



PREVALENCE OF DIARRHEAL MORBIDITY AND ASSOCIATED FACTORS AMONG INFANTS OF 7-12 MONTH IN GEZE GOFA WOREDA, GAMO GOFA ZONE, SOUTHERN ETHIOPIA.

BY: - DERESSE GASHAW (BSc)

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WOREDA, GAMO GOFA ZONE, SOUTHERN ETHIOPIA.

**Advisors:**

Prof. Kifle Woldemichael (MD, MPH)

Mr. Tamirat shewanew (BSC, MPHE)

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## **Abstract**

**Background:** *Diarrhea remains one of the leading cause of infant mortality (16%). Particularly diarrhea is most common among children age 7–12 months in Ethiopia and those who are not exclusively breast fed infants were more affected. Even though there are many researches done on under five diarrheal morbidity, data on infants are scanty.*

**Objectives:** *This study assessed prevalence of diarrheal morbidity and associated factors among 7-12 month infants in Geze Gofa woreda Gamo Gofa Zone Southern Ethiopia, 2016.*

**Methods:** *A community based cross-sectional study was conducted among infants of 7-12 months in Geze Gofa woreda Gamo Gofa Zone. Sample size was calculated for each specific objective using epi info for window 7 version and highest sample of three hundred eighty six infants of 7-12 months was used as study unit. Two stage sampling method was used to get study unit. Data were collected using structured questionnaires and mothers/care givers having infants of 7-12 months were respondents. The data were entered to Epi- data version 3.1 and analyzed using SPSS version 20 software. Descriptive statistics were used to summarize study variables. Bivariate logistic regression was used to assess the relationship between outcome and independent variables. Variables with  $P < 0.25$  in the bivariate analysis were considered for inclusion in the multivariable analysis. Variables with  $P < 0.05$  in the multivariable analysis were considered significant.*

**Result:** *The prevalence of diarrheal morbidity in infants was found to be 21%. Failure to take Rota immunization (adjusted odd ratio (AOR): 2.518, 95% confidence interval (CI): 1.221, 5.193), lack of hand washing facility (AOR: 2.912, 95% CI: 1.499, 5.659), unimproved source of water (AOR: 3.643, 95% CI: 1.924, 6.897), starting complementary feeding before six month (AOR: 3.117, 95% CI: 1.604, 6.059) and bottle feeding (AOR: 2.180, 95% CI: 1.122, 4.235) were independently associated with diarrheal morbidity in infants.*

**Conclusion and recommendation:** *Twenty one percent of infants in the study area were suffering with diarrhea. Occurrence of diarrhea could be decreased if the woreda administrative, woreda health office and health extension workers work together on interventions aimed to improve infant Rota immunization, hand washing facility availability, usage of improved water source, exclusive breast feeding and using cup to feed infant.*

**Key words:** diarrheal morbidity, breast feeding, Geze Gofa woreda.

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## ACRYONMS

AOR	Adjusted Odd Ratio
ARI	Acute Respiratory Infection
CDC	Center of Communicable Disease Control
CI	Confidence Interval
EBF	Exclusive Breast Feeding
EDHS	Ethiopia Demographic Health Survey
GTP	Growth and Transformation Plan
HSDP	Health Sector Development Plan
IFHP	Integrated Family Health Program
MDGs	Millennium Development Goal
USA	United States of America
UNICEF	United Nation Children Fund
USAID	United States Agency for International Development
WHO	World Health Organization

## 1. Background information

### 1.1. Introduction

Infant and child mortality rate is an indicator that is becoming more popular and is commonly quoted on the agendas of public health issue in the world(1). Recent data released by the United Nations show that under-five mortality rates have dropped by 49% between 1990 and 2013. But overall progress is still short of meeting the global target of a two-thirds decrease in child mortality by 2015(2). According to 2015 world bank report infant mortality in Ethiopia was 41 per 1000(3). Recent population based cohort study conducted in rural parts of Ethiopia shows that infant mortality ( IMR) was 47 per 1000 live births (95 % CI: 41, 54) over the four years of follow-up(4). According to 2014 mini Ethiopian demographic profile total infant mortality rate was 55.77/1000(5). However Ethiopian ministry of health sector development program IV plan to decrease infant mortality to 31/1000 by 2015 which shows more efforts will be needed(6).

More than 90% of child deaths are due to pneumonia, diarrhea, malaria, neonatal problems, malnutrition and HIV/AIDS, and often as a combination of these conditions.in Ethiopia(7). Diarrhea is preventable diseases so that it is the prioritized interventions for reducing child mortality rates in Ethiopia(8). diarrhea can be prevented through: increasing access to safe drinking-water; use of improved sanitation; hand washing with soap; exclusive breastfeeding for the first six months of life; good personal and food hygiene; and rotavirus vaccination (9). According to Mini EDHS 2014 data only 57 percent households have access to an improved source of drinking water in Ethiopia, Only 4 percent of households in Ethiopia use improved toilet facilities that are not shared with other households, Forty-three percent of houses have dung floors, and 42 percent have earth or sand floor(5). The other determinant factor for diarrhea morbidity is exclusive breast feeding(10).

## 1.2. Statement of problem

According to WHO diarrhea is defined as the passage of three or more loose or liquid stools per day (or more frequent passage than is normal for the individual); Frequent passing of formed stools is not diarrhea, nor is the passing of loose, "pasty" stools by breastfed babies (9). According to WHO 2013 not washing hand with soap, poor sanitation, low quantity of water and unsafe storage of water at household are risk factors for diarrheal morbidity(11). As UNICEF 2013 report the other risk factor for diarrheal morbidity is exclusive breast feeding for six months and continued breastfeeding with appropriate complementary feeding; it reduces the onset and severity of diarrhea(12). Similarly According to Lancet Nutrition Series 2008, babies who do not breastfeed are, generally, more than 14 times more likely to die from diarrhea or respiratory infections than babies who are exclusively breastfed in the first six months (13).

Diarrhea have a harmful impact on childhood growth and cognitive development and It causes death by depleting body fluids resulting in profound dehydration(14). Since 1990, the world has made great progress in reducing child mortality; the number of deaths of children under five years of age has fallen by nearly half, from 12.6 million in 1990 to 6.6 million in 2012. Despite this progress, however, around 18,000 young children died each day in 2012. Sub-Saharan Africa and South Asia together have the highest burden of child mortality and together account for four out of five child deaths globally(15).

Considerable progress has been made to improve the infant health in the past one and half decades in Ethiopia; The infant mortality rates have declined from 123/1000 in 1990 to 59/1000 in 2010 (8). It is due to a significant infrastructure building programme between 2005 and 2011 which concentrated on rural health facilities in Ethiopia; Over 10,000 health posts, 2,000 health centers and 73 hospitals were constructed during this period(16). The Health Extension Program (HEP) is also an innovative health service delivery program that aims at universal coverage of primary health care through effective implementation of the 16 packages(6).

But still Diarrhea remains the second leading cause of infant mortality (16%) after pneumonia (17%)(17). Diarrhea kills 2,195 children every day which is more than AIDS, malaria, and measles combined and this diseases account for 1 in 9 child deaths worldwide(18). Globally, there are nearly 1.7 billion cases of diarrheal disease every year; It is a tragedy that diarrhea, which is

preventable disease also remains a leading cause of mortality and morbidity of children in Sub-Saharan; 40% of childhood deaths from diarrhea worldwide will occur in Sub-Saharan Africa by the year 2000(19). And it is common among 7-12 month age group ; according to a population based study conducted in a rural community in south India in 2009 Children in the age group 7-12 months had the highest prevalence of diarrhea to the extent of 40.7% followed by in the age group 13-24 months and 0-6 months(20). The median annual incidence of diarrhea in Sub-Saharan Africa peaks among infants 6 to 12 months old and decreases progressively thereafter 6- to 11-month-old and children in Africa had a median of 4.5 diarrhea episodes per year(19). according to study done in peri-urban Zambia 26% children under 2 years experienced diarrhea, analogous to at least 13 episodes of diarrhea per child per year but Diarrhea prevalence was 22% (83/372) for all children under 5 years(21).

The risk of having diarrhea reaches peak at the age of 6-11 months. In this age group, the risk of having diarrhea was more than three times higher than those children who were aged 0-5 months and After the age of 6- 11 months, the risk of having diarrhea become decreased(4). The significant effect of age was retained even after the other variables were controlled for According to 2011 EDHS data diarrhea is also most common among children age 6–12 months and among those who are not exclusively breast feed in Ethiopia, this survey also reveals that the prevalence of diarrhea in SNNP, the study area, is 16.4% which is higher next to Somalia (19.5%), Benishangul-Gumuz (22.7%) and Gambela (22.6%)(1).

Even though there is many study done on under five diarrheal morbidity in Ethiopia; and they shows that diarrheal morbidity pick age is 7-12 moth but there is no recent research done among 7-12 month age group(22)(23)(24)(1). More over there is no study done on diarrheal morbidity and associated factors at any age group in Geze Gofa woreda, Gamo Gofa zone. Hence conducting this study is essential in order to identify the prevalence of diarrheal morbidity and associated factors among 7-12 months infant in Geze Gofa woreda Gamo Gofa zone.

