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A CASE CONTROL STUDY ON FACTORS OF DIARRHEAL MORBIDITY AMONG UNDER-FIVE CHILDREN IN WOLAITA SODDO TOWN, SOUTHERN ETHIOPIA

BY

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Abbreviations

AIDS Acquired Immune Deficiency Syndrome

AOR Adjusted Odds Ratio

CI Confidence Interval

COR Crude Odds Ratio

DHS Demographic and Health Survey

Epi Info Epidemiological Information

HIV Human Immunodeficiency Virus

ID Identification

Kms kilometers

MPH Master of Public Health

NGO Non -Governmental Organization

OR Odds Ratio

PI Principal Investigator

SD Standard deviation

SNNPR Southern Nations Nationalities and Peoples Region

SPSS Statistical Package for Social Sciences

UNICEF United Nations Children Emergency Fund

WHO World Health Organization

Abstract

Background: Diarrheal disease is the most common cause of illness and the second leading cause of child death in the world. The disease accounts for 4.3% of the total global disease burden; the burden being greatest in the developing world including Ethiopia. Even though there were studies that were done on childhood diarrhea in our country, they did not use analytical study designs to explore associated factors of diarrheal morbidity.

Objective: This study was intended to assess potential factors associated with diarrheal morbidity among under-five children in Wolaita Soddo town, Southern Ethiopia.

Methods: A community based case control study on sample population of 198 cases and 396 controls was conducted in Wolaita Soddo town, Southern Ethiopia, in 2010. Three kebeles based on purposive sampling technique were selected to enumerate total cases (under-five children with diarrhea) and their controls (under-five children with no diarrhea). For each case, two controls were selected from neighboring households. From the total cases and controls enumerated, 198 cases and 396 controls were selected randomly. Multiple logistic regression analysis was employed to evaluate independent effect of covariates on the diarrheal morbidity.

Results: The odds of experiencing diarrheal morbidity was significantly higher among children: having fathers who were able to read and write (AOR=2.56; 95%CI=1.25, 5.25), having families who perceived they were economically very poor (AOR=3.84; 95%CI=1.25, 11.82), having families without toilet facilities (AOR=13.45; 95%CI=3.58, 50.49), having families whose compound were observed to have faeces, having families who used well/spring/river as source of water**,** having mother/caretaker who did not wash at all critical hand washing times, having mother/caretaker who did not know the three transmission modes of diarrheal morbidity.

Conclusion: The potential factors of diarrheal morbidity were concluded to be unavailability of toilet facility, poor human waste management, and unsafe source of water, and poor personal hygiene, and lack of knowledge about transmission of diarrheal morbidity. Letting the community have common toilet facilities and common safe source of drinking water, giving health education to households on human waste management, utilization of water, personal hygiene and transmission modes of diarrhea are recommended to alleviate the problem of under-five children diarrheal morbidity.

Keywords: Case control study, Diarrhea, Factors, Under-five children

1. Introduction

1.1. Background

Diarrheal disease is the most common cause of illness (1), the major cause of hospitalization (2), and the second, next to respiratory infections, leading cause of child death in the world (3). The disease accounts for 4.3% of the total global disease burden (62.5 million Disability-adjusted life years). It causes approximately 4 billion morbidity and 2.2 million deaths per year. Of these deaths, about 1.7 million are children under the age of five (4).

The burden is greatest in the developing world where access to safe water, sanitation, and medical care are often limited (1). About 15% of all under-five children deaths are estimated to be in developing countries (4). Every single day, approximately 4,500 children die from diarrheal diseases in low-income countries (2). More than 70%, of which 90% being children, of annual global deaths from diarrheal disease are accounted for by eleven countries. Ethiopia is one of these countries (1).

According to Ethiopian Demographic and Health Survey 2005, the two week period prevalence of diarrhea among under-five children was estimated to be 18% in Ethiopia. The prevalence was higher in rural (19%) than urban (12%). It varied across regions; the highest (25%) being in Southern Nations, Nationalities and Peoples Region, where the current study area, Wolaita Sodo town, is located (5). The two week period prevalence of diarrhea among under-five children was reported to be 51.4% in Maskenena Mareko woreda, Southern Ethiopia, in 2003 (6); 28.9% in Nekemte town, Ethiopia, in 2007 (7), and it was 18% in Mecha Woreda, Ethiopia, in 2009 (8).

Beyond the potentially devastating and immediate impact of diarrheal disease, it can also have long-lasting implications. Children who survive persistent diarrhea are likely to suffer from malnutrition, stunted growth, and learning difficulties (1).

Diarrhea continues to be one of the most common causes of morbidity and mortality among infants and children in developing countries including Ethiopia. Various prevalence studies have demonstrated the relationship between the occurrence of diarrhea among children below the age of five years and factors such as, socio-demographic and economic, child caring and hygienic

practice, and housing and sanitation. The hypothesis that there is an association between diarrheal morbidity and these factors was tested by this particular study.

1.2. Rationale of the study

Reducing mortality of under-five children by two-thirds is one of the millennium development goals set by United Nations (9). Because diarrheal morbidity is one of the commonest causes of under-five mortality, identification of associated factors of it will have paramount importance to reduce under-five mortality thereby meeting millennium development goal four. Ethiopia is one of the countries where diarrheal morbidity is reported to be one of the major public health significance problems.

In different parts of Ethiopia, there were cross sectional studies conducted to determine the magnitude of diarrheal morbidity among under-five children. In addition to area specific studies, Ethiopian DHS conducts prevalence of childhood diarrheal morbidity every five years. For example, it conducted in 2005 when it reported diarrheal morbidity to be the highest in Southern Nations Nationalities and Peoples Region of Ethiopia (5), where Wolaita Soddo town, the study area, is located. However, there is scarcity of research conducted on the factors associated with diarrheal morbidity using analytical study design in Ethiopia. Hence, identification of the potential factors of diarrheal morbidity using analytical study design will help policy makers and programmers to design feasible strategies of prevention and control for our country in general and Wolaita Sodo town in particular.

2. Literature review

2.1 Overview of diarrheal morbidity

Diarrhea remains one of the most common illnesses of children and one of the major causes of childhood morbidity and mortality in developing countries (10-13). Worldwide estimated episodes of acute diarrhea were 1.5 billion in 2008. Of these episodes, 1.5–2 million deaths of under-five children occurred (14). Each under-five child in the developing world experiences an average three episodes of diarrhea per year (2, 13). Every single day, approximately 4,500 children die from diarrheal diseases in low-income countries (2). A joint statement, which was released in 2004, by UNICEF and WHO indicated that diarrheal morbidity accounted for 15% of under-five mortality in developing countries in 2002 (15). The disease was reported to account for an average of 18% of under-five children deaths per year from 2000 to 2003 according to WHO estimates, which was done using data from vital registration systems of 72 countries. In this estimate, the disease was shown to account for 40% of under-five children deaths in Africa (16).

