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Research Article

Magnitude and Associated Factors of Diarrhea among Under Five Children in Farta Wereda, North West Ethiopia

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ABSTRACT

Background: Diarrheal diseases are still the leading causes of under-five morbidity and mortality in sub Saharan African countries including Ethiopia. The discrepancy in the effects of different factors on the prevalence of diarrhea indicates the variation in the implementation of diarrhea prevention strategies with the context of the population from place to place and needs locality based studies. So this study aimed to assess the prevalence and associated factors with diarrhea among under five children in Farta Wereda, North west Ethiopia.

Methods: Community-based cross-sectional study was conducted in March, 2014 on 1007 mothers of under five children living in the randomly selected 10 rural and 1 urban kebeles. Pretested structured questionnaire was used to collect the data. Bivariate logistic regression analysis to see the association between dependent and independent variables and multivariate logistic regression analysis to determine the independent determinant factors of diarrhea was performed.

Results: The response rate of this study was 99%. More than two fifth of households (41.2%) used drinking water from unimproved sources. About 595 (59.6%) households had latrine facility, of which 583 (98%) were unimproved type and 578 (97.1%) had no hand washing facility. The overall diarrhea prevalence was 16.7% (95% CI: 15.52, 17.78). Children from rural areas [AOR: 2.58, 95% CI: (1.08, 6.18)], whose mother took 30 and more minutes for getting drinking water [AOR: 1.65, 95% CI: (1.01, 2.68)] ,whose age between 6-11 [AOR: 3.1, 95% CI: (1.16, 8.15)], not vaccinated for Rotavirus [AOR: 1.75, 95% CI: (1.11, 2.77)] ,from households having latrine facility [AOR: 0.62, 95%CI: (0.43, 0.89)] and whose mothers used only water to wash their hands [AOR: 1.6, 95% CI: (1.08, 2.28)] were more likely to have diarrhea.

Conclusion: The prevalence of diarrhea in Farta Wereda needs an integrated public action. Thus efforts to reduce childhood diarrhea should focus on strengthening of expanding of access to drinking water sources, education of women on hygiene promotion and child feeding practice as well as expanding access to Rotavirus vaccination for all age groups of under five children.

Keywords: Diarrhea; Determinant factors; Under five children

Background

Diarrheal disease is the second leading cause of death in children under five years old and is responsible for killing around 760, 000 children every year globally. It is a leading cause of child mortality and morbidity in the world and mostly above 90% results from contaminated food and water sources [1,2].

Diarrheal diseases, which are frequently transmitted by contaminated water, continue to be a leading cause of morbidity and mortality among children under 5 years old in developing countries .An estimated 1.8 million people die from diarrheal diseases each year, from which greater than 80% of cases are among children under five years old. Children in this age group suffer from an average of 2.6 episodes of diarrhea each year, with the peak incidence occurring between 6 and 11 months of age [3]. Inadequate quantities and quality of drinking water, lack of sanitation facilities, and poor hygiene cause millions of the world's poorest people to die from preventable primarily diarrheal diseases each year [4].

Enhancing access to improved drinking-water sources, improved sanitation and good hygiene behaviors reduce diarrheal morbidity in under five children by 21%, 37.5%, 35%, respectively [5]. In addition Water quality interventions, in terms of household (point-of-use) treatment seem to reduce 45% of diarrheal morbidity among under five children in the rural population where fecal contamination is high [4-7].

Ethiopia is one of the developing sub Saharan African countries sharing the high burden of diarrheal morbidity and mortality. The incidence of illnesses contributing to avoidable deaths diarrhea is higher in Ethiopia compared to other Sub Saharan African countries partly due to living conditions, high incidence of illness, lack of safe drinking water, sanitation and hygiene, as well as poorer overall health and nutritional status [8].