## 2. Literature review

### 2.1. over view

Diarrhea determined as an important public health problem worldwide(25). UNICEF/WHO joint report in 2010 on preventing and treating the second leading killer of children identified that Early and exclusive breastfeeding, Rotavirus vaccination, Handwashing with soap, Improved water supply and Community-based sanitation are determinant factors of diarrheal morbidity (26). In 2011 EDHS mothers were asked whether any of their children had diarrhea at any time during the two-week period preceding the survey. If the child had had diarrhea, the mother was asked about feeding practices during the diarrheal episode. The validity of this indicator is affected by the mother's perception of diarrhea as an illness and her capacity to recall the events. With this in caution 13 percent of children under age five were reported to have had diarrhea, in the two-week period before the survey. Diarrhea was most common among children 6–12 months age group (24.8 %)(1).

### 2.1. Prevalence of diarrheal morbidity

A cross sectional study done in Ghana in 2015 shows that the two-week diarrhea prevalence rates were 11.4%(27) and study done in West Bengal in 2015 reveals that the prevalence of diarrhea was found to be 22.73% (28). Different studies conducted in Ethiopia shows higher diarrhea prevalence than the EDHS 2011 data and the study conducted in Ghana and Bengal; For example A cross sectional study done in eastern Ethiopia in 2013 reveals that the prevalence of childhood diarrhea was 22.5%(29); Similar study conducted in 2014 shows that the prevalence of diarrhea found to be 19.6% in shebedino district western Ethiopia(30). Facility based cross sectional study done in 2014 in Debre Birhan referral hospital prevalence of diarrhea in children was found to be 31.7% (31). Similarly according to a cross sectional study conducted in 2012 the two weeks prevalence of diarrhea among children was 30.5% in Arba Minch district southern Ethiopia(24). The other community based cross sectional study done in Aduwa town Tigray reveals that the Prevalence of diarrhea among infants of 7-12 months old age in northern Ethiopia was found to be 26.35% (32).

### 2.3. Factors affecting diarrheal morbidity

#### 2.3.1. *Sociodemographic and economic factors*

A study conducted in West Bengal shows that from the overall 22.36% prevalence of diarrhea 21.73% was found to be males and 22.89% female which shows that being male/female has no

significant difference for diarrhea morbidity risk, but the study reveals that age of the child was determinant factor for diarrheal morbidity; according to the study finding there were 57.69% diarrhea cases in children of 7-12 months age group, followed by 25.71% in those of 13-24 months age group(28). This finding were supported by a cross sectional study conducted in sub-Sahara Africa showed that the prevalence of diarrhea was 23.8% and children under 24 months were highly affected(33). A cross sectional study conducted in Ghana at the same year with Bengal shows that the mother's age [(AOR) = 3.52, 95% (CI) = 1.11–11.16] and educational level (AOR = 4.77, 95% CI = 1.85–12.28) were significant risk factors of childhood diarrhea(27).

A cross sectional Study conducted in Arba Minch in 2012 children whose mothers were not attending formal education were more likely to develop diarrhea when compared with children whose mothers were attending formal education (AOR = 1.89, 95% CI = 1.35, 2.53)(34). A Case control study conducted in North Achefer District, Northwest Ethiopia, monthly income of mothers was found to be determinants of diarrhea. According to this study children born from mothers whose monthly income were less than 850 Birr were nearly two times more likely to be cases than those whose mother's monthly income was higher than 850 Birr. However, in this study educational status of mothers fall below the level of statistical significance(23).

Another case control study in Wolayita Soddo in 2012 shows that the odds of developing diarrheal morbidity was 2.6 times higher among children with fathers having no formal education compared to those with fathers who completed high school (AOR=2.56, 95% CI:1.25, 5.25). according to the study diarrhea morbidity were about 4 times higher among families perceived that they were economically very poor when compared to families perceived they were rich or medium (AOR=3.84, 95% CI:1.25, 11.82). But the study reveals that other socio-demographic characteristics including, educational status, age, marital status, ethnicity of the mother and family size were not significantly associated with diarrhea morbidity(35). This finding is contrary to the study conducted in Arba Minch, Achefer district and Wolayita by its mother educational status factor.

### *2.3.2. Environmental factors*

Study in Wolayita Soddo and in Debrebirhan shows children in households with no latrine were about 13.5 times (AOR=13.45, 95% CI:3.58, 50.49) more likely to develop diarrhea compared to children of households with latrines(35). Another study conducted in west Gojam Ethiopia in 2012 The odds of having diarrhea in children who lived in households which had no latrine facility were

two times higher the odds than in children who lived in households which had latrine facility (AOR = 1.9, 95% CI: 1.03,3.38)(22). According to a cross sectional study conducted in eastern Ethiopia Improper refuse disposal practices (AOR = 2.22, 95% CI: 1.20, 4.03) and lack of hand washing facilities (AOR = 1.92, 95% CI: 1.29, 2.86) were the major risk factor for diarrhea morbidity(29).

### 2.3.3. Behavioral factors

A cross sectional study conducted in Qatar in 2011 showed that exclusive breast feeding was protective for diarrheal morbidity; according to this study the risk for presenting diarrhea was higher in formula fed (48.7%) and partially breastfed children (37.3%) when compared to EBF (32.5%)(36); this finding also proved by a cohort study conducted in Bangladesh that shows there was a significant association between the lack of exclusive breastfeeding and diarrhea morbidity; The adjusted odds ratio for diarrhea was 2.50 (95% CI: 1.10, 5.69)(37). Another longitudinal Study done in three Sub-Sahara country in 2013 shows Incidence of diarrheal morbidity among infants was found to be least among those exclusively breast fed for 6 months and most when EBF for less than 6 months ( $p = 0.045$ ). It was also more when infants were weaned with a combination of animal milk, formula milk, semi-solids and solid diet and least when weaned only with semi-solids and solids ( $P = 0.018$ ). Diarrheal episodes were more in infants who were bottle-fed ( $P < 0.001$ )(38).

Behavioral factors of diarrheal morbidity were similar with the study conducted in Qatar, Bangladesh and sub-Sahara Africa; for example study conducted in Debrebirhan method of drawing/pouring water from storage container, and covering water storage container had significant association with diarrheal diseases [(AOR: 1.371, 95% CI: 1.137 - 1.607) and (AOR: 1.304, 95% CI: 1.110 - 1.836)], respectively(31). Similarly study conducted in Arba Minch and in Wolayita Soddo showed children whose mother had poor hand washing practice were more likely to develop diarrhea when compared with children whose mother had good hand washing practice (AOR= 2.33, 95%CI =1.80, 4.15)(34).

## 2.2. Conceptual framework

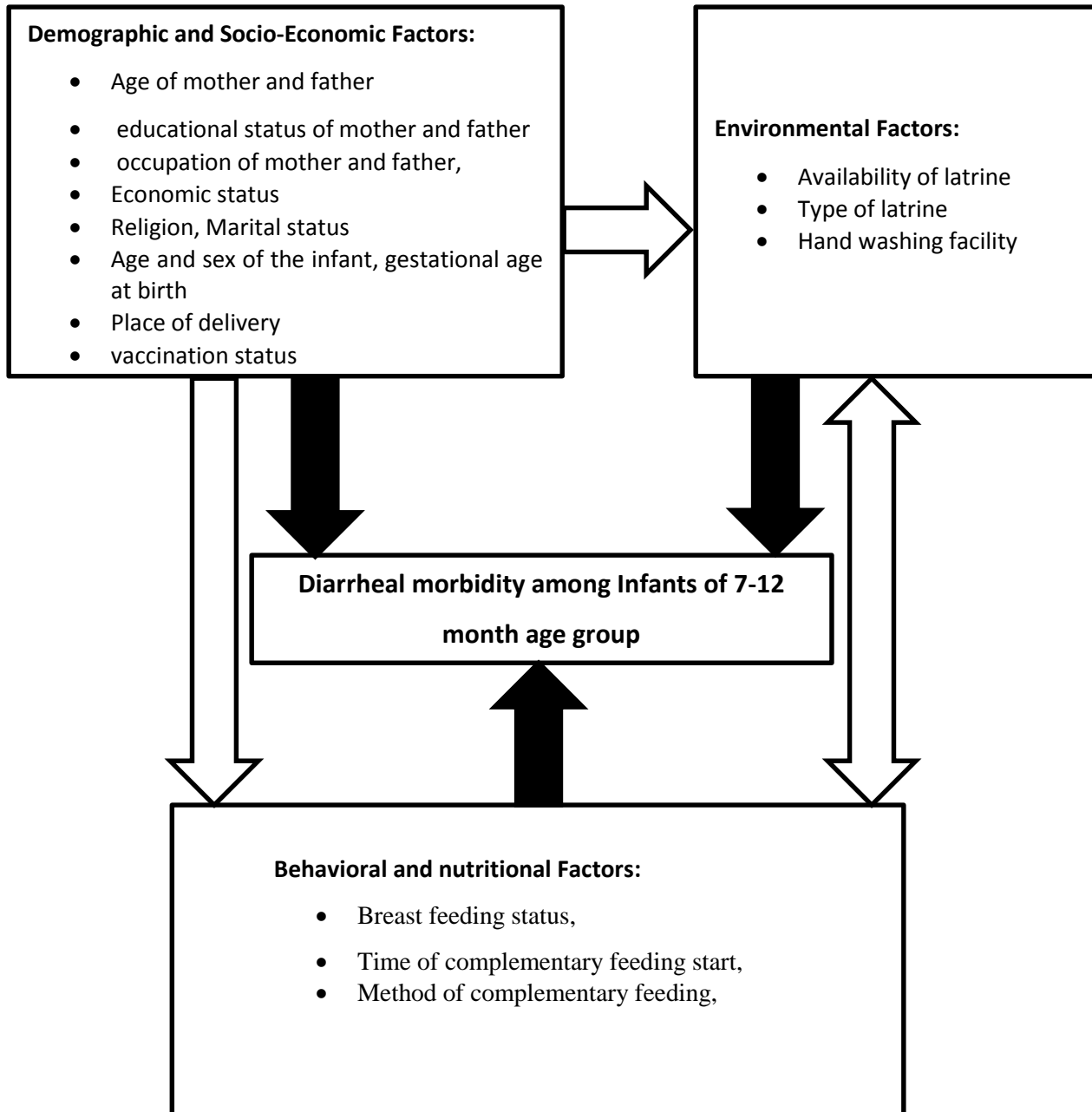


Figure 1 conceptual frame work that shows determinant factors of diarrheal morbidity developed from different literatures



### 2.3. Significance of the study

Finding the factors associated with childhood diarrhea helps to find possible intervention methods to decrease diarrheal morbidity. It also uses for monitoring and evaluation of child health program. So, this study will have important implications for health intervention programs and with a view of adding to the existing body of knowledge in the study area in particular and in the country in general. The result from this research also uses as a base line for further study.

