



## International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR /Volume 7 / Issue 4 / Oct - Dec - 2019  
www.ijamscr.com

Research article

Medical research

### Prevalence of diarrhea and associated factors among infants aged 6-12 months at dessie referral hospital, 2019 E.C

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#### ABSTRACT

##### Background

Diarrhea illnesses account for a large proportion of childhood morbidity and mortality in the developing world where the levels of hygiene and nutrition may be poor among infants aged 6-12 months in low-income countries including the study area.

##### Objective

The aim of this study is to assess the prevalence of diarrheal and associated factors among infants aged 6-12 months at Dessie Referral Hospital.

##### Methods

A community based cross-sectional study design was used among randomly selected 326 samples. Data were collected using an interviewer administered pretested structured questionnaire. Both descriptive and inferential statistics were used to analyze the data. Odds ratio along with 95%CI were estimated to measure the strength of the association. Level of statistical significance was used at P value less or equal to 0.05.

##### Results

The prevalence of diarrhea is 29.1% (95% C.I (24.0%-34.0%). Washing feeding utensils twice or more frequently [AOR= 0.12; 95% C.I (0.03-0.42)], Children born to government employed fathers [(AOR=0.01 95 % C.I, (0.00-0.06)] and government employed mothers [(AOR=0.22, 95% C.I, (0.08-0.64)]. Using private tap as source of water [(AOR=0.09, 95% C.I, (0.03-0.28)] and incorrect weaning practice [(AOR= 10.79; 95% C.I, (3.61-32.26)] were significantly associated with diarrhea in infants of age b/n 6-12 months.

##### Conclusion

The prevalence of diarrhea is high among infants at Dessie Referral Hospital. Diarrhea is significantly associated with paternal education and employment, frequently washing feeding utensils, using tap water as household \source of water, and incorrect weaning practice. Thus creating awareness about safe use of feeding practice, increasing the availability and use of safe water supplies should be strengthened to prevent the incidence of diarrhea in infants.

**Keywords:** Diarrhea, Infants, Practice, Weaning.

## INTRODUCTION

Diarrhea remains the leading cause of morbidity and mortality in children under 5 years old worldwide. The burden is disproportionately high among children in low- and middle-income countries. Young children are especially vulnerable to diarrheal disease and a high proportion of the deaths occur in the first 2 years of life. Worldwide, the majority of deaths related to diarrhea take place in Africa and South Asia. Nearly half of deaths from diarrhea among young children occur in Africa where diarrhea is the largest cause of death among children under 5 years old and a major cause of childhood illness [1-4]. Although some of the factors associated with diarrhea in children in Ethiopia such as Acute Respiratory Infection (ARI), maternal history of recent diarrhea, maternal education, well source of water, obtaining water from storage container by dipping, availability of latrine facilities, living in a house with fewer number of rooms, not breast feeding, duration of breast feeding, and age of the child, have been identified, diarrhea is still a major public health problem among children under 5 years old [5- 8]. Epidemiologic studies show that factors determining the occurrence of diarrhea in children are complex and the relative contribution of each factor varies as a function of interaction between socio-economic, environmental and behavioral variables [5, 9-11]. Recent research indicated that studies in differing environment and prioritizing interventions based on context would be useful to prevent deaths from diarrhea [12]. In Ethiopia, despite the high prevalence of the disease, reports from population-based studies are sparse. The study would be helpful in planning and implementation of prevention strategies at the community level. Thus, the objective of this study was to assess the prevalence of diarrhea and associated factors among children of age 6-12 months.

## OBJECTIVES

- To determine the prevalence of diarrheal among infants aged 6-12 months Dessie Referral Hospital, 2019.
- To identify factors associated with diarrheal among infant aged 6-12 months Dessie Referral Hospital, 2019.

## METHODS & MATERIALS

### Study area and period

This study was conducted in Dessie Town, south wollo Zone, one of the 11th Zones in the Amhara regional state.

### Study design

An institutional based cross-sectional study design was used to assess the prevalence of diarrhea and associated factors among infants of age b/n 6-12 months at Dessie Referral Hospital.

