

## Research Article

# What Factors Aggravate Prevalence of Diarrhea among Infants of 7-12 Months in Southern Ethiopia?

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### ABSTRACT

**Introduction:** Diarrhea remains one of the leading causes of infant mortality. Particularly diarrhea is most common among children age 7-12 months in Ethiopia. Even though there are many researches done on under five diarrheal morbidity, data on infants in the age group 7-12 months and factors affecting diarrhea among the same age group are scanty. Therefore, the objective of this study is to assess prevalence of diarrheal morbidity and associated factors among 7-12 months infants in Geze Gofa district, Southern Ethiopia.

**Methods and participants:** A community based cross-sectional study was conducted among infants of 7-12 months age. Sample size was calculated for each specific objective using epi info and highest sample of 386 was included. Data were collected from mothers/care givers of infants between 7 and 12 months using structured interviewer administered questionnaires. Multivariable logistic regression analysis was performed. P-values less than 0.05 were used to determine

association.

**Results:** The prevalence of diarrheal morbidity in infants was found to be 21%. Failure to take ROTA vaccination (AOR: 2.52, 95% CI: 1.22, 5.19), unimproved source of water (AOR: 3.64, 95% CI: 1.92, 6.90), lack of hand washing facility (AOR: 2.912, 95% CI: 1.50, 5.66), complementary feeding before six months (AOR: 3.12, 95% CI: 1.60, 6.06) and bottle feeding (AOR: 2.18, 95% CI: 1.12, 4.24) were independently associated with diarrheal morbidity in infants aged between 7 and 12 months.

**Conclusion:** Diarrhea remains an important health concern in the studied community. Factors that influence the occurrence of diarrhea were infant rota vaccination status, hand washing facility availability, usage of improved water source, exclusive breast feeding for six months and using cup to feed infants.

**Keywords:** Diarrheal morbidity; Breast feeding; Geze Gofa district; Southern Ethiopia

**Abbreviations:** SSA: Sub-Saharan Africa; SNNPR: South Nations Nationalities and Peoples Region; CDC: Communicable Disease Control; EDHS: Ethiopian Demographic and Health Survey

### Introduction

Infant and child mortality rate became more popular and is commonly quoted on the agendas of public health issue in the world [1]. Diarrhea remains among the leading cause of infant mortality worldwide. It kills 2,195 children every day which is more than AIDS, malaria, and measles combined [2,3]. Forty percent of childhood deaths from diarrhea worldwide occurred in sub-Sahara Africa (SSA) [4,5]. Various studies revealed that children in the age group 7-12 months had the highest prevalence of diarrhea to the extent of 40.7% [6].

More than 90% of child deaths in Ethiopia is due to pneumonia, diarrhea, malaria, neonatal problems, malnutrition and HIV/AIDS, and often as a combination of these conditions [7]. Diarrhea is preventable diseases so that it is the prioritized interventions for reducing child mortality rates in Ethiopia [8].

The risk of having diarrhea reaches peak at the age of 6-11 months. In

this age group, the risk of having diarrhea is more than three times higher than those children from birth to five months and after the age of twelve months, the risk of having diarrhea become decreased [9]. According to 2011 Ethiopian Demographic and Health Survey (EDHS) the prevalence of diarrhea in South Nations Nationalities and Peoples Region (SNNPR) is 16.4% [10]. Only 4%, 57%, 43% and 42% households in Ethiopia use improved toilet facilities that are not shared, have access to an improved source of drinking water and have earth or sand floor respectively [11].

Even though there are many studies done on under-five diarrheal morbidity in Ethiopia; they showed that diarrheal morbidity pick age is between seven and twelve months [1,12-14]. Moreover there is no study done on factors associated with diarrheal morbidity in Geze Gofa district. Hence conducting this study is essential in order to identify the prevalence of diarrheal morbidity and associated factors among 7-12 months infants in the study area.

### Methods and Participants

#### Study area

The study was conducted in Geze Gofa district, Gamo Gofa Zone,

Southern Ethiopia from April 12 to 27, 2016. The district is located 517 Km to the south of Addis Ababa capital of Ethiopia. According to the district 2015 demographic profile the district has total estimated population of 85,667 out of which 43,091 (50.3%) are female. Moreover, 13,373 (16%) are under five children while 1,627 (2%) are between 7-12 months.

In the district there are three public health centers, thirty health posts, three private clinics, 1 drug store and 2 rural drug vendors. There are also more than 7 different non-governmental organizations, participating in different health programs.