A study from Sub Saharan African and Asian countries demonstrated that diarrhea was the most principal cause of child death (17). In 2004, the two weeks recall period prevalence of diarrhea among under five children was 31.67% in West Bengal, India (18). In 2005, diarrhea was reported to be the second main cause of under-five children mortality in the Horn of Africa (19). A study conducted in Nigeria showed diarrheal diseases to be number one killer diseases for under-five children (20). According to Ethiopian DHS 2005, the two weeks recall period prevalence of diarrhea among under-five children was estimated to be 18% in Ethiopia, and 25% in Southern Nations, Nationalities and Peoples Region of Ethiopia (5).

Apart from resulting in death of children, diarrheal morbidity has consequences of both short-term and long-lasting effects- ranging from dehydration to malnutrition (1), hospitalization (2), and economic loss (21).

Of all childhood infectious diseases, diarrheal diseases are reported to have the greatest effect on growth, by reducing appetite, altering feeding patterns, and decreasing absorption of nutrients. The effect is thought to be worse on children in the first two years of life because not only

growth but also fitness, cognitive functions, and school performance are affected in this age group of children. A study conducted in West Gojam Zone, Ethiopia, indicated that diarrheal morbidity was an independent predictor of stunting for children of under-five years (22). Diarrheal diseases are the major cause of childhood hospitalization (2). It leads to 14% of outpatient visits, 16% of hospital admissions and 35 days of illness per year (23).

Diarrhea is also a burden to the economic lose of family, as its direct and indirect costs inflict family's resources. These costs include costs of treatment, the costs of missed schools, the time spent caring for a sick child, diminished productivity of children in the long-term because of growth retardation and impaired development (21).

2.2. Factors of diarrheal morbidity

Different literatures on factors of diarrheal morbidity among under-five children have been reviewed and presented in three sections: socio-demographic factors, housing and sanitation factors, and child caring, hygienic practice and knowledge of mother/caretaker.

2.2.1. Socio-demographic factors

Different studies indicated that the occurrence of diarrhea varied by age of the child. A study done in Eritrea to determine the prevalence rate of diarrhea revealed that the patterns of diarrhea prevalence showed some important variations by age. The risk of having diarrhea in the two weeks reference period indicated a peak at the age of 6-11 months. In this age group, the risk of having diarrhea was three times higher than those children aged 0-5 months (24). Children in the first year of life were more likely to suffer from diarrhea than children older than 12 months. Infants were between 30% and 70% more likely to have diarrhea than non-infants in another finding (25). A study done in Fentale woreda, Ethiopia, demonstrated that children in the age group 24-59 months had lower odds of experiencing diarrhea than children in the age group 6-23 months. But children aged 24-59 months had greater odds of having diarrhea than children aged 0-6 months (26). Children below one year were reported to be at increased risk of diarrhea in Egypt (27).

In Ethiopia, according to DHS 2005, children in the age group 6-23 months were more exposed to diarrheal morbidity compared to children in the other age groups. However, no variation of diarrheal morbidity was observed by sex of children in another study (5). Similarly, in a study conducted in India (18), sex of child was not reported to be significantly associated with diarrheal status. A study conducted in Egypt (27) reported that mothers' age, birth order and birth interval were not significantly associated with childhood diarrhea. In a study done in Tanzania (28), birth order was, however, significantly associated with diarrhea: late born children had lower odds of getting diarrhea.

A study done in Fentale woreda, Ethiopia showed that the odds of developing diarrheal morbidity was higher for children whose mothers age was above 40-49 years compared to children whose mothers age was 15-39 years (26). In rural Egypt, mothers aged below 20 years had child more exposed to diarrhea than mothers in the other age groups (27). However, this was not consistent with other studies (6, 29).

Mother's education had also a strong association with diarrhea as reported by some studies. For example, a study conducted in Haiti reported that children whose mothers had no education faced a risk that was more than 80% higher than children whose mothers had higher education. In India and Indonesia the associated relative risk between children whose mothers were illiterate and diarrhea was 40% and 55% respectively (25). In Mecha Woreda, Ethiopia, Maternal education was reported to be independent predictor of childhood diarrheal morbidity (8). However, other studies reported that education of mother was not independent predictor of childhood diarrheal morbidity in Eritrea (24), rural Egypt (27) and in Meskanena Mareko woreda, Ethiopia (6). Studies also reported that children whose fathers were illiterate had higher odds of experiencing diarrhea in Meskanena Mareko woreda, Ethiopia (6) and Egypt (27). Households in which there were more than one child, no cash crop production and no livestock reported greater odds of developing diarrhea in Meskanena Mareko woreda, Ethiopia (6). Children whose families had no own house were also reported to be at increased risk of diarrhea in Egypt (27).

A study conducted in Eritrea reported that there was a significant association between the number of children living in the house and diarrheal morbidity. The probability of having

diarrhea was 60% higher if there were six or more children living in the house than if the number of children were less than three. Place of residence was also strongly associated with diarrhea. Children living in urban areas were 46% less likely to have diarrhea compared to children living in rural areas (24). A similar finding was also reported by a study conducted in Ethiopia (6).

It was also indicated by a study done in Eritrea that household economic status was an important predictor of child diarrhea. The probability of having diarrhea was lower for children from medium economic groups than children from low economic group (24). In Colombia and the Dominican Republic, the risk of having a diarrhea episode declined significantly for richer households. However, other studies reported that no association exists between household income and diarrheal disease (25, 29).

2.2.2. Housing and sanitation factors

Sanitary conditions and water supply had a big impact on diarrhea incidence. In Mali and Ghana, for example, access to a flush or a pit toilet reduced the risk of diarrhea by 39% and 50% respectively (25). In Fentale woreda study, the odds of developing diarrhea was higher for children of households using pond water compared to children of households using piped water. On the other hand, the study reported that river water was found to be more protective for diarrhea than piped water. In the same study, households which had latrine had lower odds of getting diarrhea than those households which disposed of excreta outside on the field (26). Another study in Mecha woreda, Ethiopia (8) showed that households which had no toilet facility had higher odds of developing childhood diarrhea. A study conducted in Jimma, Ethiopia, reported that lower diarrheal morbidity was associated with well source of water (29). But no association between water source and diarrhea was reported in a study done in Mekenena Mareko, Ethiopia (6).

In a study conducted in Nekemt, Ethiopia, the way how drinking water is transported to the house from the source, the presence of faeces around the pit hole and the bottle feeding the child were found to be independent risk factors of under-five childhood diarrheal morbidity. Children from households who reported to transport their drinking water using covered container had about 87% lower chance of getting diarrhea than children from households using uncovered

container; children from those households in which faeces were observed around the pit-hole or slab had about three times more likely to have diarrhoea compared to those children from houses in which faeces were not observed around the pit-hole (7); and children from those households in which faeces were observed in the compound had higher odds to get diarrhoea compared to those children from houses in which faeces were not observed in the compound (7). However, availability of toilet facility was not independent predictor of childhood diarrheal morbidity in Eritrea (24).