### Source population

All mothers/care givers of infants aged 6-12months (infant-mother pair) at Dessie Referral Hospital

### Study population

All mothers/care givers of infant aged 6-12months (infant-mother pair) at Dessie Referral Hospital during the data collection time

### Sample population

All randomly selected mothers/care givers of infant aged 6-12months (infant-mother pair) at Dessie Referral Hospital

### Inclusion criteria

All mothers/care givers of infant aged 6-12months (infant-mother pair) residing for at least six months in Dessie town.

### Exclusion criteria

All Mothers/care givers of infants aged 6 to 12 months who were unable to communicate during interview were excluded from the study.

### Sample size determination

Single population proportion formula were used to determine the sample size 326 for this study using the following assumption  $P= 26.35\%$  from a study conducted in Mekelle town,  $Z=1.96$  and margin of error (d) to be 0.05 and 10% for non-response rate.

Since the sample size calculated for specific objective one accommodates the large sample size so, the minimum sample size considered to undertake the study was **326** after considering a non- response rate of 10%.

**Dependent Variable:** Diarrhea

## Independent variables

Socio economic and demographic variables such as age, sex, ethnic group, Religion, monthly income, occupation, educational status, housing condition, infant feeding practice.

## DATA PROCEESING AND ANALYSIS

After completing data collection, the data were categorized, coded and entered onto Epi-info version-6 software and exported to SPSS version 23 computer packages for cleaning and analysis. Data were described using proportions, frequencies and numerical summary measures. Chi-square and student's t test and OR along with the corresponding 95% CI were used to determine relationships between certain variables and multiple logistic regression was also used to control for possible confounders among variables that were associated with the diarrhea morbidity in the last two weeks. Both Bi-variate and multivariate analysis were carried out to identify significant association between independent variables and dependent variable.

## DATA QUALITY CONTROL

To ensure data quality, questionnaire was pre-tested in a Kobo town with population having similar socio-demographic status. Collected data were edited and cleaned on daily basis. For missing values, irregularities, inconsistencies, unlikely values and suspicious regularities, corrective measure was taken timely; to ensure data quality at each data collector level, data were also checked by recollecting 5% of the study population by the principal investigator.

## ETHICAL CONSIDERATION

Ethical clearance was obtained from Wollo University College of Medicine and Health Science, Research coordinating office. To ensure confidentiality interview was held on a private basis and it was ensured throughout the process. The principal investigator was referring sick infants to an appropriate healthcare facility. Parents were encouraged to seek early care, and an appropriate

follow-up was made whether infant has received appropriate care or not.

## RESULTS

### Socio-demographic characteristics

In this study there were 326 eligible infants of 6-12 months. All mothers of the infants were voluntary to be interviewed, making the response rate 100%. The mothers were in the age range of between 20 and 35 years. Eight (2.5%) were less than 20 years. Two hundred eight four (87.1%) were aged 20-34 years and thirty-four (10.4%) were aged 35 years and above. The mean age was 27.4 (SD±4.8) years. As to the infants: the male-to-female ratio was 1.16:1. Male infants were 175(53.7%) of the total study subjects.

In this study two hundred two (62%) of infants were born in a health institution whereas the remaining were at home. Among infants in this study three hundred two (92.6%) were immunized. As to the educational background, of the 326 mothers 258 (79.4%) have attended formal education of which 102 (31.3%) were primary school while the rest 156 (47.9%) were higher-level students and graduates. two hundred thirteen (65.3) of the respondents were married. Among mothers in this study 68 (20.9%) are unemployed whereas the rest were governmental or private employed workers. Two hundred thirty-four (71.8%) of husband's were employed of which 129 (39.6%) were governmental employees and 105 (32.2%) were NGO/private/ employed husbands. One hundred sixty-five (50.6%) of husbands attended formal education of which 175(53.7) attended above 6th<sup>grade</sup> (Table 1).

The monthly household income of the respondents ranges between 100 and 15000 Eth birr. Around 187 (57.4%) of households have a monthly income of less than 1500 Ethiopian birr of which (33.8%) were with a monthly income 250 Ethiopian birr and less with an overall mean monthly income of 421 Eth birr. As to the sanitary facility 258 (79.2%) of households have a proper garbage disposal site or services, whereas the rest 68(20.9%) do not have such facility and use an open field disposal. This study has also found that 88 (27.0%) have a private tap and the rest 238(73%) have a public tap water source.

