children under-five years of age differ from that obtained in other parts of the country: 28.9% in Nekemte [15], 22.5% in Kersa district/Eastern Ethiopia [17]; 18% in Mecha/West Gojjam [16] and 17.9% in North Gondar [17]. It also differs much from that obtained in other countries: 22.5% in Nepal [20], 23.6% in Dakahlia / Egypt [21] and 18% in Ghana [18]. These variations may be due to difference in awareness about diarrheal illness and its risk factors among mothers/guardians of children of this study and previous studies. Moreover, this could be attributed to the fact that there is lack of access to clean water and sanitation facilities in the rural areas than in the urban areas.

The observation that the incidence of diarrhea was higher in children whose mothers/guardians had no formal education is in agreement with the reports of Ekanem et al. [19] from Nigeria. The findings of this study substantiate earlier reports that education is important to change healthcare seeking behavior and practice of mothers/guardians [20-23]. The finding of a strong association between the risk of having diarrhea and mother's education also supports the hypothesis that mothers/guardians education will reduce the incidence of diarrhea in children [24].

Table 1 Demographic and Socio-economic characteristics of mothers/caretakers in relation to childhood diarrhea among under-five children, Debre Berhan town, February to March, 2011, (N = 312).

Variables	Frequency n (%)	Diarrhea		AOR (95%) CI, P value
		Yes(n)	No(n)	
Age of Mothers (year)				
18 – 35	111(35.6)	21	90	0.39 (0.19-0.78) 0.007*
>35	201(64.4)	17	184	R
Maternal education				
Literate	64(20.5)	14	50	R
illiterate	248(79.5)	24	224	2.61 (1.28 -5.08) 0.006*
Marital status				
Single	93 (29.8)	9	84	1.42 (0.65 - 3.14) 0.37
Married	219 (70.2)	29	190	R
Family size(number)				
<5	109(34.9)	14	95	R
5-10	199(63.8)	23	176	0.89 (0.44- 1.80) 0.74
>10	4(1.3)	1	3	2.26 (0.22 - 23.29) 0.48
Age of children (year)				
<1	57(18.3)	12	45	R
1-3	119(38.1)	13	106	0.46 (0.19- 1.09) 0.07
3-5	136(43.6)	13	123	2.53 (1.07- 5.93) 0.03*
Monthly income (Eth. Birr)				
<500	198(63.5)	24	174	1.36 (0.52 -3.59)0.53
500 - 1000	76(24.4)	8	68	0.85 (0.36 - 1.99) 0.71
>1000	38(12.1)	6	32	R

* Statistical significance, R = reference; Illiterate = cannot read and write.

Table 2 Environmental characteristics of mothers/caretakers in relation to childhood diarrhea among under-five children, Debre Berhan town, February to March, 2011.

Variables	Frequency n (%)	Diarrhea (N=312)		AOR (95% CI, P value)
		Yes(n)	No(n)	
Hand washing facilities near toilet				
Absent	254(81.4)	31	223	0.54(0.23 - 1.32)0.17
Present	58(18.6)	7	51	R
Availability of latrine				
Absent	19(6.1)	4	15	0.49(0.15 - 1.57)0.22
Present	293(93.9)	34	259	R
House hold water storage				
Jar/'Jerican'	229(73.6)	14	215	R
Pot	83(26.4)	24	59	0.32 (0.16 - 3.08)<0.01*
Location of latrine (N = 293)				
Near to kitchen	69(23.3)	11	58	0.64(0.28 - 1.46).06
Near to main house	42(14.4)	7	35	0.96(0.32 - 2.89)1
Far from both	182(62.3)	20	162	R
Faeces on the slab/latrine hole (N = 293)				
Present	87(29.5)	18	69	3.13(1.51 - 6.48)0.001*
Absent	206(70.5)	20	186	R
Cover for latrine opening (N = 293)				
Present	41(14)	6	35	R
Absent	252(86)	32	220	1.06(0.37 - 2.93)1
Mothers previous knowledge about diarrheal diseases				
Yes	240(76.9)	26	214	R
No	72(23.1)	12	60	1.65 (0.78 - 3.45)0.18
Hand washing habits after latrine usage				
Yes	172(55.1)	9	163	R
No	140 (44.9)	29	111	0.51 (0.29 – 0.87) 0.013*

In the present study, there was a high case of diarrheal diseases in children from households where there were feces around the pit-hole. This was in agreement with the study in Egypt [19], where there was a strong association between the presence of feces in the yard and non-flush toilets with under-five childhood diarrheal morbidity. But, acute childhood diarrhea presence was associated with latrine availability [25]. This has an important implication that the mere presence of latrine facility does not have a great contribution for prevention excreta-related disease, but it is the proper utilization that had a vital importance.

Mothers' age was found to be a risk factor for diarrheal disease in children. In contrast, a study conducted in Nepal [18] had shown no significant associations between the caregiver's ages and diarrheal disease occurrence among under-five children. Reduced risk of diarrhea in children from elderly caretakers could be related to increased caretakers experience in child care. However, this may be limited to within reproductive aged group. In addition, ages of children between 3 to 5 are significantly associated with diarrhea than lower age groups. This could be related to their more environmental exposure and unsafe child feces disposal methods (poor hygienic practices) associated with increased risk of diarrhea.

Moreover, children with hand washing habits after latrine usage had a lower chance of diarrhea than those without hand washing habits. This is in agreement with a study conducted among

children under- five years of age in eastern Ethiopia [26-28]. It is clear that hand washing reduces the transmission of pathogens causing diarrhea. However, monitoring correct hand washing behavior at critical times is challenging. With this regard, hygiene behavior related observational studies showed wide discrepancy between what people said and did and suggested that the availability of water and soap in places of hand washing may reveal as indicators of hand washing behavior [16,29]. The strength of this study is being community based, but the limitation may be its cross sectional study design focusing only on two-week period of diarrheal occurrence among under five children. Moreover, this study was conducted during the dry season which might underestimate the degree of diarrhea prevalence [30-32].

Conclusion

The present study identified high two-week's prevalence of diarrhea in children under the age of 5 years. Findings of the study revealed that household storage of water in a pot, observation of feces on the latrine hole, lack of maternal education and age of mothers/guardians as risk factors of diarrhea. Therefore, this highlights the need for promoting environmental sanitation and hygienic child care practices. Moreover, interventions through effective health education of the community, paying special attention to maternal education is recommended to reduce the incidence of diarrhea in the study area.

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Conflicts of Interest

No potential conflicts of interest to disclose.

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