A study conducted in Benin, Cameroon, Malawi, Morocco and Vietnam reported that the risk of diarrhea was reduced significantly if the source of water were piped. In most of these countries the effect was larger than 30%. Similarly, the study reported that in Benin, Gabon, Malawi, Namibia and Zimbabwe the presence of safe water (piped water plus covered wells) reduced the risk of diarrhea by around 20%. In Indonesia, bottled water was reported to reduce the risk of illness by 43% relative to any other source of drinking water. This study also reported that in Zambia and Zimbabwe, non-shared sources of water reduced the risk of diarrhea by 28% and 23% respectively. In Ethiopia, Ghana, Guatemala, Haiti, Namibia, Vietnam and Zimbabwe the risk of diarrhea was reported to be reduced if the household had access to a water source in the dwelling (25). However, another study reported that water source had no significant association with diarrhea in Egypt (27).

A study conducted in Meskenena Mareko woreda, Ethiopia, showed that the method of refuse disposal was associated with diarrhea. In this study, pit disposal or burning of refuse was reported to be more protective than open field disposal (6). Another study conducted in Eritrea (24) showed that children living in houses with non-dirt floor were 43% less likely to have diarrhea than those living in houses with dirt floor.

2.2.3. Child caring, hygienic practice and knowledge of mother

Diarrhea is the commonest of illnesses in children (1). It can cause malnutrition and can make it worse because: Nutrients are lost from the body in diarrhoea, a child with diarrhoea may not be hungry, and mothers may not feed children while they have diarrhoea, or even for some days

after the diarrhoea is better (30). Improving nutrition has a huge impact on child survival, helping to prevent deaths from diarrhea. Human milk is the ideal nourishment for survival, growth and development of infants. Exclusive breastfeeding in the first six months of life stimulates immune systems of babies and protects them from diarrhea. It also improves child's response to vaccination. Particularly in unhygienic conditions, breast milk substitutes carry a high risk of infection and can be fatal in infants (3).The risk is great particularly in areas where the levels of infectious diseases are high (1).

The study conducted in Nekemte, Ethiopia, revealed that bottle-fed children were three times more likely to develop diarrhea (7). This finding was not consistent with Meskanena Mareko study, in which children who were not breastfed during the study had lower odds of getting diarrhea than breastfed (6).

In addition, a study done in Egypt demonstrated the association between diarrhea and average times of meat consumption of household per month. Children whose families consumed meat less than four times per month were about 6 times more likely to develop diarrhea (27).

A study done in New-Delhi revealed that only 3.6% of the mothers knew that the microorganisms were the cause of diarrhea (31). A study conducted in Multan (32) showed that use of boiled water, and hand washing at critical times (after using toile, after cleaning child and before food) reduced diarrheal incidence. Hand washing is one of a range of hygiene promotion interventions to interrupt the transmission of diarrhea-causing organisms (33). A meta-analysis of hand washing studies conducted in developing countries showed that hand washing could reduce diarrhea in general population by about 42% (34). Hand washing with soap was reported to reduce diarrheal incidence by 35% to 47% elsewhere (4).

In general, findings of some of the studies reviewed showed that some of the variables in the three categories (socio-demographic, housing and sanitation and child caring, hygienic practice and knowledge variables) were risk factors of diarrheal morbidity. However, findings of other studies reported controversies. From the socio-demographic variables, birth order was shown to be a risk factor in Tanzania (28), but it was not in another study (27); age of mothers was shown to be a factor in some studies (26, 27), but it was not in others (6, 29); mothers' education was reported to be a factor in a study done in Haiti (25), but it was not in other studies (6, 24, 27); a

study conducted in Eritrea (24) reported household economic status to be a factor, but other studies (25, 29) showed economic status not to be a factor. From the housing and sanitation variables, source of water was reported to be a factor in some studies (25, 29), but it was not in other studies (6, 27). Similarly, one of the child caring, hygienic practice and knowledge variables, bottle feeding, was shown to be a factor in Nekemte (7), but it was not in Meskanena Mareko (6). These controversies might be due to methodological issues. Most of the studies were conducted using cross sectional study design. The scarcity of studies using analytical study designs to identify potential factors of diarrheal morbidity initiated the present study to be conducted using case control study design.

Case control study is less expensive and quicker to conduct in identifying possible multiple risk factors of an outcome. The challenge, however, in this type of study is recall bias and the preceding of the outcome before information of the factor has been collected. Considering its advantage over its challenge, this method of study design has been selected to test the hypothesis that the three categories of variables are associated with diarrheal morbidity against the null hypothesis that these variables are not associated with diarrheal morbidity among under-five children in Wolaita Soddo town.

3. Objective

3.1 General objective

-To assess factors associated with diarrheal morbidity among under-five children in Wolaita Soddo town, Southern Ethiopia, in 2010.

3.2 Specific objectives

-To determine socio-demographic factors of diarrheal morbidity among under-five children in Wolaita Soddo town

- To determine housing and sanitation factors of diarrheal morbidity among under-five children in Wolaita Soddo town

-To determine child caring, hygienic practice and knowledge factors of diarrheal morbidity among under-five children in Wolaita Soddo town

4. Methods

4.1 Study area and period

The study was conducted in Wolaita Soddo town, capital of Wolaita zone from August 2009 to June 2010.

Wolaita Zone is one of the 13 zones in Southern Nations Nationalities and Peoples Region. It is centrally located in the region, bordered by Kambata and Tembaro and Hadiya Zone in the North, Gamogofa Zone in the South, Dawro zone in the West, Sidama zone and Oromiya Region in the East. Malaria, tuberculosis, malnutrition and HIV/AIDS complicated by overcrowding are the main health problems of the zone (35).

The study area, Wolaita Soddo town, is 385 kms South of Addis Ababa and 160 kms west of the regional capital, Hawassa. The total population of the town is estimated to be 76,780. Of which 40,495 being males and 36,285 females. Based on the SNNPR urban average family size of 4.2, the total number of households in the town will be 18281 (36).

The town is structured in three Sub-cities (kifle ketema) and eleven kebeles. In the town, there is one government hospital, one NGO hospital, one government health center, two higher clinics, eight small clinics, two pharmacies, one drug distribution store, three drug stores and eight drug vendors (37).

4.2. Study design

A community-based case control study design was employed to determine factors of diarrheal morbidity among under-five children in Wolaita Soddo town, Southern Ethiopia.

4.3. Study population

4.3.1 Source population

The source population was all mothers/caretakers of all under-five children living in Wolaita Sodo town. Case is a child who experienced diarrhea within the two weeks of recall period before the survey. Control is a child who did not experience diarrheal morbidity within the two weeks prior to the survey, and whose age was equal (+/-6 months) to the age of its case.