**Table 1: Socio-demographic characteristics of infants and mothers at Dessie Referral Hospital, North Eastern Ethiopia, Sep-Nov 2019 (n=326)**

<b>Characteristics</b>	<b>Frequency</b>	<b>Percent</b>
<b>Sex of infants</b>		
Male	175	53.7
Female	151	46.3
<b>Infant's age</b>		
6-9 months	177	54.3
10-12 months	146	45.7
<b>Delivery place</b>		
Home	124	38.0
Health institution	202	62.0
<b>Infant immunization status</b>		
Appropriate for age immunized	302	92.6
Not appropriate for age immunized	24	7.4
<b>Mother's age in years</b>		
20-24	77	23.6
25-29	165	50.6
30-34	50	15.3
35-39	22	6.7
40+	12	3.7
<b>Marital status</b>		
Married	174	53.4
Single	152	46.6
<b>Religion</b>		
Orthodox	127	39.0
Muslim	76	23.3
<b>Mother's education</b>		
Have no formal education	68	20.9
1-6 <sup>th</sup> grade	102	31.3
6 <sup>th</sup> Grade and over	156	47.9
<b>Mother's occupation</b>		
Full time employed	192	58.9
Not full time employed	134	41.1
1-6th grade	102	31.3
6th Grade and over	156	47.9
<b>Mother's occupation</b>		
Full time employed	192	58.9
Not full time employed	134	41.1
Not using soap	123	37.7
I don't wash mostly	28	8.6
<b>Husband's residence</b>		
Lives together	68	20.9
Lives else where	104	31.9
<b>Husband's occupation</b>		
Government employee	129	39.6
NGO /private employee	105	32.2
Unemployed	92	28.2

<b>Husband's education</b>		
No formal education	68	20.9
1-6 <sup>th</sup> grade	83	25.5
6 <sup>th</sup> +	165	50.6
<b>Source of drinking water</b>		
Private tap	236	72.4
Public tap	90	27.5
<b>Type of latrine use</b>		
Private pit	88	27.0
Shared pit	217	66.6
Flush toilet	21	6.4
<b>Garbage disposal</b>		
Open disposal	68	20.9
Proper disposal	258	79.1
<b>Types of house floor</b>		
Earth or soil	102	31.3
Cement	224	68.7
Husband's residence		

## PREVALENCE OF DIARRHEA

**Table 2: Sample size for factors associated with diarrhea prevalence**

Variables	Diarrhea P1 (%)	Diarrhea P (%)	CI	Power	Allocation ratio	OR	Total sample Size
Marital status	41.3	23.5	95%	80%	1:1.9	2.29	258

In this study, the prevalence of diarrhea among infants of 6-12 month infants in the past 15 days (two weeks) was found to be 29.1% [(95% C.I : (24.0%-34.0%)]. Moreover, the two-week prevalence of diarrhea was higher in female infants as compared to male infants (18.7%) and (10.4%) respectively. Similarly the prevalence was also higher among infants of illiterate mothers (17.5%) compared infants of educated mothers (11.7%). Moreover, the two-week prevalence was lower among infants of married mothers than infants of single mothers (7.4%) and 21.8% respectively.

Frequency of diarrhea morbidity was much higher among infants whose mother not full time employed (22.4%) compared to infants whose mother full time employed (6.7%). Infants whose family using water from public tap were at higher prevalence of diarrhea (15%) compared to infants whose family using water from private tap were (114.1%) Frequency of diarrhea morbidity was much higher among infants whose feeding utensils was washed less frequently (24.2%) compared to infants whose feeding utensils are washed twice and above per day (4.9%).

**Table 3: Diarrhea among infants of age 6-12 months by selected Socio-demographic variables: Dessie Referral Hospital, North Eastern Ethiopia, Sep-Nov 2019 (n=326)**

Characteristics	Number (%)		Diarrhea	
			Yes (%)	No (%)
<b>Infant age</b>				
6-9 months	202(62)	61(18.7)	141(43.3)	
10-12 months	124(38)	34(10.4)	90(27.6)	
<b>Sex of infant</b>				
Male	175(53.7)	34(10.4)	141(43.3)	