A study conducted in different regions of Ethiopia support the high burden of diarrhea among under five children .A two week period prevalence of 18%, 22.5%, 28.9% and 31% were documented in Mecha Wereda of Northwest Ethiopia, Kersa Wereda of Eastern Ethiopia, Nekemt town of Western Ethiopia

and Arbaminich Wereda of Southern Ethiopia respectively [9-12]. According to 2011 Ethiopian demographic health survey report the two weeks period prevalence of diarrhea among under-five children in Ethiopia and Amhara region was 13.4% and13.7%, respectively [13].

Even though poor environmental conditions are generally believed to increase the risk of diarrheal morbidity, there was a discrepancy of findings in studies conducted in different parts of Ethiopia on the effects of majority of the environmental variables on the occurrence of childhood diarrhea [7,9-12,14]. This discrepancy is due to the variation in sociocultural and economic environments of households from place to place. This directly affects the behavioral patterns of mother and ability of getting access to water and sanitation service [15,16].

In addition diarrheal disease is still being a major public health problem which necessities locality based studies [1]. According to 2013 Farta Wereda health and water resource office report the study area Farta Wereda showed a progressive improvement in access to safe drinking water supply 37% in 2009 to 75.7% in 2013 and basic sanitation 62% to 85.2% in the same year [17,18]. Despite of this improvement diarrheal diseases were the second and fourth leading causes of under five and adult morbidity in outpatient department throughout the 5 years period in the study area [17]. This implied the interdependence between the factors contributing for the occurrence of diarrhea differs by education of mother, household wealth and by the physical characteristics of household environment from place to place which means the application of all prevention methods vary with the context of the population [15]. Assessing the effects of all these contributing factors according to the local context of the population is crucial to implement proper prevention strategy and further improvements of child health. So the aim of this study was to assess the prevalence and associated factors with diarrhea among under five children in Farta Wereda, Northwest Ethiopia.

Methods

Study design and setting

A community based cross- sectional study was conducted in Farta Wereda which is one of the 12 Weredas found in South Gonder zone, Amhara regional state. The Wereda consists of 2 urban and 41 rural kebeles with a total of 8827 households having under five children. According to 2007 national housing and population census the projected estimated population of the Wereda for the year 2013/2014 was 281,279 from which 38,634 (13.7%) were under five children [19]. There are 10 health center and 54 health posts providing health service for the Wereda population including treatment and prevention of childhood diarrhea. The Wereda had 88.4%,75.7% and 85.2% health service, improved water supply access and latrine utilization coverage, respectively [17].

Population

All mothers having under five children living in 43 kebeles of the Wereda and mothers having Under five children in the selected 11 kebeles of the Wereda were the source and study population, respectively.

Inclusion and exclusion criteria

Households having at least one under five children and lived at least for 6 month in the study area were included in the study and mothers/care givers of selected under-five children who were critically ill and other mental problems that prevent to get the required information about the index child were excluded from the study.

Sample size determination

The sample size included in the study was computed for the two objectives separately. Then the largest sample size was taken from the objective that yields the maximum sample size and calculated based on the following assumptions. The proportion of diarrhea among latrine users was 12%. Assuming a minimum of 10% difference detection rate of diarrhea among latrine users and non-users and odds of diarrhea among non-users and users was assumed equal. Finally these values were entered in to Epi Info version 3.5.3 software and give total sample size of 1007.

Sampling procedures

Stratified multi-stage sampling technique was used to select one urban and ten rural kebeles from 43 kebeles of the Wereda. In each kebele the sample was allocated proportionally and 1007 households were selected by using systematic random sampling (every other households) technique. In case, where there were more than one under-five children in the same household, only one index child was selected by lottery method to collect information on child's health characteristics.

Data collection tools and procedures

Data was collected using pretested structured questionnaire from study participants (mothers) through face to face interview. The questions regarding to socioeconomic/demographic factors, behaviors of mothers and child factors were developed after reviewing of relevant literature [9-12,14,20] and in addition to literature questions regarding to environmental factors were adapted from WHO core questions for drinking water and sanitation facilities [21]. Ten data collectors, who completed 12th grades and two clinical nurses as supervisors were recruited for the whole data collection process. The interviewers physically observed the condition of house hold water handling practices and utilization of sanitation facilities. The supervisors were fully responsible to lead and handle the whole session of data collection process along with the principal investigator.