4.3.2. Sample

The sample population was mothers/caretakers of under-five children living in the households that were selected from all sub-cities in the town.

Inclusion criteria: Mothers or caretakers who lived at least 6 months in the study area before the survey were included in the study.

Exclusion criteria: Mothers or caretakers of under-five children who were mentally retarded or critically ill were excluded.

4.3.3. Sample size calculation

The sample size was calculated using the following double proportion formula:

$$n_1 = \frac{\left[Z\alpha/2\sqrt{\left(1+\frac{1}{r}\right)\bar{P}(1-\bar{P})} + Z\beta\sqrt{P1(1-P1)+\frac{P2(1-P2)}{r}}\right]^2}{(P1-P2)^2}, \quad n_2 = n_1 r$$

Where

n_1= sample size in the cases, n_2=sample size in the controls

p_1= proportion of exposure in cases, p_2=proportion of exposure in controls

p_1-p_2= effect size, **P**= average proportion

α=level of significance=0.05, $1-\beta$=desired power=80%

r=ratio of cases to controls= n_1/n_2= 1:2

$Z\beta$= coefficient at level of power=0.84, $Z\alpha/2$ =coefficient at level of significance=1.96

Taking proportion of 0.21 and 0.32 respectively of faeces seen in the compound, one of the determinant factors of diarrheal morbidity, among non-cases and cases of diarrhea from other study (7), the sample size was determined to be 198 cases and 396 controls.

4.3.4. Sampling procedure

Three kebeles were first selected from the three sub-cities based on purposive sampling technique. This technique considered the inclusion of one kebele from each sub-city. Then total enumeration of cases and their controls was conducted, from January 20 to January 28, 2010, in the three selected kebeles. The three kebeles were Gido from Mehal sub-city, Kidanemihret from Arada sub-city and Kera from merkato sub-city. Cases are children who experienced diarrheal morbidity within two weeks recall period before the enumeration. Controls are children who did not experience diarrheal morbidity within two weeks recall period.

Five diploma holder female nurses were recruited to enumerate cases and controls. Enumerators approached the household by greeting and introducing themselves. Then they explained the purpose why they were visiting the household and asked for verbal consent.

When enumerators got verbal consent, they asked the household for the presence of a case (under-five child with diarrheal morbidity within two weeks prior to the survey); and when they got a case, enumerators registered name and age of that case; and gave an identification number for the household. If there were two or more children that were eligible to be cases in a household, the one who experienced diarrheal morbidity most recently was selected.

Enumerators selected two controls for each case. The controls of each case were obtained from the neighbor household. When enumerators got verbal consent, they asked the neighboring household of the case for the presence of a control (under-five child who had no diarrheal morbidity within two weeks prior to the survey and whose age was $\pm$ 6 months of the case); and when they got a control, enumerators registered name and age of that control; and gave an identification number for the household. If there were two or more children that were eligible to be controls in a household, the one who best matched (in age) the case was selected.

If there was no under-five that satisfied the above mentioned criteria of controls in a household neighboring to the case, that household was skipped and the next neighboring household was entertained to get the controls.

Totally, 213 eligible cases and 426 eligible controls were identified in the selected kebeles. From these eligible subjects, 198 cases and 396 controls were randomly selected to be study subjects.

4.4. Data collection technique

4.4.1. Data collection tools

Data were collected using a pre-tested structured questionnaire prepared by reviewing previously done similar studies and other materials on the topic. The questionnaire was translated into Amharic and back to English to ensure its consistency.

4.4.2. Data collection procedures

Data were collected from January 29 to February 8, 2010. Eight diploma holder female nurses who did not participate in the enumeration were recruited to collect the data. One MPH holder supervisor and the principal investigator (PI) supervised the data collection.

Data collectors were given the identification numbers of households that were randomly selected from the sampling frame made in the total enumeration. Data collectors didn't know the diarrheal status of study subjects. Diarrheal status of each filled questionnaire was filled by the PI after data collectors had submitted it to the PI. The PI did so based on the identification (ID) number of households. Enumerators were assisting data collectors by showing the households that were numbered to be included in the study.

Data collectors approached the households of the cases by extending their greetings and introducing themselves. After introduction, they continued explaining the purpose and other information of their visit by reading the information sheet to the mother/caretaker. Then they requested for verbal consent. Data collection was conducted after data collectors obtained verbal consent.

When a household was closed or mother/caretaker was not present during the first visit of data collection, data collectors made revisits.

4.5. Study variables

Dependent variable:

- Two weeks recall period diarrheal status of children under five years of age

Independent variables:

Socio-demographic variables:

- Sex of child
- Age of child
- Family size
- Age of mother at birth of child
- Relation of respondent with the child
- Education of mother/caretaker
- Religion of mother
- Ethnicity of mother/caretaker
- Marital status of mother/caretaker
- Education of father
- Occupation of mother
- Occupation of father
- Monthly family income (in Birr)
- Perceived economy of family
- Availability of radio/television
- Availability of livestock

Housing and sanitation variables:

- Ownership status of the house
- Floor of the house
- Number of rooms
- Separate kitchen availability
- Toilet availability
- Faeces seen in the compound
- Type of water collection container
- Separate container for drinking water
- Transportation of water yesterday
- Refuse disposal
- Refuse seen in the compound
- Source of water
- Availability of source of water in the compound
- The way collected water drawn
- Availability of home drinking water treatment

Child caring, hygienic practice and knowledge variables:

- Place of birth of child
- Current breastfeeding status of child
- Time at which breast milk initiated after delivery
- Critical times for hand washing
- Hand washing material
- Frequency of eating meat
- Are microorganisms cause of diarrhea
- Transmission ways of diarrhea

4.6. Definition of terms

Diarrhea is defined as the passing of three or more loose or watery stools or one stool with blood or mucus in a 24 hour period

Case is a child who experienced diarrheal morbidity within two weeks prior to enumeration

Control is a child who didn't experience diarrheal morbidity within two weeks prior to enumeration

Protected well is a well which is fenced and covered

Unprotected well is a well which is neither fenced nor covered

Refuse is solid wastes such as ash, paper, home sweepings; but not human excreta

4.7. Data quality management

There are points at which the quality of data may be affected unless measures are taken at these points. These points are questionnaire designing, data collection, and data entry.

As this is one of the points to control the quality of data, due emphasis was given to questionnaire designing. Objective based, logically sequenced, free of scientific terms and non-leading structured questionnaire was prepared. Pre-test was undertaken on the questionnaire before the actual data collection started. It was undertaken on 30 individuals and amendment was taken on the questionnaire.