### **3. Objectives**

#### **3.1. General objectives**

To assess the prevalence of diarrheal morbidity and associated factors among 7-12 month infants in Geze Gofa woreda, Gamo Gofa Zone, February- April 2016.

#### **3.2. Specific objectives**

- To determine the two-week prevalence of diarrheal disease among 7-12 month infants in Geze Gofa woreda, Gamo Gofa Zone.
- To identify factors associated with diarrheal morbidity among 7-12 month infants in Geze Gofa woreda, Gamo Gofa Zone.

## **4. Methods and Participants**

### **4.1. Study area and period**

The study was conducted in Geze Gofa woreda, Gamo Gofa Zone, Southern Ethiopia, which is located 517 Kilo meters to the south of Addis Ababa. The woreda is bounded by Demba Gofa Woreda in east direction, by Basketo special Woreda in west, by Melokoza Woreda in north and by Oyda Woreda in south direction.

In the woreda there are 30 Kebeles with a total of 18,231 households (HH). According to the woreda 2007 E.C demographic profile data the woreda has total estimated population of 85,667 out of which 42,576(49.7%) are male and 43,091(50.3%) are female. from this 13,373 (16%) are under five while 1,627 (2%) are 7-12 months age group.

In the woreda there are three public health centers, thirty health posts and three private clinics, 1 drug shops and 2 rural drug venders. There are also more than 7 different non-governmental organizations working on different areas like Integrated Family Health Programme (IFHP) and Communicable Disease Control program (CDC). There are three health centers which gives integrated management of neonatal and child illness (IMNCI) services by trained health professionals and one health center gives inpatient feeding center services. Data were collected April 12- 27, 2016.

### **4.2. Study design**

A community based cross-sectional study was conducted among 7-12 month infants in Geze Gofa woreda, Gamo Gofa zone.

### **4.3. Population**

#### *6.3.1.. Source population*

Infants of 7-12 month age in the woreda.

#### *6.3.2. Study Population*

Selected Infants of age 7- 12 months that fulfil the inclusion criteria.

#### *6.3.3. Study unit*

Infants of age 7-12 month.

#### 4.4. Inclusion and exclusion criteria

##### 4.4.1. Inclusion criteria

Infants of 7-12 months age with Mothers/care takers and who lived in the area.

##### 4.4.2. Exclusion criteria

Infants in the age group 7-12 months with mothers/care takers but who were unable to respond due to severe illness in the interview.

#### 4.5. Sample size determination

Using EPI INFO for window version 7, Sample size was calculated for each specific objective and the highest sample size was taken (n=386)

For Objective one: Sample size was calculated using single population proportion formula. The prevalence of diarrhea for the study area was not known from previous studies. Hence, the prevalence of diarrhea for infants of 7-12 month was taken from a study done in Tigray which is 26.35%(32).

So, by assuming  $p = 26.35\%$ ,  $Z_{\alpha/2}$  = critical value at 95% confidence interval (1.96),  $d$  =desired precision (5%), DEF = design effect for two stage sampling (1.5) and using correction formula since the source population is less than 10000 and finally adding 10% for none response rate, the total calculated sample size was 386 mothers/care takers with infants of 7-12 month who fulfilled the inclusion criteria.

$$\text{First: } n = \frac{[(Z_{\alpha/2})^2 \times P \times (1-P)] \times \text{DEF}}{d^2} = 447.3184$$

Where:  $n$  = the required sample size

$Z$  = the standard score corresponding to 95% CI, and is equal to 1.96

$P$  = the proportion of diarrhea which is to be 26.35%

$d$  = level of precision (margin of error) which is 5%

DEF = is design effect which is taken 1.5

Then: since  $N$  (entire source population) was less than 10,000 which is 1627, the required sample size was smaller. So that the desired sample size ( $NF$ ) estimated by using Finite Population Correction (FPC) formula.

$$NF = \frac{n}{1 + (n/N)} = 350.865$$

Where NF =desired sample size (with population < 10,000)

n=desired sample size (when population > 10,000) which is 447.3184

N=the estimate of the population size which is 1627

Finally adding 10% non-response rate

NF + 10% NF = 386 infants of 7-12 month.

For specific objective two: using two population proportion formula: considering latrine availability, occupation of father and measles vaccination as determinant of diarrheal morbidity taken from study done in Debre Birhan, Amhara region and shebedino District respectively.

Table 1 Epi info window version 7 two population proportion sample size calculation result and assumptions, 2016.

variable	Assumptions	Total sample
Latrine availability	% of unexposed with outcome= 28.5, % of exposed with outcome= 54.2, 95% CI, 80% Power, Ratio 1:1	128
Occupation of father	% of unexposed with outcome = 24.6, %exposed with outcome = 45.2, 95% CI, 80% Power, Ratio 1:1	94
Measles vaccination	% of unexposed with outcome= 21.4 % of exposed with outcome= 9.7, 95% CI, 80% Power, Ratio 1:1	322

#### 4.6. Sampling procedure

A two stage sampling method was employed to get study unit. First, the woreda was clustered into 30 kebeles. Then ten kebeles (more than 25% of the total twenty nine rural kebeles) was selected using simple random technique (lottery method). Finally proportional to size allocation, a total of 386 mothers/care givers with infants of 7-12 month age was identified from the selected ten Kebeles. The study unit was selected by simple random techniques using sample frame prepared from family folder registration data available in the health post.

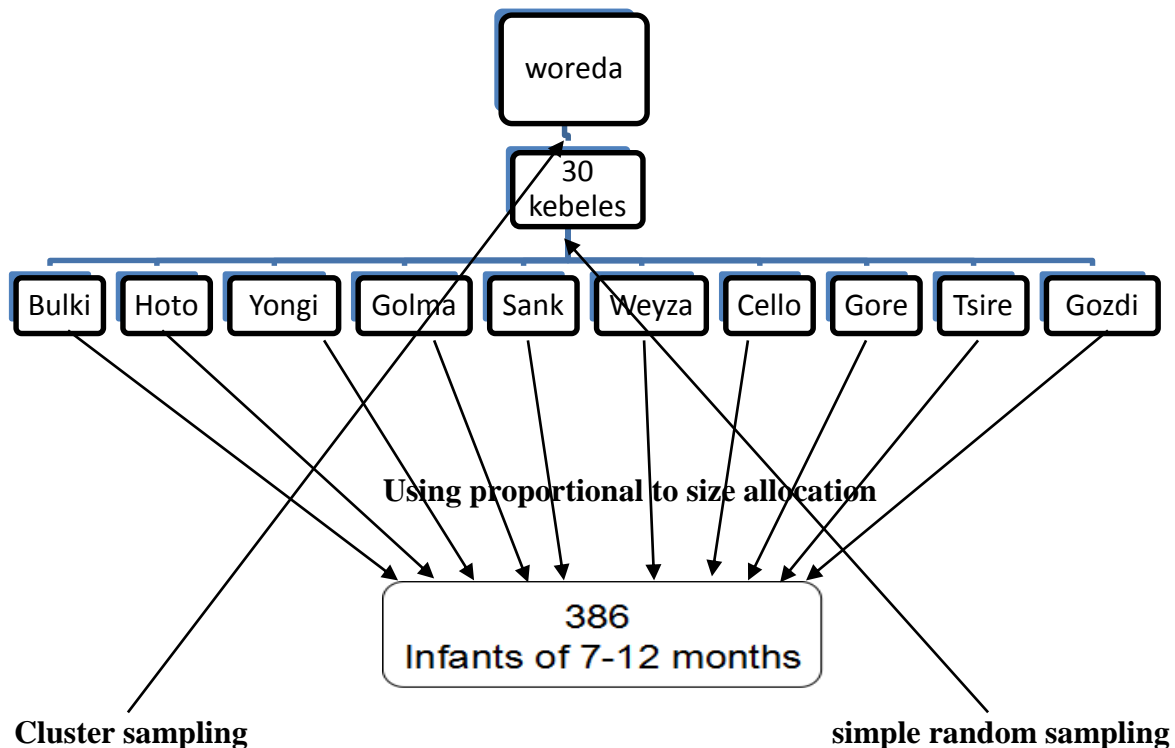


Figure 2 two stage sampling procedure stepwise illustration to study unit.