Variables

The occurrence of diarrhea in a child during or two-week preceding the survey was the dependent variable, whereas age & sex of child, educational and occupational status of parents, place of residence, number of under five children, family size, maternal age, type, ownership and availability of latrine, hand washing facility of latrine, water source, distance from house to water source, daily water consumption, ways of refuse disposal, Latrine utilization, water handling practice, hand washing practice, child feeding, vaccination and faces disposal practice, knowledge towards transmission and treatment methods of diarrhea were the independent variables

Data quality control

Pretest was conducted two weeks prior to actual data collection on near kebeles which was not included in the actual study for validation of data collection tool. The supervisors and principal investigator had closely followed the day-to-day data collection process and ensure completeness and consistency of questionnaire administered each day. Then the collected information was entered and cleaned into Epi Info software Version 3.5.3.

Data analysis

Data analysis was performed by using SPSS version 16 statistical software .Initially descriptive statistics including proportion, mean and standard deviations were performed to describe the sample population in relation to relevant variables. Then bivariate logistic regression analysis (crude odds ratio with 95% confidence interval) was performed for each group of independent variables (socio-economic, environmental, behavioral and child related factors) to see the association with the dependent variable. Finally to determine the significant determinant factors of diarrhea multivariate logistic regression analysis (Adjusted odds ratio with 95% confidence interval) was employed by selecting only variables that appeared with $P \leq 0.3$ in the bivariate analysis. Variables with $P<0.05$ were considered as statistically significant.

Ethical consideration

Prior to data collection letter of approval was obtained from Ethiopian Institute of Water Resource Addis Ababa University. Permission letter for study kebeles also obtained from the Wereda administrators before the study started. Then informed verbal consent was obtained from the mothers/care givers of index child, after the necessary explanation about the purpose, benefits and risks of the study and also their right on decision of participating in the study. Finally further linkage and referral to the nearby health facilities was performed for those children having diarrhea during the survey.

Operational definitions

Diarrhea: Diarrhea is defined as having three or more loose or watery stool in a 24 h period in the household during or within the two weeks period prior to the survey, as reported by the mother/caretaker of the child

Index child: It refers to a child that was included in the study from a household, a child with diarrhea, if no child with diarrhea, a randomly selected child ,in case more than one child in the house to collect information on the child's demographic and health characteristics [9].

Prevalence of diarrhea: The total number of diarrhea cases at the time of the interview divided by the total number of surveyed under-five children in the study area.

Improved water sources: It includes Piped water into dwelling, Piped water to yard/plot, Tube well or borehole, Public standpipes, protected dug wells, protected springs and Rainwater. "Improved" source is one that is likely to provide "safe" water [21].

Unimproved water sources: They are unprotected dug wells, unprotected springs, Cart with small tank/drum, Tanker-truck, Surface water (rivers, dams, lakes, ponds, streams, canals, and irrigation channels) [21].

Improved sanitation facilities: It includes flush toilet, piped sewer system, septic tank, ventilated improved pit latrine (VIP), pit latrine with slab, composting toilet [21].

Unimproved sanitation facilities: It includes a flush/pour flush to elsewhere, a pit latrine without slab, bucket, hanging toilet or hanging latrine, no facilities or bush or field [21].

Proper hand washing facility: Household having functional hand washing facility with water in the container and moisture under the container.

Proper latrine utilization: Households with functional latrines and at least no observable faeces in the compound, observable fresh faeces through the squat hole and the foot-path to the latrine were uncovered with grasses.

Good hand washing practice: Hand washing practices at least three times out of five critical times of hand washing practice.

Proper refuse disposals: A way of disposal refuses that which included burning, burying in a pit or storing in a container and disposing in designed site.