Data collection and supervision is another area of focus to keep the quality of the data. The data collectors and supervisor were provided with intensive training for two days on the objective of the study, contents of the questionnaires and how to maintain confidentiality and privacy of the study subjects. The data collectors were blinded (i.e., they didn't know the diarrheal status of study subjects) to reduce observer bias. Diarrheal status of study subjects was determined during enumeration and kept secret from data collectors. The principal investigator filled the diarrheal status of each filled questionnaire based on the ID of the household. The collected data were checked by principal investigator on daily basis for any incompleteness and/or inconsistency. When any incompleteness and/or inconsistency appeared, correction was made by going back to the household for which incompleteness or inconsistency appeared.

The last point of focus for data quality is data entry. At this point, two things were seriously seen. The first of them was to reduce introduction of errors. To reduce introduction of errors, the principal investigator (PI) entered the data in to the computer. And the second thing was to correct errors introduced. To correct errors introduced, data cleaning was given due attention as it is the means for identifying and correcting errors. To identify and correct errors introduced easily, each questionnaire was given identification (ID) that was considered as a variable in the data entry. In data cleaning, frequency and list commands in Epi Info 3.2.2 for windows were used to identify errors.

4.8. Data processing and analysis

The data were entered into Epi Info 3.3.2 for windows and exported to SPSS 15.0 for windows for analysis. The first step before analysis was data exploration to visualize the general feature of the data to be analyzed. After exploration, bivariate analysis and multivariate analysis were performed step by step.

Bivariate analysis using cross tabulation and bivariate logistic regression were done. Bivariate analysis using cross tabulation was done to determine distribution of study subjects by independent variables of interest. Bivariate logistic regression technique was done to see the crude association between the independent variables and the dependent variable.

The final step of analysis was multivariate analysis using forward stepwise multiple logistic regression technique. This technique was used to evaluate independent effect of independent variables on the outcome variable by controlling the effect of others. All explanatory variables which were significantly associated with diarrheal morbidity in the bivariate analysis were included in the stepwise regression technique.

The reason to take the criterion of variables whose p-values were below 0.05 and not to include other variables was to minimize the influence of large number of variables on validity of the logistic model. Peduzzi P. and his colleagues (38) evaluated the effect of the number of events or sample size per variable analyzed in logistic regression analysis. They found that number of events or sample size per variable had impact on the logistic model; indicating that low events

per variable (low sample size per variable) could lead to major problems. They indicated that as the number of variables to enter the logistic regression increases, the validity of the logistic model is influenced.

Taking this finding in to account, the number of variables which were entered logistic regression were limited to those that showed association in the bivariate analysis.

Odds ratios from multivariate analysis are adjusted ratios since they are controlled for confounders. Significance level of 0.05 was taken as a cut point for significance tests, and P-value less than 0.05 or 95% CI containing no 1 was taken to decide that there is a significant association.

4.9. Ethical considerations

Ethical clearance was obtained from the Institutional Review Board of Medical Faculty, Addis Ababa University, through School of Public Health before the study undergone. Permission was obtained from Wolaita town administration through official letter written by School of Public Health. Information sheet was prepared and read to the eligible participants to obtain verbal consent. Without permission no data collector tried to enter the house of any body. Any person found to be sick in the household during data collection was advised to visit the nearby health facility.

4.10. Dissemination of results

The output of this study was disseminated to the School of Public Health as partial fulfillment of a master's degree in Public Health. It will also be disseminated to the Wolaita Zone health department. Attempts will be made for publication in national/regional scientific journals.

5. Result

5.1 Distribution of study subjects

In this particular study, a total of 594 (198 cases and 396) study subjects were included. The distribution of study subjects by selected socio-demographic characteristics are presented in this section.

One hundred twenty six (63.6%) of cases and 190 (48.0%) of controls were male children. And 72 (36.4%) of cases and 206 (52.0%) of controls were females.

The mean (±SD) age of cases and controls were 29.8 (±14.7) and 30.6 (±14.1) months respectively. The mean age difference of cases and controls was -0.84 months, which was not statistically significant (P-value=0.501). One hundred eighty two (91.9%) of the cases and 359 (90.7%) of the controls were born to mothers of age 18-35 years. Whereas, 11 (5.6%) of the cases and 24 (6.1%) of the controls were born to mothers of age above 35 years.

One hundred eighty one (91.4%) of the cases and 366 (92.4%) of the controls had their mothers as caretakers, while 17 (8.6%) of the cases and 30 (7.6%) controls were with their caretakers.

Regarding education of caretakers, 50 (25.3%) of the cases and 111 (28.0%) of the controls completed high school; and 40 (20.2%) of the cases and 109 (27.5%) of the controls completed elementary school.

Religiously, 130 (65.7%) caretakers of the cases and 240 (60.6%) of the controls were from protestant religion; and 65 (32.8%) of the cases and 140 (35.4%) of the controls from orthodox religion. Ethnically, 168 (84.80%) of cases and 384 (87.9%) of controls were from Wolaita, 8 (4.0%) of the cases and 19 (4.8%) of the controls were from Amhara; and 9 (4.5%) of the cases and 11 (2.8%) of the controls were from Gamo.

Concerning the income of the household, 66 (33.3%) of the cases and 54 (13.6%) of the controls were from a family whose average monthly income was below 400 Birr. Ninety nine (47.5%) of cases and 224 (56.6%) of controls were from families whose monthly income was from 400 to 1000 Birr. Table1 shows distribution of study subjects by socio-demographic characteristics.

Table1. Distribution of study subjects by socio-demographic characteristics, Wolaita Sodo, 2010.

Characteristics	Cases (n=198) No. (%)	Controls (n=396) No. (%)
Sex of child		
Male	126 (63.6)	190 (48.0)
Female	72 (36.4)	206 (52.0)
Age of child (month)		
1-6	10 (5.1)	21 (5.3)
7-12	22 (11.1)	33 (8.3)
13-24	58 (29.3)	100 (25.3)
25-36	44 (22.2)	100 (25.3)
37-48	49 (24.7)	110 (27.8)
49-59	15 (7.6)	32 (8.1)
Family size		
1-2	4 (2.0)	6 (1.5)
3-5	112 (56.6)	253 (63.9)
>5	82 (41.4)	137 (34.6)
Age of mother at birth of child (year)		
15-17	5 (2.5)	13 (3.3)
18-35	182 (91.9)	359 (90.7)
>35	11 (5.6)	24 (6.1)
Relation of respondent with the child		
Mother	181(91.4)	366 (92.4)
Caretaker	17(8.6)	30 (7.6)
Educational status of mother/caretaker		
Illiterate	54 (27.3)	81 (20.5)
Read and write	54 (27.3)	95 (24.0)
Elementary completed	40 (20.2)	109 (27.5)
High school completed	50 (25.3)	111(28.0)
Religion of mother		
Protestant	130 (65.7)	240 (60.6)
Orthodox	65 (32.8)	140 (35.4)
Other(catholic+muslim)	3 (1.5)	16 (4.0)
Ethnicity of mother/caretaker		
Wolaita	168 (84.8)	384 (87.9)
Amhara	8 (4.0)	19 (4.8)
Gamo	9 (4.5)	11 (2.8)
Other	13 (6.6)	18 (4.5)
Monthly Family income (in Birr)		
<400	66 (33.3)	54 (13.6)
400-1000	94 (47.5)	224 (56.6)
>1000	38 (19.2)	118 (29.8)