#### 4.7. Data collection techniques and procedures

Data collection was made using a house-to-house visit used structured questionnaire administered by an interviewer. The questionnaire was prepared based on EDHS 2011 data and other reviewed literatures. The questionnaire first was written in English, then translated into Amharic, and then translated back into English to assure its consistency. The respondents were

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

Ten data collectors who are non-health professional diploma holder and Amharic speakers were trained in questionnaire administration and data collection procedures and ways of data quality and ethical issue. The data collection was supervised by three supervisors (non-health professional degree holder) and the principal investigator at the center. Their role was to daily check the consistency, clarity and completeness of the completed questionnaires. The data collectors along with their supervisors were given two days training about the questionnaire and data collection procedures after prepared training manual.

#### 4.8. Data quality control

To ensure data quality, the questionnaires first prepared in English, then translated into Amharic, and back into English to assure its consistency. Training was given to data collectors. Questionnaire was pre-tested in infants with mother/care taker in Demba Gofa woreda that had similar population with the study area. Collected data was edited and cleaned on daily basis for completeness. Corrective measure was taken timely; to ensure data quality at each data collector level.

#### 4.9. Operational definition

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

**Behavioral factors:** for this study includes infant breast feeding practice, complementary feeding practice, method of feeding practice and feeding utensils washing practice.

**Child immunized:** applied to using immunization card or if the mother/care takers remember her infant immunization status.

**Uneducated:** is to mean as the respondents answer that they have no any formal education or cannot read and write.

**Primary school education:** is to mean as the respondents answer that they have educated formal education up to grade seven and lower.

**Higher education:** is to mean as the respondents answer that they have educated up to grade eight and above.

**Improved latrine:** is to mean latrine that has cover and no flies around during survey including Flush/pour flush to piped sewer system, Flush/pour flush to septic tank and Ventilated improved pit (VIP) latrine.

**Unimproved latrine:** is to mean latrine that has no cover and flies around it during survey.

**Hand washing availability:** is to mean availability of water with soap or ash during survey and as the respondent told they use it.

**Improved water source:** is to mean as the respondents answer that the household's uses water from Pipe, Protected dug well, protected spring.

**Unimproved water source:** is to mean as the respondents answer that the household uses water from unprotected well, unprotected spring, River.

**Less frequent feeding utensils wash:** applied to mothers/care takers who respond as they does not wash their infants feeding utensils immediately before and after use.

**Prevalence:** the number of diarrhea cases at the time of the interview divided by the total number of infants included in the study.

#### 4.10. Study variables

##### 4.10.1. *Dependent variable*

Diarrheal morbidity among infants of 7-12 month age group.

##### 4.10.2. *Independent variables*

**Demographic and Socio-Economic Factors:** Age of mother/care taker and the father, marital status, house hold economic status, educational status of mother/care taker and father, occupation of mother/care taker and father, religion, age of the infant, sex of the infants, vaccination status, place of delivery, type of birth and gestational age at birth.

**Environmental Factors:** Type of water source, Availability of latrine, type of latrine, Availability of hand washing facility, Type of floor and roof of the house.

**Behavioral factors:** Breast feeding status of the infant, time of breast feeding start, duration of breast feeding, complementary feeding status, time of complementary feeding start, method of complementary feeding and washing frequency of feeding utensils.

#### 4.11. Data processing and analysis

After completing data collection, the data were categorized and coded by the principal investigator. The data entered in to EPI data software version 3.1 were transferred to SPSS version 20 for



analysis. Descriptive statistics was done to summarize the study variables. Binary logistic regression was used to assess the relationship between infant diarrhea and each factors. To reduce excessive number of variables and resulting instability of the model binary logistic regression was performed separately for each variables. Factors with a p-value  $\leq 0.25$  were considered as candidates and included in to multiple logistic regression model. All candidate variables were entered together in multiple logistic regression model used back ward stepwise method to select the significant determinants and adjusted for confounding factors. Hosmer-Lemeshow goodness-of-fit test was checked and it was  $> 0.05$  which fit the model. Multiple logistic regression model identify an independent predictors of outcome variables. Variables at P value  $< 0.05$  in the multiple logistic regression model were considered significant. House hold economic status was estimated based house hold assets using principal component analysis.

#### 4.12. Ethical consideration

Ethical clearance was obtained from Institutional Review Board (IRB), Jimma University. Permission was obtained from Geze Gofa woreda health office. Verbal consent was secured from each respondents. The respondents name did not mention to maintain Confidentiality and privacy. Infants with diarrhea during the data collection process were given ORS and their family members were advised to take them to the nearby health institution for better management.

#### 4.13. Dissemination of the finding

The result of this study will be presented to Jimma University colleague of Health Science department of epidemiology. It is also disseminated to southern regional health bureau, Gamo Gofa zone health department, Geze Gofa woreda health office and to local NGOs in the study area working on infant care and support. Efforts will be done to publish in peer reviewed journal.

## 5. Results

### 5.1 sociodemographic and economic characteristics

A total of 385 mothers with infants of 7-12 months participated in the study with a response rate of 99.7%. The age range of mothers/care takers in this study was between 15 and 48 years. The mean age was 27.5 (SD $\pm$ 9.9) years. As to the educational background, 153 (39.9%) were uneducated, 98 (25.4%) primary school and the rest 134 (34.7%) were higher-level students and graduates. Nearly, all of the respondents were married. Among mothers/care takers in this study 347 (90.2%) were housewife. As to the infants: male infants were 202(52.7%) of the total study

subjects. 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 employ. One hundred sixty five (43%) of husbands were uneducated while others were primary school and higher and graduate level. Regarding religion, 194(50.7%) households were protestant, 140(36.6%) were orthodox Christians and 17(4.4%) were Muslims (Table 2).

Table 2 Socio demographic and economic and economic characteristics of the respondents Geze Gofa woreda, southern Ethiopia, 2016.

<b>variables</b>	<b>frequency</b>	<b>%</b>
<b>Sex of the infant</b>		
Male	202	52.7
Female	183	46.3
<b>Place of delivery</b>		
Health institution	319	82.9
Home	66	17.1
<b>marital status of the respondent</b>		
married	377	97.9
unmarried	8	2.1
<b>Educational status of the mother</b>		
uneducated	153	39.9
higher and graduate	134	34.7
primary school	98	25.4
<b>occupation of the mother/care taker</b>		
housewife	347	90.2
government employee	22	5.7
other	16	4.1
<b>age of the child mother/caretakers</b>		
15-24	209	54.4
25-34	63	16.3
35-49	113	29.3

<b>educational level of the father</b>		
uneducated	165	43
primary school	129	33.4
higher and graduate	91	213.6
<b>occupation of the father</b>		
farmer	256	66.6
merchant	93	24.1
government employee	36	9.3

Three hundred one (78%) of infants were vaccinated for Rota vaccination while eighty four (22%) were not vaccinated. Regarding wealth index quintal, 83 (21.5%) were in the second wealth quintile.

## 5.2 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 3).

Table 3 Characteristics of infants living environment Geze Gofa woreda July, 2016.

<b>Variables</b>	<b>frequency</b>	<b>%</b>
<b>Type of house floor</b>		
Mud	333	86.5
Cement	46	11.9
Other	6	1.6
Total	385	100
<b>Availability of latrine</b>		
Yes	331	86
No	54	14
<b>Type of latrine</b>		
Non Improved	344	98.6
improved	5	1.4

**Availability of hand washing facility**

Yes	251	73.2
No	94	26.8

**Sources of drinking water**

Improved source	255	66.3
Unimproved source	130	33.7

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**5.3 nutritional and behavioral characteristics**

Out of 381(98.7%) breast feed infants, 348(91.1%) started breast fed immediately after birth. Three hundred seventy six (97.7%) infants started complementary feeding out of which 283(74.5%) started complementary feeding at six month, 96(25.3%) before six month and other after six month whereas 9(2.3%) 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) of mothers/care takers took their diseased infant to health facility for medication. (Table 4). One hundred thirty four (35.5%) mother/care takers use bottle while 197(52.3%) mother/care takers use cup to feed their infant.

Table 4 Behavioral characteristics of infant and respondents Geze Gofa woreda July, 2016.

<b>Variables</b>	<b>frequency</b>	<b>%</b>
<b>Complementary feeding starting status</b>		
Yes	376	97.7
No	9	2.3
<b>complementary feeding start time (month)</b>		
At 6	283	74.5
Before 6	96	25.3
After 6	1	0.3
<b>Frequency of washing feeding utensils</b>		
Immediately before and after use	182	50.1
Less frequent	181	49.9
total	363	100
<b>Action taken for the diarrhea</b>		

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Continue feeding	42	51.9
Stop feeding	32	39.55
Decrease feeding	7	8.6
Total	81	100

#### 5.4 prevalence of infant Diarrhea

In this study the prevalence of diarrhea among infants of 7-12 month infants 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 (table 5).