### Data collection

Before collecting data the *kebeles* (the smallest administrative unit in Ethiopia, of village size) in the district were stratified into urban and rural *kebeles*. The existing one urban *kebele* and nine rural *kebeles* from 29 were included in the study. A total of 386 mothers/care givers with infants of 7-12 months age were identified from the selected ten *kebeles*. This sample size proportionally allocated to the selected ten *kebeles*. The study unit was selected by simple random sampling techniques using sampling frame prepared from family folder registration data available in the health posts of the respective *kebele*.

Sample size was calculated using Epi Info software. The prevalence of diarrhea for infants of 7-12 months was taken from a study done in Tigray which is 26.35% [15]. So, by assuming  $p=26.35\%$ ,  $Z_{\alpha/2}$ =critical value at 95% confidence interval,  $d$ =desired precision (5%), design effect of (1.5) and using correction formula since the source population is less than 10,000 and by adding 10% none response rate, the total calculated sample size became 386 mothers/care takers with infants of 7-12 months.

Data collected house-to-house using interviewer administered structured and pre-tested questionnaire by trained data collectors. The questionnaire was prepared based on EDHS 2011 data and other relevant literature [10,16,17]. The questionnaire was first developed in English, then translated into Amharic, and back translated into English to assure its consistency. The questionnaire has three major sections. The first one was socio-demographic; the second one was environmental factors and finally behavioral factors section.

The respondents were mothers/care takers with infants of 7-12 months age. In absence of a respondent visits was repeated for three times to minimize non-response rate as possible.

### Data processing and analysis

After completing data collection, the data were coded and entered in to Epi data version 3.1 then transferred to SPSS version 20 for analysis. Descriptive statistics was done to summarize the study variables. Factors with  $p$ -value  $\leq 0.25$  in bivariate logistic regression were considered as candidates for multiple logistic regression models. Backward stepwise logistic regression method used to identify significantly associated factors for diarrheal morbidity. Hosmer-Lemeshow goodness-of-fit test was checked and it was  $>0.05$ . Multiple logistic regression models identified independent predictors. Variables with  $P$  value  $<0.05$  in the multiple logistic regression model were considered significantly associated with the outcome variable.

### Ethical considerations

The proposal of this study was reviewed, approved and ethical clearance was obtained from Institutional Review Board of Jimma University. Before the study started permission letter obtained from Geze Gofa district health office. The objective of the study was explained and verbal informed consent was obtained from the respondents.

## Results

### Socio-demographic characteristics

A total of 385 mothers and caretakers with infants of 7-12 months

participated in the study. Two hundred two (52.7%) studied infants were male. The mean age of mothers/care takers was 27.5 (SD  $\pm$  9.9) with a range between 15 and 48 years. One hundred fifty three (39.9%) were respondents unable to read and write. Almost all of the respondents were married. Among mothers/care takers in this study 347 (90.2%) were housewife. One hundred ninety four (50.7%) respondents were protestant. Three hundred nineteen (82.9%) of infants were born in a health institution where as the rest were at home. Two hundred fifty six (66.6%) of fathers were farmer and 36 (9.3) were government employee. One hundred sixty five (43%) of husbands were unable to read and write (Table 1).

### Characteristics of the child's living environment

From the total of 385 households, 333 (86.5%) had dwelling with mud floor. Majority of dwelling houses 311 (80%) had corrugated iron sheet roof. Three hundred thirty one (86%) of the households had latrine and 257 (73.2%) had hand washing facility. About one-third of households (33.7%) used water from unimproved sources (Table 2).

### Nutritional and behavioral characteristics

Out of 381 (98.7%) breast feed infants, 348 (91.1%) started breast feeding immediately after birth. Three hundred seventy six (97.7%) infants started complementary feeding out of which 283 (74.5%) started complementary feeding at six months of age, 96 (25.3%) before six months and other after six months; whereas 9 (2.3%) were not started yet. About half, 182 (50.1) of mothers/care takers wash feeding materials immediately after and before use. Out of 81 (21%) infants suffered diarrhea, 77 (95.1) were taken to health facility. One hundred thirty four (35.5%) mother/care takers use bottle; while 197 (52.3%) mother/care takers use cup to feed their infant.

### Immunization status of infants

From the studied infants almost all 383 (99.5%) were ever immunized one or more types of vaccines. Particularly 355 (92.4%), 364 (94.8%) and 328 (85.4%) infants got BCG, pentavalent and pneumococcal immunizations, respectively.