5.2 Bivariate result

5.2.1 Association of socio-demographic variables with the diarrheal status

In the bivariate analysis, being male was positively and significantly associated with two weeks recall period diarrheal morbidity (COR=1.90; 95%CI=1.34, 2.69). Having fathers with educational status of read and write was significantly associated with two weeks recall period diarrheal morbidity as compared to fathers who completed high school (COR=1.72; 95%CI=1.07, 2.75). Children from fathers with no job had higher odds of developing diarrheal morbidity than children from government employed fathers (COR=2.81; 95%CI=1.46, 5.43).

With regard to household economy, children from households that reported to earn less than 400 Birr per month had greater odds of experiencing diarrheal morbidity when compared to children from households that reported to earn greater than 1000 Birr per month (COR=3.80; 95%CI= 2.27, 6.34). The odds of developing diarrheal morbidity was higher among children from families that perceived they were economically very poor as compared to children from families that perceived they were rich or medium (COR=15.69; 95%CI= 7.98, 30.85).

Number of under-five children in the household was not significantly associated with diarrheal status (COR=0.94; 95%CI=0.39, 2.24).

Other socio-demographic characteristics included in the questionnaire were not significantly associated with diarrheal status in the bivariate analysis. Table 2 shows association of socio-demographic variables with the diarrheal status.

Table 2. Association of socio-demographic variables with diarrheal status, Wolaita Sodo, 2010.

Variables	Diarrheal status		Crude OR (95%CI)
	Cases (n=198)	Controls (n=396)	
Sex of child			
Male	126	190	1.90 (1.34, 2.69)*
Female	72	206	1.00
Family size			
1-2	4	6	1.11 (0.31, 4.1)
3-5	112	253	0.74 (0.52, 1.10)
>5	82	137	1.00
Number of under five			
1-2	190	381	0.94 (0.39, 2.24)
>=3	8	15	1.00
Age of mother at birth of child			
15-17	5	13	0.84 (0.24, 2.94)
18-35	182	359	1.11 (0.53, 2.31)
>35	11	24	1.00
Relation of respondent with the child			
Mother	181	366	0.87 (0.47, 1.62)
Caretaker	17	30	1.00
Marital status of mother/caretaker			
Married	171	352	0.71 (0.32, 1.56)
Single	16	28	0.83 (0.31, 2.22)
Divorced/widowed	11	16	1.00
Educational status of mother/caretaker			
Illiterate	54	81	1.48 (0.912, 2.39)
Read and write	54	95	1.26 (0.787, 2.02)
Elementary completed	40	109	0.82 (0.50, 1.33)
High school completed	50	111	1.00
Educational status of father			
Illiterate	30	49	1.43 (0.85, 2.40)
Read and write	42	57	1.72 (1.07, 2.75)*
Elementary completed	39	87	1.05 (0.67, 1.65)
High school completed	87	203	1.00
Occupation of mother			
Housewife	141	258	1.46 (0.56, 3.81)
Government employee	23	53	1.16 (0.40, 3.33)
Private work	18	31	1.55 (0.51, 4.67)
Merchant	10	38	0.702 (0.22, 2.26)
Other	6	16	1.00
Occupation of father			
Other	14	27	1.17(0.57, 2.37)
No job	25	20	2.81 (1.46, 5.43)*
Merchant	40	113	0.80 (0.50, 1.27)
Private work	55	92	1.35 (0.86, 2.10)
Government employee	64	144	1.00

***significant at significance level of 0.05**

Continued from **table 2. ----------**

Monthly income of the family			
<400	66	54	3.80 (2.27, 6.34)*
400-1000	94	224	1.30 (0.84, 2.02)
>1000	38	118	1.00
Perceived economy			
Very poor	49	12	15.69 (7.98, 30.85)*
Poor	66	65	3.90 (2.57, 5.93)*
Medium/rich	83	319	1.00
Availability of radio/TV			
No	57	92	1.34 (0.91, 1.97)
Yes	141	304	1.00
Availability of livestock			
Yes	33	45	1.56 (0.96, 2.54)
No	165	351	1.00

***significant at significance level of 0.05**

5.2.2 Association of housing and sanitation variables with the diarrheal status

In the bivarate analysis, the odds of developing diarrheal morbidity was significantly higher among children whose families lived in rented house (COR=1.52; 95%CI=1.08, 2.14). Children who lived in houses of mud floor had higher odds of developing diarrheal morbidity when compared to children who lived in houses of cement floor (COR=2.36; 95%CI=1.65, 3.37). Children from households that reported to have one room had higher odds of developing diarrheal morbidity as compared to children from households that had three or more rooms (COR=2.22; 95%CI=1.37, 3.59).

Children whose families had no toilet facilities had higher odds of developing diarrheal morbidity as compared to children from households that had toilet facilities (COR=35.82; 95%CI= (12.74, 100.74). Children from families whose compounds were observed to have faeces were at higher odds of developing diarrheal morbidity (COR=16.28; 95%CI= 8.88, 29.85). Children from families who disposed of refuse in open field or water bodies were at higher odds of developing diarrheal morbidity as compared to children from families who used pit for refuse disposal (COR=4.57; 95%CI=2.52, 8.31). Children from families whose compounds were observed to have refuse had higher odds of experiencing diarrheal morbidity (COR=3.21; 95%CI=2.21, 4.66).

Children whose families used unprotected well or river or spring as source of water had higher odds of experiencing diarrheal morbidity as compared to children from families who used pipe water (COR=15.89; 9.03, 27.93). Children whose families used pot as water container were at increased odds of developing diarrheal morbidity as compared to children whose families used jerry can (COR=4.27; 95%CI= 1.57, 11.57). Children whose families had no separate container for drinking water were at higher odds of experiencing diarrheal morbidity (COR=1.75; 95%CI= 1.20, 2.56). Children whose families transported collected water without cover had higher odds of getting diarrheal morbidity (COR=3.23; 95%CI= 2.10, 4.98). Children whose families drew collected water by dipping had higher odds of getting diarrheal morbidity (COR=6.51; 95%CI=4.34, 9.78). Children whose families did not use home water treatment method were at increased odds of developing diarrheal morbidity (COR=3.20; 95%CI=2.17, 4.71). Other housing and sanitation variables included in the questionnaire were not significantly associated with diarrheal morbidity. Table 3 depicts crude association of housing and sanitation variables with the diarrheal status.