.Table 5 Diarrheal morbidity among infants of age 7-12 month by some characteristics Geze Gofa woreda July, 2016.

characteristics	Participants	Diarrhea morbidity
	N	N (%)
<b>Family size</b>		
<= 4	172	37(21.5)
>4	212	44(20.8)
<b>Maternal occupation</b>		
Government employ	16	0(0)
Housewife	347	80(23)
other	22	1(04.5)
<b>Marital status</b>		
Married	377	81(21.4)
single	8	0(0)
<b>Age of mother</b>		
15-24	209	37(17.6)
25-34	63	13(20.6)
35-49	113	31(27.4)

<b>Dwelling floor</b>		
Mood	333	73(21.9)
Cement	46	8(17.4)
other	6	0(0)
<b>Start complementary Feeding</b>		
Yes	376	79(21)
no	9	2(22.2)

## 5.5. Factors associated with infant diarrheal morbidity

### 5.5.1. Bivariate analysis

The results from bivariate analysis showed: sex of infant (COR: 1.347, 95% CI: 0.820, 42.213), type of birth (COR: 1.993, 95% CI: 0.860, 4..620), Rota vaccination (COR: 1.890, 95% CI: 1.092, 3.290), father's education (COR: 1.784, 95% CI: 1.089, 2.922), house hold wealth index quintal (COR: 0.428, 95% CI: 0.203, 0.899), availability of latrine (COR: 1.730, 95% CI: 0.908, 3.293), availability of hand washing facility (COR: 2.523, 95% CI: 1.437, 4.428), source of drinking water (COR: 4.820, 95% CI: 2.882, 8.119), infant age at which complementary feeding start (COR: 4.157, 95% CI: 2.454, 7.041), method of complementary feeding feed (COR: 0.480, 95% CI: 0.290, 0.794), feeding utensils washing practices (COR: 2.367, 95% CI: 0.833, 5.568) and frequency of washing (COR: 2.331, 95% CI: 1.366, 3.978) were candidate variables for multiple logistic regression model at p-value <0.25 (Table 5).

Table 6 Bivariate analysis of diarrheal morbidity among infants of age 7-12 month by sociodemographic and economic, environmental and behavioral determinant characteristics in Geze Gofa woreda, 2016.

characteristics	Diarrheal morbidity		COR (95% CI)
	N (%)		
	yes	no	
<b>Sex of infant</b>			
M	37 (18.3)	165 (81.7)	1.00
f	42 (23.2)	139 (76.7)	1.347 (0.820, 2.213)*

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<b>Place of delivery</b>			
Health institution	68 (21.2)	251 (78.8)	1.00
Home	13 (19.7)	53 (80.3)	1.100 (0.567, 2.135)
<b>total family size</b>			
>4	37 (21.5)	135 (78.5)	1.00
<=4	44 (20.8)	168 (79.2)	0.956 (0.584, 1.564)
<b>Educational status of the mother</b>			
uneducated	35 (22.7)	118 (77.3)	1.169 (0.724, 1.953)
higher and graduate	23 (17.2)	111 (82.8)	1.00
primary school	23 (23.5)	75 (76.5)	1.216 (0.702, 2.105)
<b>Maternal education</b>			
15-24	37 (17.6)	172 (82.4)	1.00
25-34	13 (20.6)	50 (74.9)	0.975 (0.501, 1.898)
35-49	31 (27.4)	82 (72.6)	0.975 (0.501, 1.898)
<b>Father educational status</b>			
uneducated	44 (26.5)	121 (73.5)	1.784 (1.089, 2.922)*
Primary	20 (15.5)	109 (84.5)	0.590 (0.338, 1.029)*
High level	17 (18.7)	74 (18.3)	1.00
<b>Wealth index quintal</b>			
Lowest quintile	12 (16.4)	61 (83.6)	0.922 (0.504, 1.688)
Second quintile	15 (18.1)	68 (81.9)	1.016 (0.549, 1.878)
Middle quintile	23 (25)	68 (75)	1.00
Fourth quintile	18 (28.6)	45 (71.4)	0.428 (0.203, 0.899) *
Highest quintile	13 (17.3)	62 (82.7)	0.701 (0.392, 1.254)
<b>Latrine availability</b>			
Yes	65 (19.6)	266 (80.4)	1.00
no	16 (29.6)	38 (70.4)	1.730 (0.908, 3.293)*
<b>Handwashing</b>			
Yes	37 (14.4)	220 (85.6)	1.00
no	28 (29.8)	66 (70.2)	2.523 (1.437, 4.428) **

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<b>Water source</b>			
Improved	37 (14.5)	218 (85.5)	1.00
unimproved	44 (33.8)	86 (66.2)	4.820 (2.882,8.119) **
<b>Complementary feeding start</b>			
6 month	40 (14.1)	243 (85.9)	1.00
before 6 month	39 (40.6)	57 (59.4)	4.157 (2.454, 7.041) **
<b>Method of feeding</b>			
Bottle	39 (29.1)	95 (70.9)	0.480 (0.290, 0.794) **
Cup	34 (17.3)	163 (82.7)	1.00
<b>Frequency</b>			
Immediately	25 (13.7)	157 (86.3)	1.00
Less frequently	49 (27.1)	132 (72.9)	2.331 (1.366,3.978) **

\* Factor candidate at p-value < 0.25

\*\* Factor significant at p-value < 0.05

### 5.5.2. Multivariate analysis

Adjustment of variables using multiple logistic regression was made for predicting variables that were associated with infant diarrhea morbidity during crude analysis. The odds of experiencing diarrhea among infants who did not take Rota immunization were almost 2.5 times higher than the odds of experiencing diarrhea among infants who took Rota immunization [AOR: 2.518, 95 % C.I: 1.221, 5.193].

Moreover, diarrhea among infants in the house hold without hand washing facilities had 2.912 times higher odds of having diarrhea as compared to infant in the households with hand washing facility[AOR: 1.912, 95% CI: 1.499, 5.659]. 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: 3.643, 95% CI : 1.924, 6.897].

Infants who started complementary feeding before six months were about three times more at odds with having diarrhea than infants who started complementary feeding at six month (AOR 3.117 95% CI: 1.604, 6.059). Moreover infant diarrhea in those whose mother/care takers fed their infant by bottle were two times higher than the odd of having diarrhea in infants whose mother/care takers fed their infant by cup [AOR: 2.180, 95% CI: 1.122, 4.235] (Table 6).



Table 7 multi variable analysis of risk factors of diarrhea among 7-12 months of age in Geze Gofa woreda, Southern Ethiopia, 2016.

characteristics	Diarrheal morbidity		COR (95% CI)	AOR (95% CI)
	Yes (%)	No (%)		
<b>Sex</b>				
M	37 (18.3)	165 (81.7)	1.00	1.00
f	42 (23.2)	139 (76.7)	1.347 (0.820, 2.213)	1.640 (0.857, 3.139)
<b>Type of birth</b>				
single	72 (20.1)	286 (79.9)	1.00	1.00
twin	9 (33.3)	18 (66.7)	1.993 (0.860, 4.620)	0.825 (0.191, 3.276)
<b>Rota immunization</b>				
Yes	45(18.3)	283(81.7)	1.00	1.00
no	25(29.8)	59(70.2)	1.895(1.092, 3.290)	2.518(1.221, 5.193)***
<b>Father education</b>				
uneducated	44 (26.5)	121 (73.5)	1.784 (1.089, 2.922)	1.653 (0.842, 3.244)
Primary	20 (15.5)	109 (84.5)	0.590 (0.338, 1.029)	0.898 (0.339, 2.380)
High level	17 (18.7)	74 (18.3)	1.00	1.00
<b>Latrine availability</b>				
Yes	65 (19.6)	266 (80.4)	1.00	1.00
no	16 (29.6)	38 (70.4)	1.730 (0.908, 3.293)	1.085 (0.362, 3.249)
<b>Handwashing</b>				
Yes	37(14.4)	220(85.6)	1.00	1.00
no	28(29.8)	66(70.2)	2.523(1.437,4.428)	2.912(1.499, 5.659)***
<b>Water source</b>				
Improved	37(14.5)	218(85.5)	1.00	1.00
unimproved	44(33.8)	86(66.2)	3.028(1.831, 5.009)	3.643(1.924, 6.897)***
<b>Compl. feeding start</b>				
6 month	40(14.1)	243(85.9)	1.00	1.00
before 6 month	39(40.6)	57(59.4)	4.157(2.454, 7.041)	3.117(1.604, 6.059)***

<b>feeding method</b>				
Bottle	39(29.1)	95(70.9)	0.480(0.290, 0.794)	2.180(1.122, 4.235)***
Cup	34(17.3)	163(82.7)	1.00	1.00
<b>Frequency</b>				
Immediately	25 (13.7)	157 (86.3)	1.00	1.00
Less frequently	49 (27.1)	132 (72.9)	2.331 (1.366,3.978)	1.668 (0.858, 3.245)

\*\*\*Factor significant at p-value < 0.05

## 6. Discussion

Diarrhea is widely recognized a major causes of infant morbidity and is affected by socio demographic factors, environmental factors and behavioral factors. In our 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% (28) and study done in eastern Ethiopia in 2013 which was 22.5%(29); It is also Similar with study conducted in 2014 that documented the prevalence of diarrhea to be 19.6% in Shebedino district western Ethiopia(30). 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% (1). It is also higher than a study done in Ghana in 2015 (11.4%) (27). The high prevalence in the current study could be due to the season of data collection which was wet season when diarrhea prevalence is high. It could also be due to difference in basic environmental and behavioral characteristics of the mothers/care takers.