### Prevalence of infant diarrhea

In this study the prevalence of diarrhea among infants of 7-12 months in the past 15 days was found to be 21% (95% CI: 17.3,25). All infants with history of diarrhea were from mother/care takers who are married. Similarly diarrhea morbidity was much higher among infants who live in mud floor dwelling. Moreover the prevalence was also much higher in infants who started complementary feeding.

### Factors associated with diarrheal morbidity

After bivariate analysis between the dependent variable and each of the independent, the candidate variables for the final model were identified. The experience of diarrhea among infants who did not take Rota immunization was more than 2.5 times higher than those who took immunization (AOR: 2.52, 95% C.I: 1.22, 5.19).

Moreover, the occurrence of diarrhea among infants in households without hand washing facility in the latrine was 2.91 times higher households with hand washing facility (AOR: 2.91, 95% CI: 1.50, 5.66). Moreover infants in the house hold who used unimproved water source were 3.6 times more at risk of having diarrhea as compared to infants in the house hold who used improved water source (AOR: 3.64, 95% CI : 1.92, 6.90).

Infants who started complementary feeding before six months were about three times more likely to have diarrhea than infants who started complementary feeding after six months (AOR 3.12 95% CI: 1.60, 6.06). In addition bottle feeding increase the occurrence of diarrhea more than two times as compared to cup feeding in the studied area (AOR: 2.18, 95% CI: 1.12, 4.24) (Table 3).

**Table 1:** Socio demographic and economic characteristics of the respondents, Geze Gofa district, Southern Ethiopia, 2016.

Variables	Categories	Frequency	%
Sex of the infant	Male	202	52.7
	Female	181	46.3
Age of the child mother/caretakers	15-24	209	54.4
	25-34	63	16.3
	35-49	113	29.3
Place of delivery	Health institution	319	82.9
	Home	66	17.1
relation of the respondent to the child	Mother	373	96.9
	Care taker	12	3.1
marital status of the respondent	Married	377	97.9
	Unmarried	8	2.1
Religion mother/care taker	Protestant	194	50.7
	Orthodox	140	36.6
	Catholic	32	8.4
Occupation of the mother/care taker	Muslim	17	4.4
	Housewife	347	90.2
	Government employee	22	5.7
	Other	16	4.1
Educational status of the mother/care taker	Unable to read and write	153	39.9
	Higher and graduate	134	34.7
	Primary school	98	25.4
Total family size	>4	211	55.2
	<=4	174	44.8
Type of birth	Single	358	93
	Twin	27	7
Educational level of the father	Unable to read and write	165	43
	Primary school	129	33.4
	Higher and graduate	91	23.6
Occupation of the father	Farmer	256	66.6
	Merchant	93	24.1
	Government employee	36	9.3

**Table 2:** Characteristics of infants living environment, Geze Gofa district, Southern Ethiopia, July 2016.

Variables	Category	Frequency	%
Type of house floor	Mud	333	86.5
	Cement	46	11.9
	Other	6	1.6
Availability of latrine	Total	385	100
	Yes	331	86
Type of latrine	No	54	14
	Non Improved	344	98.6
Availability of hand washing facility	improved	5	1.4
	Yes	251	73.2
Sources of drinking water	No	94	26.8
	Improved source	255	66.3
	Unimproved source	130	33.7

## Discussion

According to this study, the two-week prevalence of diarrhea among infants was (21%), which is nearly similar to study done in West Bengal in 2015 that reported 22.73% [18] and study done in Eastern Ethiopia in 2013 which was 22.5% [19]. It is also similar with study conducted in 2014 that documented 19.6% prevalence in Shebedino district western Ethiopia [20]. The prevalence of

diarrheal morbidity found in our study is higher as compared to 2011 EDHS data that showed the prevalence of diarrheal morbidity in SNNPR to be 16.4% [10]. It is also higher than a study done in Ghana in 2015 (11.4%) [21]. The high prevalence in the current study could be due to the season of data collection which was wet season when diarrhea prevalence became high. It could also be due to difference in basic environmental and behavioral characteristics of the mothers/care takers.

**Table 3:** Factors associated with diarrhea infection among 7-12 months of age, Geze Gofa district, Southern Ethiopia, 2016.