Female	151(46.3)	61(18.7)	90(27.6)
<b>Mother education</b>			
Educated	161(49.9)	38(11.7)	123(37.7)
Not educated	165(50.6)	57(17.5)	108(33.1)
<b>Water source</b>			
Private tap	232(71.2)	49(15)	183(56.1)
Public tap	94(28.8)	46(14.1)	48(14.7)
<b>Washing feeding material</b>			
Twice and above	165(50.6)	16(4.9)	149(45.7)
Less frequently	161(49.4)	79(24.2)	82(25.2)
<b>Mother's age</b>			
20-24	77(23.6)	29(8.9)	136(41.7)
25-29	165(50.6)	40(12.3)	37(11.3)
30-34	50(15.3)	4(1.2)	46(14.1)
35-39	22(6.7)	21(6.4)	1(0.3)
40+	12(3.7)	1(0.3)	11(3.4)
<b>Mothers' occupation</b>			
Full time employed	188(57.7)	22(6.7)	166(50.9)
Not full time employed	138(42.3)	73(22.4)	65(19.9)

## FACTORS ASSOCIATED WITH DIARRHEA

Bi-variable logistic regression analyses were carried out to identify the risk factors associated with diarrhea. Childhood diarrhea was significantly associated with weaning practice, immunization states, washing feeding utensils twice or more frequently, children born to government employed fathers and government employed mothers, using private tap as source of water and incorrect weaning practice. More specifically, the likelihood of experiencing diarrhea was higher among infants who were incorrectly weaned than among infants who were correctly weaned [(COR= 4.67; 95% C.I, (2.73-8.00)]. Also, the likelihood of experiencing diarrhea was less among infants who were appropriate for age immunized infants than who were not appropriate for age immunized [(COR= 0.16; 95% C.I, (20.07-14.0.37)]. Moreover, the odds of experiencing diarrhea was less among infants of educated mothers than among infants of mothers who have no formal education, [(COR= 0.59 95% CI, (0.36-0.95)].

Additionally, Mother's occupation was also associated with infant diarrhea morbidity where the odd of experiencing diarrhea among infants from

full time employed mother was less than the odds of experiencing diarrhea among infants of not full time employees [(COR=0.12; 95% C.I, 0.07-0.21)]. Average frequency of washing feeding materials was also associated with infant diarrhea morbidity, where a lesser proportion of infants whose feeding utensils were washed twice or more frequently experienced diarrhea, than infants whose feeding utensils were washed less frequently [(COR= 0.11; 95% C.I 0.06-0.20)].

Husband's occupation was associated with infant diarrhea morbidity where the odd of experiencing diarrhea among infants from governmental employed fathers was less than the odds of experiencing diarrhea among infants of un employees' fathers [(COR=0.70; 95% C.I, (0.02-0.22)]. Similarly, the odds of experiencing diarrhea among infants of un-employed father was less than the odds of infants of unemployed fathers [(COR=0.80; 95% C.I, (0.27-2.35)].

Hand washing habit was also associated with infant diarrhea morbidity where the odd of experiencing diarrhea among infants mother from washing by using soap was less than the odds of experiencing diarrhea among infants of mother irregular washing [(COR=0.37; 95% C.I, (0.16-0.82)]. Similarly, the odds of experiencing diarrhea

among infants mother from washing by mostly using soap was less than the odds of experiencing diarrhea among infants of mother I don't wash mostly [(COR=0.26; 95% C.I, (0.11-0.60)].

More or less source of water also crudely associated with infant diarrhea morbidity where the odd of experiencing diarrhea among using private

tap was less than the odd of experiencing diarrhea among using public tap water [(COR=0.28; 95% C.I, (0.17-0.47)].

Moreover, husband's education, residence, family size, feeding style, latrine facility and marital status were not significantly associated.