Table 3. Association of housing and sanitation variables with diarrheal status, Wolaita Sodo, 2010.

Variables	Diarrheal status		Crude OR(95%CI)
	Cases	Controls	
Ownership status of the house			
Private	84	209	1.00
Rented	114	187	1.52 (1.08, 2.14)*
Floor of the house			
Cement	74	229	1.00
Wood	9	16	1.74 (0.74, 4.10)
Mud	115	151	2.36 (1.65, 3.37)*
Number of rooms			
Three or more	65	175	1.00
Two	86	164	1.41(0.96, 2.08)
One	47	57	2.22 (1.37, 3.59)*
Separate kitchen availability			
Yes	143	314	1.00
No	55	82	1.47 (0.99, 2.19)
Latrine availability			
Yes	145	392	1.00
No	53	4	35.82 (12.74, 100.74)*
Faeces seen in the compound			
No	124	382	1.00
Yes	74	14	16.28 (8.88, 29.85)*
Refuse disposal			
Pit	26	82	1.00
Burning	114	274	1.31(0.80, 2.15)
Open field/water bodies	58	40	4.57(2.52, 8.31)*
Refuse seen in the compound			
No	110	317	1.00
Yes	88	79	3.21(2.21, 4.66)*
Source of water			
Pipe	77	332	1.00
Protected well	51	45	4.89 (3.05, 7.83)*
Unprotected well/spring/river	70	19	15.89 (9.03, 27.93)*

***significant at significance level of 0.05**

Continued from table 3.----------

Availability of source of water in the compound			
Yes	94	208	1.00
No	104	188	1.12 (0.87, 1.72)
Type of water collection container			
Jerry can	158	337	1.00
Pot	12	6	4.27 (1.57, 11.57)*
Plastic/iron bucket	28	53	1.13 (0.69, 1.85)
Availability of separate container for drinking water			
Yes	132	308	1.00
No	66	88	1.75 (1.20, 2.56)*
Transportation of water yesterday			
In covered container	139	350	1.00
In uncovered container	59	46	3.23 (2.10, 4.98)*
The way collected water is draw			
By pouring	102	346	1.00
By dipping	96	50	6.51 (4.34, 9.78)*
Availability of home drinking water treatment			
Yes	44	189	1.00
No	154	207	3.20 (2.17, 4.71)*

***significant at significance level of 0.05**

5.2.2 Association of child caring, hygienic practice and knowledge variables of mother with the diarrheal status

In the bivarate analysis, the odds of developing diarrhea were significantly higher among children whose mothers reported one of the five critical times for hand washing (before eating, after eating, after cleaning the child, before feeding the child, before preparing food) as compared to children whose mothers reported all five (COR=7.17; 95%CI=4.60, 11.17). Children whose mothers reported two of the five times for hand washing were at increased odds of getting diarrheal morbidity as compared to children whose mothers reported all five (COR=4.54; 95%CI= 2.33, 8.86). Children whose families reported to eat meat less than four times per month had higher odds of developing diarrheal morbidity as compared to children whose families who reported to eat four or more times per month (COR=2.36; 95%CI=1.55, 3.59).

Children whose mothers answered that microorganisms are not the cause of diarrheal disease were at increased odds of developing diarrheal morbidity (COR=2.02; 95%CI=1.40, 2.91).

Children whose mothers answered none of the three common transmission modes (contaminated food, contaminated water, flies) of diarrheal disease had higher odds of diarrheal morbidity (COR=3.48; 95%CI=1.98, 6.13). Children whose mothers answered one of the three transmission modes of diarrheal disease were at higher odds of getting diarrheal morbidity (COR= 6.47; 95%CI=4.25, 9.84). Other variables were not significantly associated with diarheal morbidity. Table 4 depicts the association of child caring, hygienic practice and knowledge variables of mother/caretaker with diarrheal morbidity.

Table 4. Association of child caring, hygienic practice and knowledge of mother/caretaker with diarrheal status, Wolaita Sodo, 2010.

Variables	Diarrheal status		Crude OR(95%CI)
	Cases (n=198)	Controls (n=396)	
Place of birth of child			
Home/other	104	180	1.33 (0.94, 1.87)
Health facility	94	216	1.00
Current breastfeeding status of child			
Not at all breastfed	119	22	1.10 (0.62, 1.96)
Partially breastfed	59	133	0.91 (0.49, 1.68)
Exclusively breastfed	20	41	1.00
Time at which breast milk initiated after delivery			
After a hour	100	195	1.05 (.75, 1.48)
Within a hour	98	201	1.00
Times for hand washing			
One out of five	81	42	7.17 (4.60, 11.17)*
Two out of five	22	18	4.54 (2.33, 8.86)*
Three out of fife	10	20	1.86 (0.84, 4.12)
Four or more out of five	85	316	1.00
Hand washing material			
Water only	27	39	1.47 (0.87, 2.49)
Ash	4	2	4.25 (0.77, 23.44)
Soap	167	355	1.00
Frequency of eating meat			
Less than 4 times/month	163	263	2.36 (1.55, 3.59)*
4 or more times/month	35	133	1.00
Is microorganism cause of diarrhea			
No	77	95	2.02 (1.40, 2.91)*
Yes	121	301	1.00
Transmissions of diarrhea			
Answered none	29	38	3.48 (1.98, 6.13)*
Answered one from three	102	72	6.47 (4.25, 9.84)*
Answered two from three	12	35	1.57 (0.76, 3.21)
Answered all the three	55	251	1.00

***significant at significance level of 0.05**

5.3 Multivariate result

All variables that have association (at significance level of 0.05) with outcome variable in the bivariate analysis were entered stepwise forward multiple logistic regression. Variables that were entered the multiple logistic regression are sex of child, educational status of father, occupation of father, monthly income of the family, perceived economy, ownership status of the house, floor of the house, number of rooms, toilet facility availability, refuse disposal, refuse seen in the compound, source of water, type of water collection container, availability of separate container for drinking water, transportation of water, how collected water drawn, availability of home drinking water treatment, critical times for hand washing, frequency of eating meat, is microorganism cause of diarrhea and transmissions of diarrhea.

From the total 21 variables that were entered the multiple regression, nine were found to have significant independent association with the diarrheal status.

The odds of developing diarrheal morbidity was 2.6 (95% CI: 1.25, 5.25) times higher among children whose fathers educational status was able to read and write as compared to children whose fathers educational status was high school completed. The odds of developing diarrheal morbidity was 3.8 (95% CI: 1.25, 11.82) times higher among children whose families perceived that they were economically very poor when compared to children whose families perceived they were rich or medium.

The odds of developing diarrheal morbidity was 13.5 (95% CI: 3.58, 50.49) times higher among children of families who had no toilet facilities when compared to children of families who had toilet.