Variable	Category	Diarrheal morbidity		COR (95% CI)	AOR (95% CI)
		Yes (%)	No (%)		
Sex	Male	37 (18.3)	165 (81.7)	1.00	1.00
	Female	42 (23.2)	139 (76.7)	1.35 (0.82, 2.21)	1.64 (0.86, 3.14)
Type of birth	Single	72 (20.1)	286 (79.9)	1.00	1.00
	Twin	9 (33.3)	18 (66.7)	1.99 (0.86, 4.62)	0.83 (0.19, 3.28)
Rota immunization	Yes	45 (18.3)	283 (81.7)	1.00	1.00
	No	25 (29.8)	59 (70.2)	1.90 (1.09, 3.29)	2.52 (1.22, 5.19)*
Father education	Uneducated	44 (26.5)	121 (73.5)	1.78 (1.09, 2.92)	1.65 (0.84, 3.24)
	Primary	20 (15.5)	109 (84.5)	0.59 (0.34, 1.03)	0.90 (0.34, 2.38)
	High level	17 (18.7)	74 (18.3)	1.00	1.00
Latrine availability	Yes	65 (19.6)	266 (80.4)	1.00	1.00
	No	16 (29.6)	38 (70.4)	1.73 (0.91, 3.29)	1.09 (0.36, 3.25)
Hand washing	Yes	37 (14.4)	220 (85.6)	1.00	1.00
	No	28 (29.8)	66 (70.2)	2.52 (1.44, 4.43)	2.91 (1.50, 5.66)*
Water source	Improved	37 (14.5)	218 (85.5)	1.00	1.00
	Unimproved	44 (33.8)	86 (66.2)	3.09 (1.83, 5.01)	3.64 (1.92, 6.90)*
Complementary feeding start	6 months and after	40 (14.1)	243 (85.9)	1.00	1.00
	Before 6 months	39 (40.6)	57 (59.4)	4.16 (2.45, 7.04)	3.12 (1.60, 6.06)*
Feeding method	Bottle	39 (29.1)	95 (70.9)	0.48 (0.29, 0.79)	2.18 (1.12, 4.24)*
	Cup	34 (17.3)	163 (82.7)	1.00	1.00
Frequency	Immediately	25 (13.7)	157 (86.3)	1.00	1.00
	Less frequently	49 (27.1)	132 (72.9)	2.33 (1.37, 3.98)	1.67 (0.86, 3.25)

\*Factor significantly associated at p-value<0.05

Infant Rota vaccination status was significantly associated with diarrheal morbidity. The prevalence of diarrhea was higher among infants who did not take Rota vaccination than infants who took Rota vaccination. This finding is consistent with a study done in Wolayita Soddo in 2012 [22]. The explanation for this could be that Rota vaccine has protective effect against infant diarrheal morbidity.

The other factors that affect diarrheal morbidity of infants were availability of hand washing facility at latrine. This is similar with a study done in Eastern Ethiopia [19]. This could be because the existence and use of hand washing facility can help prevent fecal contamination which may lead to contamination of infant's food and in turn prevent infant diarrheal morbidity.

Mini EDHS 2014 data showed only 57% of households have access to an improved source of drinking water in Ethiopia [23]. Similarly this study shows that 66.3% of the respondents used an improved water source. The study also showed that the prevalence of diarrhea in infants living in household with an unimproved water source is higher. It is consistent with study conducted in Debre Birhan [24], in Qatar [25] and in Bangladesh [26]. This showed that preparing infants' food with unclean water can expose them to diarrhea. Since water is essential for drinking and mother's/care takers activity to their infant, it should be used from improved source.

In our study starting time of infant complementary feeding was significantly associated with incidence of diarrheal morbidity. This finding is similar with a study done in Qatar in 2011 and Bangladesh [25,26]. It can be justified that exclusive breast feeding for six months has a protective effect for diarrhea occurrence in the following period.

Method of complementary feeding was significantly associated with incidence of diarrheal morbidity. This is consistent with study done in three SSA countries in 2013 [27]. This can be justified that, the practice of bottle feeding is more exposed to contamination.

The findings of this study have to be seen with the following limitations. Mothers/caretakers were asked if the infant had diarrhea

in the past two weeks and experience of breast-feeding in the past six months that could have a possible recall bias. Furthermore, the study was conducted in the early rainy season and probably it might have overestimate diarrhea prevalence as compared to dry season.

## Conclusion

Diarrhea in the age group seven up to twelve months remains an important health concern in the Geze Gofa district, Southern Ethiopia. Twenty one percent of infants in the study area were suffering from diarrheal morbidity. Occurrence of diarrhea could be affected negatively by infant Rota vaccination status, hand washing facility availability at latrine, usage of improved water source. On the other hand, starting complementary feeding before six months and using bottle to feed infant positively affects occurrence of diarrhea.

## Author Contribution

Conceived and designed the study: DG KW TS. Performed the study: DG KW TS. Analyzed the data: DG. Wrote the paper and manuscript: DG KY. Reviewed the paper and manuscript DG KY KW TS. All authors read and approved the manuscript.

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