**Table 4: Bi-variable logistic regression analysis of diarrhea among infants of age 6-12 months (n=326)**

Characteristics	Diarrhea		COR (95%CI)	P-Value
	Yes	No		
	n (%)	n (%)		
<b>Infant age</b>				
6-9 months	61(18.7)	141(43.3)	1.15(0.70-1.88)	0.59
10-12 months	34(10.4)	90(27.6)	1.00	
<b>Sex of infant</b>				
Male	34(10.4)	141(43.3)	1.00	
Female	61(18.7)	90(27.6)	3.56 (0.217-1.58)	0.87
<b>Child immunization</b>				
Appropriate for age	76(23.3)	222(68.1)	0.16(0.07-0.37)*	0.001
Not Appropriate for age	19(5.8)	9(2.8)	1.00	
<b>Mother education</b>				
Educated	38(11.7)	123(37.7)	0.59(0.36-0.95)*	0.03
Not educated	57(17.5)	108(33.1)	1.00	
<b>Water source</b>				
Private tap	49(15)	183(56.1)	0.28(0.17-0.47)*	0.001
Public tap	46(14.1)	48(14.7)	1.00	
<b>Washing feeding material</b>				
Twice and above	16(4.9)	149(45.7)	0.11(0.06-0.20)*	0.001
Less frequently	79(24.2)	82(25.2)	1.00	
<b>Mothers' occupation</b>				
Full time employed	22(6.7)	166(50.9)	0.12(0.07-0.21)*	0.001
Not full time employed	73(22.4)	65(19.9)	1.00	
<b>Weaning time</b>				
Correct	51(15.6)	195(59.8)	4.67(2.73-8.00)*	0.001
Incorrect	44(13.5)	36(11.0)	1.00	
<b>Hand washing habit</b>				
Using soap	52(16.0)	123(37.7)	0.37(0.16-0.82)*	0.02
Not using soap	28(8.6)	95(29.1)	0.26(0.11-0.60)*	0.001
I don't wash mostly	15(4.6)	13(4.0)		
<b>Husband's occupation</b>				
Government employed	21(6.4)	177(54.3)	0.07(0.02-0.22)*	0.001
Non-government employed	64(19.6)	48(14.7)	0.80(0.27-2.35)	0.69
Un employed	10(3.1)	6(1.8)	1.00	
<b>Type of floor</b>				
Cement	23(7.1)	74(22.7)	1.48(0.86-2.54)	0.16
Soil	72(22.0)	157(48.2)	1.00	

After adjustment for potential confounders, diarrhea among infants age from 6-11 months was significantly associated with washing feeding utensils twice or more frequently, children born to government employed fathers and government employed mothers, using private tap as source of water and incorrect weaning practice.

Average frequency of washing feeding materials was associated with infant diarrhea morbidity, where a 0.08 times lesser proportion of infants whose feeding utensils were washed twice or more frequently experienced diarrhea, than infants whose feeding utensils were washed less frequently [(AOR= 0.08; 95% C.I (0.02-0.32)]. Experiencing diarrhea among infants of government employed fathers were almost 0.01 times lesser than that of experiencing diarrhea among infants of un-employed fathers [(AOR=0.01. 95 % C.I, (0.00-

0.56)]. Moreover, the likelihood of getting diarrhea among infants whose mothers are employees was less compared to infants whose mothers are unemployed [(AOR=0.0.12, 95% C.I, (0.04-0.35)]. Source of water also associated with infant diarrhea morbidity where experiencing diarrhea among using private tap was less than that of experiencing diarrhea among using public tap water [(AOR=0.07, 95% C.I,( 0.02-0.21)].

The likelihood of experiencing diarrhea was 7 times higher among infants who were incorrectly weaned than among infants who were correctly weaned[ (AOR= 7.22; 95% C.I, (2.50-20.92)].

In our study, variables that were associated with experience of diarrhea during crude analysis like hand washing habit turned to be insignificant after it was adjusted for some of the significant explanatory variables.