Results

A total of 1007 households were included in the study with a response rate of 99%. Out of these households, 83 (8.3%) were from urban and 915 (91.6%) from rural area.

Socio-demographic and economic characteristics of the respondents

The majority (95.1%) of the respondents were mothers, married (93.3%), no formal education (80%), Orthodox in religion (99.3%) and Amhara (100%) in ethnicity. The mean (± SD) age of mothers were 31 (± 7.1) years. Eight hundred four (80.6%) mothers were farmers. The mean household family size of the study population was 5 (± 1.5) persons. Five hundred ninety three (59.4%) households had five or more persons in their families and 201 (20.1%) households had two or more under five children.

Environmental characteristic of study households

From the total households, 991 (99.3%) had dwelling with mud floor and 772 (77.4%) corrugated roof. Four hundred fifty nine (46%) dwelling houses had three and more living rooms and 731 (73.2%) households shared their living rooms with animals. More than two fifth of households (41.2%) used drinking water from unimproved sources. Regardless of the time taken to fetch drinking water, 894 (89.6%) took less than 30 min for round trip from their home. The mean per capita daily water consumption of the households was 11.9 (± 5.7) L. About five hundred ninety five (59.6%) households had latrine facility, of which 583 (98%) were unimproved type of latrine and 554 (93.1%) had privately owned. Three hundred fifty seven (35.8%) households disposed their refuse improperly and almost all 578 (97.1%) had no hand washing facility.

Behavioral characteristics of respondents

Of the total 998 households, 166 (16.6%) and 670 (67.1%) households were at high and medium contamination risk in household water handling practices, respectively. Treating water was not common in the study area; only 49 (4.9%) households used household water treatment method. Five hundred forty nine mothers (55%) were claimed to poor hand washing practice. From those practicing hand washing above half of (56.3%) the mothers used only water to wash their hands. Of those total mothers who were asked about the transmission of diarrhea 772 (77.4%) replied, no answers. The extent of the latrine utilization habit of households in the study area was improper, only 174 (29.2%) of the households used the latrine properly. Five hundred thirty five (56.3%) of the households disposed their child feces improperly. Of the total (167) mothers who were asked about treatment of diarrhea 41 (24.6%) knew the treatment options.

Child demography and health characteristics

Of the total 998 index children, 521 (52. 2%) and 560 (56.1%) were male and above the age of 24 months respectively. The mean (± SD) age of the index children was 27 (± 5.7) months. In terms of their birth order five hundred fifty two (55.3%) children had an order of three and above three. Only 382 (38.3%) children were born from the health institution. Almost all of the children 985 (98.7) had history of breast feeding and 483 (48.3) got breast milk for greater than two years. Of the total 998 index children 874 (87.6%) started supplementary feeding, of which 854 (97.7%) started at and above six months of their age (Table 1). Four hundred seventy nine (48%) and 859 (86.1%) children were vaccinated for Rotavirus and measles vaccination respectively.

Prevalence of diarrhea

Of the total 998 children in the study households, 16.7% (95% CI: 15.52, 17.78) had history of diarrhea in the preceding two weeks which were 6 (7.2%) and 161 (16.1%) in urban and rural areas respectively. Of these diarrheal cases 151 (90.4%) children experienced diarrhea for less than 14 days and 154 (92.2%) had watery type of diarrhea. The majority (64.7%) of children had three and more episodes of diarrhea per day.

Factors associated with childhood diarrhea: Bivarite analysis

Socio-demographic and economic factors related with diarrhea: Table 2 presents the households' selected socio-economic and demographic variables and their relation to childhood diarrhea. As shown in the table, in the crude analysis, number of under five siblings per household and place of residence showed significant association with diarrheal morbidity.

Children who lived in households with two and more under

Table 1: Child demography and health characteristics of Farta Wereda, Northwest Ethiopia, March 2014 (n=998).