From all the socio demographic variables considered in this study, only infant Rota vaccination status remained significant after controlling for possible confounding variables. Diarrhea among infants who did not take Rota vaccination was higher than among infants who took Rota vaccination [AOR: 2.518, 95 % C.I: 1.221, 5.193]. This finding is consistent with a study done in wolayita Soddo in 2012 (35). The explanation for this could be that Rota vaccine has protective effect against infant diarrheal morbidity.

This study also showed that there was a significant positive association between the availability of hand washing facility with infant diarrhea. The prevalence of diarrhea in infants who lived in households without hand washing facility was about three times higher than infants who lived

households with hand washing facility and this is similar with a study done in eastern Ethiopia (29). 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 shows only 57 % of households have access to an improved source of drinking water in Ethiopia (10). Similarly this study shows that 66.3% of the respondents used an improved water source. The study also shows that the prevalence of diarrhea in infant who live in house hold who use an unimproved water source was 3.6 times higher than in infant who live in house hold who use an improved water source. It is consistent with study conducted in Debrebirhan (31), in Qatar (36) and in Bangladesh (37). This could be explained by feeding infants food which is prepared with unclean water that can expose infants for 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 were significantly associated with incidence of diarrheal morbidity. Diarrhea among infants who start complementary feeding before six month were three times higher than infants who start at six month. This finding is similar with a study done in Qatar in 2011 and Bangladesh (36) (37). It is may be due to that protective effect of exclusive breast feeding in the first six month.

Method of complementary feeding were significantly associated with incidence of diarrheal morbidity. This study showed that using bottle to fed infant increase occurrence of diarrhea. This is consistent with study done in three Sub-Sahara countries in 2013, (38). This could be explained by bottle fed is more exposed for contamination.

## **7. Limitations**

In this study, mothers were asked if the infant had diarrhea in the past two weeks that could have a possible recall bias. The practice of breast-feeding in the past six months is also liable to a possible recall bias. The study was conducted in the early rainy season and probably it might have overestimate diarrhea prevalence as compared to dry rainy season, and a limitation to the generalizability of the result.

## 8. Conclusion

Diarrhea remains an important health concern in the study community. Twenty one percent of infants in the study area were suffering with diarrhea. Occurrence of diarrhea could be decreased by interventions aimed to improve infant Rota vaccination status, hand washing facility availability, usage of improved water source, not starting complementary feeding before six month and using cup to feed infant.

## 9. Recommendations

Depending on this study finding, the woreda water and energy office has to work to increase improved water source for the community. The woreda health office has to plan and work to increase the awareness of the community about importance of hand washing facility to decrease diarrhea. Health extension worker should teach mothers/care takers so that get their infants vaccinated Rota vaccination, to wash feeding utensils before and after use, to feed exclusive breast feed up to six month and to use cup to feed their infant. Further study should be done to identify the possible other factors that are responsible for the high prevalence of diarrhea for proper interventions.

### a. Reference

1. Macro O. Ethiopia Demographic and Health Survey, 2000. Heal San Fr [Internet]. 2001;(March):1–5. Available from: [http://www.measuredhs.com/pubs/pub\\_details.cfm?ID=596&srchTp=type\nhttp://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Ethiopia+Demographic+and+Health+Survey#4](http://www.measuredhs.com/pubs/pub_details.cfm?ID=596&srchTp=type\nhttp://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Ethiopia+Demographic+and+Health+Survey#4)
2. WHO, UNICEF, WB U-D. New data show child mortality rates falling faster than ever [Internet]. 2014. p. 4–7. Available from: [http://www.who.int/mediacentre/news/releases/2014/child\\_mortality\\_estimates/en/#](http://www.who.int/mediacentre/news/releases/2014/child_mortality_estimates/en/#)

3. The World Bank. Mortality rate, infant (per 1,000 live births) [Internet]. 2015. Available from: <http://data.worldbank.org/indicator/SP.DYN.IMRT.IN?page=1>
4. Weldearegawi B, Melaku YA, Abera SF, Ashebir Y, Haile F, Mulugeta A, et al. Infant mortality and causes of infant deaths in rural Ethiopia : a population-based cohort of 3684 births. *BMC Public Health* [Internet]. *BMC Public Health*; 2015;1–7. Available from: <http://dx.doi.org/10.1186/s12889-015-2090-x>
5. Central Statistical Agency. 2014 Ethiopia Mini Demographic and Health Survey (EMDHS). 2014;(August):111.
6. MoFED. The Federal Democratic Republic of Ethiopia Growth and Transformation Plan (GTP) 2010/11-2014/15. 2010;(September 2010):1–85. Available from: [http://www.ethiopians.com/Ethiopia\\_GTP\\_2015.pdf](http://www.ethiopians.com/Ethiopia_GTP_2015.pdf)
7. Health FDR of EM of, Health. Health Sector Development Programme IV 2010/11 – 2014/15. 2014.
8. GoE. Assessing progress towards the Millennium Development Goals [Internet]. 2012. p. 42. Available from: [http://www.et.undp.org/content/dam/ethiopia/docs/Ethiopia MDG Report 2012\\_Final.pdf](http://www.et.undp.org/content/dam/ethiopia/docs/Ethiopia_MDG_Report_2012_Final.pdf)
9. WHO. WHO | Diarrhoeal disease Fact sheet N°330 [Internet]. 2013. Available from: <http://www.who.int/mediacentre/factsheets/fs330/en/>
10. Exavery A, Kanté AM, Hingora A, Phillips JF. Determinants of early initiation of breastfeeding in rural Tanzania. *Int Breastfeed J* [Internet]. *International Breastfeeding Journal*; 2015;10(1):27. Available from: <http://www.internationalbreastfeedingjournal.com/content/10/1/27>
11. Karambu S, Matiru V, Kiptoo M, Oundo J. Characterization and factors associated with diarrhoeal diseases caused by enteric bacterial pathogens among children aged five years and below attending Igembe District Hospital, Kenya. *Pan Afr Med J* [Internet]. 2013;16:1–8. Available from: <http://www.panafrican-med-journal.com/content/article/16/37/full/>
12. UNICEF. Thematic Report 2013 Young child survival and development. 2013;
13. Series LN. Scientific Rationale : Benefits of Breastfeeding . 2012. 2012. p. 1–7.
14. CDC. Diarrhea : Common Illness , Global Killer. *Centers Dis Control Prev*. 2012;1–4.
15. United Nations Statistic Division. unstats Millennium Indicators [Internet]. The official United Nations site for the MDG indicators. 2013. p. 1. Available from:

<http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=749>

16. Programme HE, Fund MDGP. Excelent returns on your development funding. Ethiop Heal Sect. 2013;
17. Diarrhea - Wikipedia, the free encyclopedia.
18. CDC. Global Diarrhea Burden \_ Global Water, Sanitation and Hygiene \_ Healthy Water \_ CDC.
19. Health C, Report S. Childhood Diarrhea in Sub-Saharan Africa. Health (San Francisco). 1998.
20. Stanly AM, Palani G. A POPULATION BASED STUDY OF ACUTE DIARRHOEA AMONG CHILDREN UNDER 5 YEARS IN A RURAL COMMUNITY IN SOUTH INDIA. Dep Community Med Sri Ramachandra Univ Chennai. 2009;1(1):1–7.
21. Peletz R, Simuyandi M, Sarenje K, Baisley K, Kelly P, Filteau S, et al. Drinking water quality, feeding practices, and diarrhea among children under 2 years of HIV-positive mothers in Peri-Urban Zambia. Am J Trop Med Hyg. 2011;85(2):318–26.
22. Dessalegn M, Kumie A, Tefera W. Predictors of under-five childhood diarrhea: {Mecha} {District}, {West} {Gojam}, {Ethiopia}. Ethiop J Heal Dev. 2012;25(3):192–200.
23. Gedefaw M, Berhe R. Determinates of Childhood Pneumonia and Diarrhea with Special Emphasis to Exclusive Breastfeeding in North Achefer District , Northwest Ethiopia : A Case Control Study. 2015;(May):107–12.
24. Mohammed S. Morbidity and Associated Factors of Diarrheal Diseases Among Under Five Children in Arba-Minch District, Southern Ethiopia, 2012. Sci J Public Heal [Internet]. 2013;1(2):102. Available from: <http://www.sciencepublishinggroup.com/journal/paperinfo.aspx?journalid=251&doi=10.11648/j.sjph.20130102.19>
25. stefano guandalini and halen vaziriE. diarrhea diagnostic and therapeutic advances Series Editor. 2011.
26. Wardlaw T, Salama P, Brocklehurst C, Chopra M, Mason E. Diarrhoea: why children are still dying and what can be done. The Lancet. 2010. p. 870–2.
27. Danquah L. Risk Factors Associated with Diarrhea Morbidity Among Children Younger than Five Years in the Atwima Nwabiagya District, Ghana: A Cross-Sectional Study. Sci J Public Heal [Internet]. 2015;3(3):344. Available from:

- <http://www.sciencepublishinggroup.com/journal/paperinfo.aspx?journalid=251&doi=10.11648/j.sjph.20150303.17>
28. Gupta A, Sarker G, Rout AJ, Mondal T, Pal R. Risk correlates of diarrhea in children under 5 years of age in slums of bankura, west bengal. [Internet]. *Journal of global infectious diseases*. 2015. p. 23–9. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4338445&tool=pmcentrez&rendertype=abstract>
  29. Mengistie B, Berhane Y, Worku A. Prevalence of diarrhea and associated risk factors among children under-five years of age in Eastern Ethiopia: A cross-sectional study. *Open J Prev Med* [Internet]. 2013;03(07):446–53. Available from: <http://www.scirp.org/journal/PaperDownload.aspx?DOI=10.4236/ojpm.2013.37060>
  30. Tamiso A. Prevalence and Determinants of Childhood Diarrhoea among Graduated Households, in Rural Area of Shebedino District, Southern Ethiopia, 2013. *Sci J Public Heal* [Internet]. 2014;2(3):243. Available from: <http://www.sciencepublishinggroup.com/journal/paperinfo.aspx?journalid=251&doi=10.11648/j.sjph.20140203.28>
  31. Region A, Mamo A, Hailu A. Assessment of Prevalence and Related Factors of Diarrheal Diseases among Under-Five Year ' s Children in Debrebirehan Referral Hospital , Debrebirehan Town , North Shoa. 2014;(April):1–14.
  32. Gezehagne G. “Feeding profile and diarrhea morbidity among infants of 7-12 months” A community based study among mothers with infants of 7-12 months in Adua town, Tigray, North Ethiopia 2006. 2006;
  33. Tambe AB, Nzefa LD, Nicoline NA. Childhood Diarrhea Determinants in Sub-Saharan Africa: A Cross Sectional Study of Tiko-Cameroon. *Challenges* 2015, 6, 229-243; doi103390/challe6020229. 2015;229–43.
  34. Mohammed S, Tamiru D. The occurrence of childhood diarrhea and its home management among mothers of under-five years children in Arba Minch Zuria , Southern Ethiopia. 2013;1(3):135–40.
  35. Mulat T, Fikre E. A case control study on determinants of diarrheal morbidity among under-five children in Wolaita Soddo Town, Southern Ethiopia. 2012;26(School of Public Health, Addis Ababa University, Addis Ababa, Ethiopia.):78–85. Available from:

<http://ejhd.uib.no/>

36. Bener A. Exclusive breast feeding and prevention of diarrheal diseases . A study in Qatar . Um estudo realizado no Qatar. 2011;11(1):83–7.
37. Mhrshahi S, Oddy WH, Peat JK, Kabir I. Association between infant feeding patterns and diarrhoeal and respiratory illness: a cohort study in Chittagong, Bangladesh. Int Breastfeed J. 2008;3:28.
38. J. N. Bf Subsahara. indian journal community medicine; 2013.

b. annex

*i. Questioners*

**Jimma University collage of health science**

Questionnaire prepared to assess childhood diarrheal disease and associated factors in Geze Gofa woreda 2015.

Introduction and Consent

Hello. My name is \_\_\_\_\_ I am on behalf of Deresse Gashaw, student of Jimma University. He is conducting a research for the partial fulfillment of masters' degree on childhood diarrhea among infants of 7-12 month of age in Geze Gofa woreda.



Your household is selected randomly to participate in this study and there are other households to be selected randomly in the woreda. Therefore, I am going to ask you several questions about those factors and related issues about the research. He has received permission from Jimma University, Woreda council office and respective health offices to conduct this study. I would very much appreciate your participation in this interview. We assure that the interview process will not bring any harm to you and your family. Whatever information you provide will be kept strictly confidential, and will not be shared with anyone other than the investigator. Participation in this survey is voluntary, and if we should come to any question you don't want to answer, just let me know and I will go on to the next question; or you can stop the interview at any time. However, we hope you will participate in the survey since your views are important. At this time, do you want to ask me anything about the survey?

Are you willing to participate in this study?

1. Yes: -..... Continue to the next page
2. No: -..... Skip to the next participant

Interviewer name \_\_\_\_\_ signature \_\_\_\_\_  
 Date of interview \_\_\_\_\_ Time started \_\_\_\_\_ Time-finished \_\_\_\_\_  
 Supervisor name \_\_\_\_\_ Signature \_\_\_\_\_

QUESTIONNAIRE ON EXCLUSIVE BREAST FEEDING STATUS AND  
 DIARRHEAL MORBIDITY AMONG INFANTS OF 7-12 MONTHS AGE

001. QUESTIONNAIRE NUMBER \_\_\_\_\_  
 002. STUDY AREA KEBELE \_\_\_\_\_  
 003. HOUSE CODE/HOUSE NUMBER \_\_\_\_\_ VISIT NUMBER 1 \_\_\_\_\_ 2 \_\_\_\_\_ 3  
 \_\_\_\_\_ 3+ \_\_\_\_\_  
 Name of interviewer \_\_\_\_\_ Date of interview DD \_\_\_\_\_ MM \_\_\_\_\_ YY \_\_\_\_\_

**Part one: Demographic and socioeconomic characteristics**

No	Questions	Response in code	order
----	-----------	------------------	-------

Q101	Infant's age in month		
Q102	Infant's sex	1. male 2. Female	
Q103	Place of delivery.	1 Home 2. Health institution	
Q104	Type of birth	1. Single 2. Twin	
Q105	Gestational age at birth	1. Term 2. Pre term 3. Post term	
Q106	Had the infant ever been vaccinated?	1. Yes 2. No	If no skip to Q108
Q107	If yes see card for vaccination/check for vaccination	1. BCG 2. PENTA 3. PCV 4. ROTA 5. MEASLE 6. No card found	
Q108	Relation of the respondent to the infant	1. Mother 2. Care taker	
Q109	Marital status of the mother/care taker	1. Married 2. Divorced 3. Single 4. Widowed 5. separated	
Q110	Total family size In no	-----	
Q111	Religion of the parents/care taker	1. orthodox 2. Muslim 3. catholic	

		4. protestant 5. Other (specify)	
Q112	Educational status of the mother/care taker	1.uneducated 2.primary school educated 3. higher school educated	
Q113	Occupation of the mother/care taker	1. Government employee 2. Housewife 3. Other (specify)	
Q114	Age of the child's mother	-----years	
Q115	Educational level of the father	1. uneducated 2. primary school educated 3. higher school educated	
Q116	Occupation of the father	1. Governmental employee 2. Farmer 3. Other	
Q117	Do you have any of the following? (More than one is possible) Radio? Television? Mobile Telephone? None mobile telephone? Electricity? Electric mitad? Chair? Table Bed with cotton/sponge/spring Mattress? Watch/clock? Refrigerator? Kerosene lamp/pressure lamp? Milk cows, oxen or bulls?	Yes (√)    No (x)	

	Horses, donkeys, or mules? Camels? Goats? Sheep? Chickens? Beehive?		
Q119	Does any member of this household own any land?	Yes (√) No (x)	
Q120	Does any member of this household have a bank or microfinance saving Account?	Yes (√) No (x)	

**Part two: Environmental health conditions**

Q201	Type of floor material of the living house (observation)	1. Mud 2. Cement 3. Other	
Q202	Type of roof material of the living house (observation)	1. Thatched 2. Corrugated iron sheet 3. Others	
Q203	Do you have latrine?	Yes (√) No (x)	If No skip to Q 206
Q204	Type of latrine facility (observation)	1. Flush/pour flush to piped sewer system 2. Flush/pour flush to septic tank 3. pit latrine 4. Ventilated improved pit (VIP) latrine 5. Others (specify)	
Q205	Do you have hand washing facility?	Yes (√) No (x)	

Q206	From where do you get water for drinking?	1. Pipe 2. Protected well/spring 3. Unprotected well/spring 4. River 5. Other (specify)	

**Part three: Behavioral conditions / Feeding practice**

Q301	Did you breast-feed your infant after birth?	1. Yes 2. No	
Q302	After how many hours did you breast-feed?	1. Immediately. 2. After _____Hours	
Q303	Is the infant started on complementary feeding	1. Yes 2. no	
Q304	Age at which complementary feeding started	1. At six month 2. Before six month 3. After six month	
Q305	Method of complementary feeding?	1. Bottle 2. Cup /Spoon/ 3. Other (specify) _____	
Q306	Do you wash the feeding utensils?	1. Yes 2. No	If No Skip to Q308
Q307	If yes how frequent do you wash it?	1. before and after use 4. Less frequent	
Q308	Had the baby had diarrhea in the past 15days?	1. Yes 2. No	If no finish interview
Q309	What did you do with the diarrhea on feeding?	1. Stopped feeding. 2. Continued feeding. 3. Other (specify)_____	

Q310	Where did you take your infant when he had diarrhea?	1. Health facility 2. Holly water 3. Local healer 4. Other (Specify)_____	
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THANK YOU

Annex. QUESTIONNAIRE .IN AMHARIC VERSION

**በጅማ ዩኒቨርሲቲ የጤና ሳይንስ ኮሌጅ የኢፒድሚዮሎጂ ትምህርት ክፍል**

በገዜ ጎፋ ወረዳ ዕድሜያቸው ከ7-12 ወር ውስጥ ባሉ ህጻናት የተቅማጥ በሽታና ተያያዥነት ያላቸው ጉዳዮች ዙርያ ጥናት ለማካሄድ የተዘጋጀ መጠይቅ ነው። የካቲት2008 ዓ.ም