**Table 5: Multivariate analysis of diarrhea in infants of 6-12 months (n=326)**

Characteristics	Diarrhea		COR (95%CI)	AOR (95%CI)
	Yes	No		
<b>Child immunization</b>	n (%)	n (%)		
Appropriate for age immunized	76(23.3)	222(68.1)	0.16(0.07-0.37)*	4.28(0.78-23.56)
Not Appropriate for age immunized	19(5.8)	9(2.8)	1.00	1.00
<b>Mother education</b>				
Educated	38(11.7)	123(37.7)	0.59(0.36-0.95)*	1.68(0.46-6.11)
Not educated	57(17.5)	108(33.1)	1.00	1.00
<b>Water source</b>				
Private tap	49(15)	183(56.1)	0.28(0.17-0.47)*	0.07(0.02-0.21)*
Public tap	46(14.1)	48(14.7)	1.00	1.00
<b>Washing feeding material</b>				
Twice and above	16(4.9)	149(45.7)	0.11(0.06-0.20)*	0.08(0.02-0.32)*
Less frequently	79(24.2)	82(25.2)	1.00	1.00
<b>Mothers' occupation</b>				
Full time employed	22(6.7)	166(50.9)	0.12(0.07-0.21)*	0.12(0.04-0.35)*
Not full time employed	73(22.4)	65(19.9)	1.00	
<b>Weaning time</b>				
Correct	51(15.6)	195(59.8)	4.67(2.73-8.00)*	7.22(2.50-20.92)*
Incorrect	44(13.5)	36(11.0)	1.00	1.00
<b>Hand washing habit</b>				
Using soap	52(16.0)	123(37.7)	0.37(0.16-0.82)*	0.83(0.19-3.67)
Not using soap	28(8.6)	95(29.1)	0.26(0.11-0.60)*	0.10(0.02-0.61)*
I don't wash mostly	15(4.6)	13(4.0)	1.00	1.00
<b>Husband's occupation</b>				



Government employed	21(6.4)	177(54.3)	0.07(0.02-0.22)*	0.01(0.002-0.56)*
Non-government employed	64(19.6)	48(14.7)	0.80(0.27-2.35)	0.86(0.19-3.83)
Unemployed	10(3.1)	6(1.8)	1.00	1.00

## DISCUSSION

In this study, we compared diarrhea prevalence (recall period: 2 weeks) and risk factors among infants of Dessie Referral Hospital. We found that the 2-week, caregiver-reported prevalence of diarrhea among infants was 29.1%, which is slightly above the rate reported for the same age group in the 2016 Ethiopian DHS (23%) [7]. Similarly, it was also slightly above the research that was done at 2006 Mekelle Ethiopia 26.4 % [41] and with the diarrhea prevalence in Butajirra 23% [22]. But higher than the prevalence in Wolayta 14.1% and keffa-sheka zone (15%) [23, 28]. Our finding was lower than the prevalence in Jimma 39.3% [20]. Similarly, it was also lower than the prevalence in Eritrea 30.1 % [27]. This is also lower than the prevalence in Gondar (59.3%), Illubabor (41.9%) and Welega (45.7%) [41]. Moreover, the prevalence was much lower than the prevalence in Manna district of Jimma 33.7% [21]. However, our rate is below that reported in the National Survey on Food Security and Nutrition 2013 survey report (32%) in Senegal [22]. It is also lower than the 35% prevalence among children previously reported in Kaédi, Mauritania by Touray and colleagues (2012) [23]. Other studies in secondary cities of sub-Saharan Africa reported lower rates: 23.6% in a 2008 survey in Nouakchott, Mauritania; 14% in 2006 in Yopougon, Côte d'Ivoire; and 13.5% in 2010 in other districts of Nouakchott, Mauritania [23-27].

Our study showed that the risk of diarrhea was significantly associated with the mother's occupation (i.e. housewife was associated with higher diarrhea risk compared to those working in the private or public sector). This finding is consistent with other reports, which found that parental occupation was associated with diarrheal occurrence [31, 32]. Although socioeconomic status (middle and poorest) showed a significant association with the occurrence of diarrhea in the bivariate analysis, it was not significant when other variables were included. In the multivariate analyses, we found that children living in better off households were less likely to have diarrhea compared to their lower wealth counterparts. A

likely explanation of this observation is that wealth is associated with better access to household amenities and facilities, including those related to better hygiene and environmental health, which might reduce the risk of diarrhea. In addition, wealth allows parents to use health services more frequently [33, 34]. However, Root suggested that wealthy parents may be unable to reduce the risk of diarrhea due to factors beyond their control, such as contaminated community environment or lack of water [35]. However, many other studies indicate that socioeconomic factors are strongly associated with the occurrence of diarrhea; this appears to confirm the social determinants of health [36, 37].

Our study also showed that using private tap water less affected by diarrhea than public water source. This observation is consistent with the prevalence of diarrhea has been reported to be associated with water source [29, 50]. Studies in Central America, South Africa, Kuwait and India have also revealed a high peak incidence of diarrhea in using public tap water [51, 52]. The same trend was observed in eastern Ethiopia [53].