Characteristics	Frequency	Percent
Sex		
Male	521	52.2
Female	477	47.8
Child's age (in months)		
0-5	76	7.6
6-11	97	9.7
12-23	265	26.6
≥ 24	560	56.1
Birth order		
First	218	21.8
Second	228	22.8
≥ third	552	55.3
Breast feeding history		
Yes	985	98.7
No	13	1.3
Duration of breast feeding (in years) (n=985)		
<1	218	21.9
1-2	294	29.5
>2	483	48.5
Initiation of supplementary feeding (in months) (n=874)		
<6	20	2.3
≥ 6	854	97.7
Rotavirus vaccination taken		
Yes	479	48
No	519	52
Measles vaccination taken		
Yes	859	86.1
No	139	13.9

Table 2: Sociodemographic/economic factors related with diarrhea among under five children in Farta Wereda, Northwest Ethiopia, March 2014 (n=998).

Characteristics	Diarrhea		Crude OR (95% CI)
	Yes	No	
Age of mother or care giver			
15-24	29	132	0.96 (0.59, 1.57)
25-34	80	446	0.78 (0.54, 1.14)
>34	58	253	1.00
Educational level of mother			
Formal education	33	167	1.00
No formal education	134	664	1.02 (0.67, 1.55)
Number of <5 children			
1	123	674	1.00
≥ 2	44	157	1.54 (1.04, 2.26)*
Family size			
≤ 4	66	339	1.00
≥ 5	101	492	1.05 (0.75, 1.48)
Residence of family			
Rural	161	754	2.74 (1.17, 6.39)*
Urban	6	77	1.00

*significant at (P<0.05)

five siblings were 1.5 times more likely to develop diarrhea than those with only one under five sibling per household [COR: 1.54, 95% CI: (1.04, 2.26)]. The finding on place of residence suggested that children in rural areas had significantly higher odds of diarrhea than their urban counterparts. The likelihood of developing diarrhea for children who lived in rural area was 2.7 times higher than those who lived in urban area [(OR: 2.74, 95% CI: (1.17, 6.39)].

Environmental factors related with diarrhea: Table 3 presents the households' selected environmental variables and their relation to childhood diarrhea. As shown in the table, in the crude analysis, availability of latrine facility, time taken to obtain drinking water from source (round trip) and number of living rooms showed significant association with diarrheal morbidity.

There was a difference in the likelihood of diarrhea by the availability of latrine facility. The gross effect suggests that, the absence of a latrine facility were significantly associated and reduce the odds of childhood diarrhea by 30% [COR: 0.70, 95% CI (0.49, 0.99).

Regarding to drinking water access , there were a significant differences on the basis of getting drinking water in a reasonable distance [COR: 1.8, 95% CI: (1.10, 2.87)]. Children in households who spend less than 30 min for round trip from their home to get drinking water access were the least vulnerable to diarrhea compared with those who spent 30 and more minutes.

The odds of diarrhea among children from families of having only one partition room was 1.7 times higher than those children from families of having three and more partition rooms [COR: 1.7, 95% CI: (1.12, 2.61)].

Behavioral and child care related factors of diarrhea: In Table 4 maternal child care and behavioral practices and the demographic and health characteristics of index children in relation to diarrheal morbidity is shown. The odds of developing diarrhea was 1.6 times higher among children whose mother used only water to wash their hands when compared with children whose mother used water with soap to wash their hands [OR: 1.59, 95% CI: (1.11, 2.27)].

Children whose age was between 6-11 and 12-23 months were about 3 [OR: 3.22, 95% CI: (1.23, 8.45)] and 2.9 [OR: 2.85, 95% CI: (1.17, 6.92)] times more likely to develop diarrhea when compared with children whose age was less than five months, respectively.

Rotavirus vaccination was also significantly associated with childhood diarrhea. The odds of having diarrhea was 1.6 times higher among non-vaccinated children than those children vaccinated for Rotavirus ([OR: 1.61, 95% CI: (1.14, 2.26)].