**የስምምነት ቅጽ**

ስሜ-----ይባላል። የጅማ ዩኒቨርሲቲ እያካሄደ ባለው ሳይንሳዊ ጥናት ውስጥ የድህረ ምረቃ ፕሮግራም አስመልክቶ የምረቃ ጽህፍ ለማዘጋጀት መረጃ በመስብሰብ ላይ እገኛለሁ። የጥናቱ ርዕሰና ዓላማ የተቅማጥ በሽታና ተያያዥነት ያላቸው ምክንያቶች ላይ በገዜ ጎፋ ወረዳ ጥናት እያካሄድን ነው። በዚህ ጥናት ላይ የሚሳተፉት የተመረጡ እድሜያቸው ከ7-12 ወራት የሆኑ የህጻናት እናቶች ወይም አሳዲጊዎች ላይ ሲሆኑ ለዚህ ዓላማ ሲባል የተዘጋጁትን የተወሰኑ ጥያቄዎችን በመመለስ እንዲተባበሩን እንጠይቃለን። የሚሰጡትም መልስ በሚሰጥላቸው የሚያዝ ሲሆን ስምም ሆነ አድራሻ ተመዝግቦ አይያዝም። በጥናቱ ያለመሳተፍ መብትዎ የተጠበቀ ሲሆን እንደዚሁም በማንኛውም ሰዓት ከቃለ-መጠይቅ የማቋረጥና መልስ ሊሰጡባቸው የማይፈልጉ ጥያቄዎችም ካሉ ያለመመለስ ይችላሉ። ሆኖም የሚሰጡት እውነተኛ መልስ በተቅማጥ በሽታ ዙሪያ ያሉ ዋና ዋና እንቅፋቶችን ለማወቅና አገልግሎትን የበለጠ ለማሻሻል ትልቅ ጠቀሜታ እንዳለው ላረጋግጥሎዎት እወዳለሁ። በመጨረሻም ለሚሰጡት መልስ በቅዳሚያ እያመሰገነኩ በአጠቃላይ መጠይቁ ከ20- 30 ደቂቃ በላይ እንዳማይወስድ እገልጽሎታለሁ። ለተጨማሪ ማንኛውም አስተያየትና ጥያቄ ካለዎት በስልክ ቁጥር **0913149238** ወይም

**በኢሜል [deregashawo@gmail.com](mailto:deregashawo@gmail.com) ላይ ማግኘት ይችላሉ።**

- 1) የመጠይቅ ቁጥር----- 2) በዚህ ጥናት ላይ ለመሳተፍ ፍቃደኛ ናዎት 1=አዎ----- 2=አይደለሁም

መልሱ አዎ ከሆነ ጥያቄዎን ይቀጥሉ----- ካልሆነ ያቁሙ-----

- 2) መኖሪያ ቦታ ዞን-----ወረዳ/ከተማ-----ቀበሌ----- የቤት ቁጥር -----

- 3) መጠይቁ የተሞላበት ቀን-----

መመሪያ፣ ከዚህ በታች ለተዘረዘሩ ጥያቄዎች እንደየአቀራረባቸው መልስ በመክበብ ወይም ዳሽ በመሙላት ይመልሱ።

**ክፍል አንድ :- የማህበራዊና የሥነ- ህዝብ መጠይቅ**

ተ/ቁ	ጥያቄ	የመልስ ኮድ	
101	የህጻኑ ውልደት ቀን	ቀን---- ወር---- /ም	
102	የህጻኑ ጾታ	1)ወንድ                      2) ሴት	
103	የወልደት ቦታ	1)ቤት                      2) ጤና ተቋም 3)ሌላ	
104	የወልደት ዓይነት	1)መንታ                      2) መንታ ያልሆነ(አንድ)	
105	ህጻኑ ሲወለድ የነበረው ዕድሜ	-----ወር	
106	ህጻኑ ተከትሏል	1)አዎ                      2)አልተከተለም	ካልተከተለ ወደ 108 ይለፉ
107	ተከትቦ ከሆነ ካርዱን ይመልከቱ	1)ሳንባ ነርሳ የከትባት                      3)የሳንባ ምች 2) የጸረ አምሰት ክትባት                      4) የተቅማት ክትባት 5)የኩፍኝ ክትባት                      6) ካርድ የለም	
108	ከልጁ ጋር ያለዎት ግንኙነት	1)እናት                      2)አሳዳግ/ተንከባካብ	
109	የእናትዮ የጋብቻ ሁኔታ	1)ያገባች                      3)ያላገባች 2)የፈታች                      4)የሞተባት	
110	የቤተሰብ ብዛት	-----	
111	ሃይማኖት	1)ኦርቶዶክስ                      3)ካቶሊክ 2)ሙስሊም                      4)ፕሮቴስታንት	
112	የእናትዮ የትም/ት ደረጃ	1)ያልተማረች                      3)1-4 2)ማንበብና መጻፍ                      4)5-8 6)12+                      5)9-12	
113	የእናትዮ ሥራ ምንድነው	1)የንግስት ሠራተኛ                      3) ነጋዴ 2)የቡቴ እመቤት                      4)ቀን ሠራተኛ 5)ሌላ ካሌ-----	
114	ያባትዮ ዕድሜ ሰንት ነው	-----ዓመት	
115	ያባትዮ ጠ/ት ደረጃ	1)ያልተማረ                      3)1-4 2)መጻፍና ማንበብ                      4)5-8 5)9-12                      6)12+	
111	ያባትዮ ሥራ	1)የመንግስት ሠራተኛ                      3)አ/አደር 2)ነጋዴ                      4)የቀን ሠራተኛ 5)ካሌ ይጥቀሱ-----	

117	ከዚህ በታች የተዘረዘሩት ነገሮች ይኖረዎታል ከፊደላት ቴሌቪዥን ሰልክ(ተንቀሳቃሽ) በመደበኛ ሰልክ ሙብራት የኤሌክትሮኒክ ምጣድ ወንበር ጠረጴዛ አልጋ ፈራሽ ሰዓት ፍርጅ ፋኖስ ላም፤በሬ ፤ ፈረሰ፤አሀያ፤ በቅሎ ግመል ፍየል፤ በግ ዶሮ የንብ ቀፎ	አዎ (✓) የለም ( )	
119	የእርሻ መሬት አለዎት	1)አዎ 2) የለም	
120	የባን አካዉንት /የማይክሮ ፋይናንስ ቁጠባ ደብተር አለዎት	1)አዎ 2) የለም	

**ክፍል ሁለት፤ የአካባቢ ጤና አጠባበቅን በተመለከተ**

201	የወለል ዓይነት	1)አፈር 2)ቀርካሃ 3)ሰሚንቶ 4)ሌላ	
202	የጣሪያ ዓይነት	1)ሳር 2) ቆርቆሮ 3)ሌላ ካሌ ይጠቀሱ----	
203	ሽንት ቤት አለዎት	1)አዎ 2)የለም	
204	ካለዎት ዓይነት ምንድነዉ	1)የሚታጠብ 2)የሚታጠብ ሆኖ ማጠራቀሚያ ያለዉ 3)ጣሪያና ግድግዳ ብቻ ያለዉ ሽንት ቤት	



		4)ጣሪያ፣ግድግዳ፣ወለልና ሽታ ማሰወገጃ ቱቦ ያለዎ ሽንት ቤት ሌላ ዓይነት ካሌ ይጥቀሱ---	
205	ሽንት ቤቱ የእጅ መታጠቢያ አለዉ	1)አዎ 2)የለዉም	
206	የመጠጥ ወሃ ከየት ነዉ የሚያገኙት	1)ከቧንቧ 2) ከተከሌሌ ምንጭ 3) ካልተከለለ ምንጭ 4) ከወንዝ 5) ሌላ ካለ ይጠቀሱ-----	

**ክፍል ሦስት፤ ሥነ-ባህር ሁኔታን በተመለከተ**

301	ህጻኑ እንደተወለደ ጡት ጠብተዋል	1)አዎ 2)አልጠባም	
302	መልሱ አዎ ከሆነ ከሰንት ሰዓት በኋላ ነዉ	1)ወዲጣዉ 2)-----ሰዓት	
303	ህጻኑ ተጨማሪ ምግብ ጀምሯል	1)አዎ 2)አልጀመረም	
304	ጀምሮ ከሆነ መቼ	-----ወር	
305	የጻኑ የተጨማሪ ምግብ አመጋገብ ሁኔታ	1)በጡጦ 2)በማንኪያ 3)ሌላ ካሌ ይጠቀሱ-----	
306	የህጻኑ መመገቢያ ዕቃዉ ይታጠባል	1)አዎ 2)አይታጠብም	ካልታጠበ ወደ 308
307	ከታጠበ ሰንት ጊዜ	1)በቀን ሁለቴ 2)በየቀኑ 3) በየሁለት ቀኑ 4)አልፎ አልፎ	
308	ህጻኑ ባለፉት 15 ቀናት ዉስጥ ተቆማት ታሟል	1)አዎ 2)አልታመመም	ካልታመመ ትያቀዉን ይጨርሱ
309	ከታመመ ምን ተደረገለት	1)ምግብ መስጠት ቆሟል 2)ምግብ መመገብ ቀጥሏል 3) ሌላ ካለ ይጥቀሱ-	
310	ህጻኑ ተቆማት ሲታመመ ወደየት ወሰዱት	1)ጤና ተቋም 2)ጸበል 3) ወደ ባህል ሃክም 4)ሌላ ካለ ይጥቀሱ----	