In our study, lacking basic sanitation like washing feeding materials of twice and above were 0.08 times less affected by diarrhea than less frequently washing and also those were not hand washing were affected by diarrhea.

There was reported WHO and UNICEF 2006, Africa leads the world in terms of the disease burden arising from unclean water and poor sanitation, as almost a quarter of Sub-Saharan African people lack access to safe drinking water, and the number of people lacking basic sanitation has increased by over 30 %.

Infant weaning was found to be significantly associated with diarrhea morbidity that infants who were correctly weaned were at lower odds of experiencing diarrhea than those who were weaned incorrectly. This is consistent with a study done in Philippines where infants under six month who were given non-nutritive additives were three times at higher risk of diarrhea morbidity than exclusively breast fed infants and the risk was thirteen times higher among infants who were non-breast-fed. Moreover it was consistent with a study done in India where exclusively breast fed infants

were at a lower risk of developing diarrhea compared to spoon and bottle fed infants  $P < 0.01$  [54]. In addition, it was consistent with studies done in USA, England, Peru and Thailand: where infants with better breast-milk intake had a lower risk of diarrheal morbidity and mortality compared to infants with lower breast milk intake [50-52, 55]. Moreover, Diarrhea morbidity was lower by half among those infants who were exclusively breast-fed compared to those early-weaned infants. This could be because infant's who were weaned too early will lack the antibodies and nutrients supplied by breast milk, which could be exposed to different pathogens. On weaning time and those infants who are lately weaned will suffer of inadequacy of nutrient from breast milk because unless the infant is supported with weaning diet the breast milk will gradually lack its ingredients to supply the ever increasing nutrient demand of the growing infant. Additionally, there was significant difference in the likelihood of acquiring diarrhea in infants under different age categories. This could be because infants within the age range 6-12 months have almost similar rate of exposure because this is the age at which infants are weaned and are exposed to different pathogens for it is the time when the infant starts to crawl on the ground and put sever thing at hand to its mouth.

In our study, the risk of diarrhea among children whose mothers had the two poor hand related practices and children that don't wash their hands before eating are higher than that among those whose mothers paid attention to washing their hands after going to toilet and before feeding children respectively and also hand washing by mothers with soap and water. Studies showed the importance of hand washing in reducing the occurrence of childhood diarrhea [24, 25]. However, monitoring correct hand washing behavior at critical times is challenging. Hygiene behavior related observational studies showed wide discrepancy between what people said and did and suggested that reported hand washing behavior over estimate observed behavior [26-28] and supported the availability of water and soap in

places of hand washing as indicator of hand washing behavior [29]. In this study, there was a significant positive association between the availability of hand washing facility with childhood diarrhea. Similarly in Childhood Diarrhea in Sub-Saharan Africa reported that Methods of food handling and storage, source, storage and use of safe water, and personal hygiene all contribute to the potential risk of developing acute diarrhea [46].

## CONCLUSION

According to this study, washing feeding utensils twice or more frequently, children born to government employed fathers and government employed mothers, using private tap as source of water and incorrect weaning practice were found to be significant determinants of diarrhea morbidity so that to prevent this diseases with a focus on breast-feeding and safe weaning foods, better personal and domestic hygiene, and the provision of safe water supplies are being gradually must introduced. These are all more important to effect. Measuring the impact of water supply, improvements in sanitation, and public health education on diarrheal disease is mandatory. The long-term solution for decreasing morbidity from diarrhea may include the delivery of improved sanitation and hygiene through efficient educational programs that concentrate on personal hygiene which lead to full sanitation. This should be reinforced in combination with health workers educating households on sanitation. Longitudinal studies can be the best designs to provide data on the changing prevalence of diarrhea and address seasonality by including relevant factors.

## Acknowledgment

We would like to express our deepest gratitude and appreciation to Wollo University, Dessie Referral Hospital and our data collectors for their full cooperation and permission to conduct this research.

**Conflict of Interest:** None

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**How to cite this article:** Samuel Anteneh, Moges Workneh, Dr. Prem Kumar. Prevalence of diarrhea and associated factors among infants aged 6-12 months at dessie referral hospital, 2019 E.C. Int J of Allied Med Sci and Clin Res 2019; 7(4): 1333-1344.

**Source of Support:** Nil. **Conflict of Interest:** None declared.