Factors associated with child hood diarrhea: Multivariate analysis

The unadjusted OR results revealed significant differences in the effects of different variables on childhood diarrhea. However, because no controls were introduced at this level, assessing the independent predictors of childhood diarrhea was impossible. To identify the independent predictors of childhood diarrhea, multivariate logistic regression analysis was performed. Accordingly, being from rural areas, families of spending 30 and more minutes to get drinking water, presence of latrine facility, being from mothers of using only water to wash their hands, child's above 6 months and not vaccinated for Rotavirus were found independent predictors for the occurrence of childhood diarrhea (Table 5).

Children from rural areas were 2.6 times more likely to have diarrhea compared to their urban counterparts [AOR: 2.58, 95% CI: (1.08, 6.18)]. The odds of developing diarrhea was 1.7

Table 3: Environmental factors related with diarrhea among under five children in Farta Wereda, Northwest Ethiopia, March 2014 (n=998).

Characteristics	Diarrhea		Crude OR (95% CI)
	Yes	No	
Drinking water source			
Improved	105	482	1.00
Unimproved	62	349	0.82 (0.58, 1.15)
Time taken to obtain drinking water (round trip)			
<30 min	141	753	1.00
≥ 30 min	26	78	1.78 (1.10, 2.87)*
Latrine facility			
Available	111	484	1.00
Not available	56	347	0.70 (0.49, 0.99)*
Methods of refuse disposal			
Proper	100	541	1.00
Improper	67	290	1.25 (0.89, 1.76)
Types of roof material			
Thatched	46	180	1.38 (0.94, 2.01)
Corrugated iron sheet	121	651	1.00
Number of rooms			
1	44	148	1.71 (1.12, 2.61)*
2	55	292	1.08 (0.74, 1.59)
≥ 3	68	391	1.00
Animal lives with humans			
Yes	86	373	1.30 (0.94, 1.82)
No	81	458	1.00

*Significant at (P<0.05)

higher among children whose mother took 30 and more minutes for getting drinking water when compared with children whose mother took less than 30 min [AOR: 1.65, 95% CI: (1.01, 2.68)].

There was a difference in the likelihood of diarrhea by the availability of latrine facility. The absence of a latrine facility were significantly associated and reduce the odds of childhood diarrhea by 38% [AOR: 0.62, 95% CI: (0.43, 0.89)].

Children whose mothers used only water to wash their hands were 1.6 times more likely to develop diarrhea than children whose mothers used water with soap to wash their hands [AOR: 1.6, 95% CI: (1.08, 2.28)].The age of the child was also significantly associated with the development of diarrhea. Children whose age was between 6-11 and 24 and above months were about three times more likely to develop diarrhea when compared with children whose age was less than five months [AOR: 3.1, 95% CI: (1.16, 8.15)] and [AOR: 3.1, 95% CI: (1.26, 7.64)], respectively. In addition children whose age was between 12-24 months were 2.8 times more likely to develop diarrhea than children whose age was less than 5 months. The odds of having diarrhea was also 1.8 times higher in non-vaccinated children than vaccinated children for Rotavirus [AOR: 1.75, 95% CI: (1.11, 2.77)].

Discussion

The two-week period prevalence of childhood diarrhea morbidity in this study was 16.9% (95% CI: 15.52, 17.78). This finding is almost consistent with the study done in different parts Ethiopia, which was 15% in Keffa Sheka Zone of Southern Ethiopia, 18% in Mecha District of North West Ethiopia, 22.5% Kersa district of Western Ethiopia 18% and 13.5%, in 2005 and 2011 report of EDHS, respectively [9,10,13,22,23]. But the finding is not in agreement with the studies reported from Arbaminich zuria Wereda, Meskena Mareko Wereda of Southern Ethiopia and Nekemt town of Western Ethiopia which were 30.5%, 38.5% and 28.9% of two weeks period prevalence of diarrheal morbidity respectively [11,12,14]. The difference might be attributed to the difference in the socio demographic characteristics and basic environmental infrastructure of study households, behaviors of care givers, the time of the study and also some difference in study design and method of data collection.

Children living in rural areas were more vulnerable than their urban counter parts in this study. The odds of diarrhea were more than two times higher among rural children than urban ones. This finding is similar with the result obtained from another study in Ghana, Western and Southern Ethiopia .This could be attributed to the factors that the basic environmental infrastructures (access to drinking water and sanitation facilities) in the urban area was more than in the rural area. In addition it may be due to the fact that rural residents tend to be poorer than urban residents, which impact the level of hygienic practice for child rearing.

In this study walking time to water source was an important determinant of diarrhea. Children in households who spend less than 30 min to get drinking water access were the least vulnerable to diarrhea compared with those with who spend 30

Table 4: Behavioral and child care related factors of diarrhea among under five children in Farta Wereda, north-west Ethiopia, March 2014 (n=998).

Characteristics	Diarrhea		Crude OR (95% CI)
	Yes	No	
Household water handling practice			
High sanitary risk	26	140	0.65 (0.37, 1.14)
Medium sanitary risk	105	565	0.65 (0.43, 1.00)
Low sanitary risk	36	126	1.00
Disposal system of child faeces			
Proper	85	378	1.00
Improper	82	453	0.81 (0.58, 1.12)
Hand washing practice			
Good	75	374	1.00
Poor	92	457	1.00 (0.72, 1.40)
Hand washing materials			
Soap & water	52	343	1.00
Ash & water	6	35	1.13 (0.45, 2.82)
Only water	109	453	1.59 (1.11, 2.27)*
Knowledge on transmission of diarrhea			
Good	34	198	1.00
Poor	133	633	1.41 (0.92, 2.16)
Child's age(in month)			
0-5	6	70	1.00
6-11	21	76	3.22 (1.23, 8.45)*
12-23	52	213	2.85 (1.17, 6.92)*
≥ 24	88	472	2.17 (0.92, 5.16)
Rotavirus vaccination taken			
Yes	64	415	1.00
No	103	416	1.61 (1.14, 2.26)**
Measles vaccination taken			
Yes	146	713	1.00
No	21	118	1.151 (0.70, 1.89)

*Significant at (P<0.05), **Significant at (P<0.01)

and above minutes to get drinking water. This finding was in agreement with a review analysis study from 26 countries in sub-Saharan Africa on the relationship between household walk time to water source and child health outcomes identified walk time to water source as an important determinant of child health [24]. These may be due to the time burden of water fetching has been suggested to influence the volume of water collected by households as well as time spent on income generating activities and child care. In addition even if the water is obtained from an improved source, when the water needs to be fetched from a source that is not immediately accessible to the household, it may become contaminated during transport or storage.

In this study, the risk of having diarrhea was found to be significantly associated with latrine facility, where children living in houses without latrine facilities were about 38% reduction of diarrhea than children living in households with such facilities, which is inconsistent with the study in Ghana, western, southern and northwest Ethiopia [7,9,11,12,15]. This has an important implication that the mere presence of latrine facility does not have a great contribution for prevention of excreta-related disease but it is the proper utilization that had a vital importance. In this study majority (98%) of the household had unimproved type of latrine which serves as for the breeding of flies and increase the risk of diarrhea than those used open field. Because this unimproved type of latrine found near the living room and the child exposed for diarrhea causing pathogens during playing and the flies contaminate food and drinking water at household.

This study indicated that hand washing materials were an important predictors of diarrhea. The risk of developing diarrhea was higher among children whose mother used only water to wash their hands when compared with children whose mother used water with soap to wash their hands. This finding is similar with a randomized controlled trial study on the effect of hand washing promotion on childhood diarrhea in Pakistan [25]. Since soaps are an antimicrobial agent and it has a power to prevent diarrhea and occurrence of other hygiene related disease.

Another predictor variables of diarrhea found in this study was age of child. Children whose age was greater than 6 months were at high risk of developing diarrhea when compared with children whose age was less than five months. This was in line with study conducted in North West, Southern and Eastern Ethiopia [9,10,12]. This can be explained by the introduction of contaminated weaning foods, starting of crawling, risk of ingesting contaminated materials, and loss of inborn immunity

Table 5: Multivariate analysis of determinant factors of diarrhea among under five children in Farta Wereda, north-west Ethiopia, March 2014 (n=998).

Variables	Diarrhea		Crude OR (95% CI)	Adjusted OR (95% CI)
	Yes	No		
Residence of family				
Rural	161	754	2.74(1.17,6.39)*	2.58 (1.08, 6.18)*
Urban	6	77	1.00	1.00
Time taken to obtain drinking water (round trip)				
<30 min	141	753	1.00	1.00
≥ 30 min	26	78	1.78 (1.10, 2.87)*	1.65 (1.01, 2.68)*
Latrine facility				
Available	111	484	1.00	1.00
Not available	56	347	0.70 (0.49, 0.99)*	0.62 (0.43, 0.89)*
Hand washing materials				
Soap & water	109	453	1.00	1.00
Ash & water	52	343	1.13 (0.45, 2.82)	1.17 (0.46, 2.98)
Only water	6	35	1.59 (1.11, 2.27)*	1.57 (1.08, 2.28)*
Rotavirus vaccination taken				
Yes	64	415	1.00	1.00
No	103	416	1.61 (1.14, 2.26)*	1.75 (1.1, 2.77)*
Child age (in months)				
0-5	6	70	1.00	1.00
6-11	21	76	3.22 (1.23, 8.45)*	3.1 (1.16, 8.15)*
12-23	52	213	2.85 (1.17, 6.92)*	2.8 (1.13, 6.85)*
≥ 24	88	472	2.17 (0.92, 5.16)	3.1 (1.257,7.637*

*Significant (P<0.05)

may increase the occurrence of diarrhea. The low occurrence of diarrhea during the age 0-5 months clearly indicates the protective effect of exclusive breast feeding, inborn immunity and less exposure to contaminated agents in the first six months of life.

This study also found Rotavirus vaccination was important predictors of childhood diarrhea.

Children who were not vaccinated for Rotavirus were more likely to develop diarrhea than those children vaccinated for Rotavirus. Since the Rotavirus vaccination was started in our country since the last seven months there was no consistent finding in line with the current finding in Ethiopia .But there was an evidence of 89-93% reduction of diarrheal disease in vaccinated children than in non-vaccinated children in a systematic reviewed analysis on the effect of rotavirus vaccine on diarrhea mortality [26].

Conclusion

The result of this study showed the prevalence of childhood diarrhea was high. Overall, the findings have important policy implications for health intervention and support the view that investing in drinking water access at a reasonable distance, strengthening distribution of basic environmental infrastructures (drinking water and sanitation facilities) for both urban and rural residence as well as women education on hygiene promotion, appropriate child feeding and care practice respective to their age have substantial benefits on child health.

State of current knowledge on the subject

- Diarrheal disease is still being a major public health problem.
- The incidence of illnesses contributing to avoidable deaths diarrhea is higher in Ethiopia compared to other Sub Saharan African countries partly due to living conditions, high incidence of illness, lack of safe drinking water, sanitation and hygiene, as well as poorer overall health and nutritional status.
- Discrepancy of findings on the effects of different factors on the occurrence of childhood diarrhea which needs locality based study.

Contribution of this study to knowledge

- The role of Rotavirus vaccination on the reduction of childhood diarrhea.
- The mere presence of latrine facility does not have a great contribution for prevention of childhood diarrhea but it is the proper utilization that had a vital importance.
- The effect of drinking water access on the reduction of childhood diarrhea.

Author's Contribution

GG was the principal investigator of the study and played a leading role starting from concept development up to finalization of the paper including manuscript preparation. AK participated in designing of the study, data analysis, reviewing of the whole document including approval of the manuscript.

DH also participated in designing of the study, data collection, data analysis and write up of the manuscript. All authors read and approved this manuscript.

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