The odds of developing diarrheal morbidity was 2.46 (95% CI: 1.07, 5.63) times higher among children whose mothers answered none of the three transmission modes of diarrheal diseases as compared to children whose mothers answered all of the three transmission modes. Table 5 shows independent effect of the exposure variables on the outcome variable.

Table 5. Independent association of all variables that were entered the multiple logistic regression with diarrheal status, Wolaita Sodo, 2010.

Variables	Crude OR (95%CI)	Adjusted OR (95%CI)
Educational status of father [a]		
Illiterate	1.43 (0.85, 2.40)	0.48 (0.21, 1.11)
Read and write	1.72 (1.07, 2.75)*	2.56 (1.25, 5.25)*
Elementary completed	1.05 (0.67, 1.65)	0.68 (0.34, 1.39)
High school completed	1.00	1.00
Perceived economy [a]		
Very poor	15.69 (7.98, 30.85)*	3.84 (1.25, 11.82)*
Poor	3.90 (2.57, 5.93)*	1.62 (0.87, 3.03)
Medium/rich	1.00	1.00
Toilet availability [a]		
No	35.82 (12.74, 100.74)*	13.45 (3.58, 50.49)*
Yes	1.00	1.00
Faeces seen in the compound [a]		
Yes	16.28 (8.88, 29.85)*	5.26 (2.17, 12.74)*
No	1.00	1.00
Source of water [a]		
unprotected well/spring/river	15.89 (9.03, 27.93)*	9.79 (4.58, 20.97)*
Protected well	4.89 (3.05, 7.83)*	3.40 (1.76, 6.58)*
Pipe	1.00	1.00
Type of water collection container [a]		
Plastic/iron bucket	1.13 (0.69,1.85)	0.51 (0.23, 1.10)
Pot	4.27 (1.57, 11.57)*	5.57 (1.18, 26.25)*
Jerry can	1.00	1.00
Availability of home drinking water treatment [a]		
No	3.20 (2.17,4.71)*	2.34 (1.33, 4.14)*
Yes	1.00	1.00
Times for hand washing [a]		
One out of five	7.17 (4.60, 11.17)*	5.41 (2.65, 11.04)*
Two out of five	4.54 (2.33, 8.86)*	1.78 (0.611, 5.19)
Three out of fife	1.86 (0.84, 4.12)	0.99 (0.25, 3.98)
Four or more out of five	1.00	1.00
Transmissions of diarrhea [a]		
Answered none	3.48 (1.98, 6.13)*	2.46 (1.07, 5.63)*
Answered one from three	6.47 (4.25, 9.84)*	6.3 (3.20, 12.45)*
Answered two from three	1.57 (0.76, 3.21)	1.94 (0.73, 5.20)
Answered all the three	1.00	1.00

***significant at significance level of 0.05;** [a] **adjusted for:** sex of child, education of father, occupation of father, income of the family, perceived economy, ownership status of house, floor of the house, number of rooms, latrine availability, refuse disposal, refuse in compound, source of water, type of water container, separate container for drinking water, transportation of water, way of drawing collected water, home drinking water treatment, times for hand washing, frequency of eating meat, is microorganism cause of diarrhea, transmission mode of diarrhea.

6. Discussion

Childhood diarrheal diseases has been hypothesized by different studies to be associated with socio-demographic, sanitation and housing, and maternal hygiene, child caring practices and knowledge. This study tried to assess potential amenable factors of diarrheal morbidity among under-five children at population level.

In the present study being male was associated with diarrheal status in the bivarite analysis. But it disappeared in the multivariate analysis. Diarrheal morbidity had no variation by sex of children according to Ethiopian DHS 2005 (5). Other studies (18, 39) also showed that diarrheal morbidity had no significant variation by sex. Having father with no job was associated with diarrheal status in the bivariate analysis; however, it disappeared when the effect of other variables was controlled.

Monthly income and perceived economy had association with diarrheal morbidity in the bivariate analysis. However, monthly income disappeared in the multivariate analysis. Perceived economy of the family remained being one of the independently associated factors of diarrheal morbidity. The odds of developing diarrheal morbidity were greater among children from families who perceived they were economically very poor (AOR=3.84; 95%CI=1.25, 11.82). In Colombia and Dominican Republic, it was reported that diarrheal episodes decreased significantly for richer households (25).

Education of mothers was not significantly associated with diarrheal status in the present study. It was consistent with studies done in Eritrea (24), Egypt (27) and Meskanena Mareko woreda (6). But it was not consistent with studies conducted in Mecha Woreda, Ethiopia (8) and in India and Indonesia (25). This variation might be explained by two things. The first thing might be methodological differences among studies because the study done in Mecha Woreda was cross sectional; and the study conducted in India and Indonesia was Demographic and Health Surveys. And the second explanation might be socio-demographic variations among study subjects. Educational status of fathers was independently and significantly associated with diarrheal morbidity in the present study. It was consistent with studies conducted in Meskanena Mareko woreda, Ethiopia (6) and Egypt (27). Having illiterate father was not significantly associated when having father who read and wrote was associated.

Increased education of fathers might contribute for the improvement of sanitation conditions and the quality of food. Therefore, the role of fathers' education in reducing childhood diarrhea should not be neglected. Maternal age was not significantly associated with diarrheal morbidity in the present study. This was consistent with some studies (6, 27, 29), but it was inconsistent with the study done in Fentale Wereda, Ethiopia (26). Like in another study (27), birth order and birth interval were not significantly associated with diarrhea in the present study. But in a case control study done in Tanzania (28), birth order was reported to be significantly associated with diarrhea. This inconsistency might be explained by sample size difference as sample size taken in Tanzania study was lower. Socio-demographic variations between study subjects might also attribute for the difference.

Unlike other studies (6, 24), this study didn't show significant association between number of children in the family and diarrheal status. This inconsistency might be explained by design difference since other studies, unlike the present study, used cross sectional study designs.

In the bivariate analysis, children whose families had no their own house, children living in the house of mud floor, children living in the house of one room were found to have significantly higher odds of developing diarrhea. However, the associations disappeared in the multivariate analysis. Unlike this study, the study done in Egypt (27) showed that children from families of having no own house had higher odds of developing diarrheal morbidity. This disagreement might be attributed to the study design difference as the study done in Egypt was using cross sectional design.

Availability of toilet facility was independently associated with diarrheal morbidity of under-five children. Children from families of having no toilet facilities were at higher odds of developing diarrheal morbidity (AOR=13.45; 95%CI=3.58, 50.49). This finding was similar to the report of other studies (8, 26). However, toilet availability was not independent factor of childhood diarrheal morbidity in Eritrea (24). The odds of developing diarrheal morbidity was independently and significantly higher among children from families whose compounds were observed to have faeces. This was in agreement with a study done in Nekmte (7).

Refuse disposal system and refuse seen in the compound were also found to be associated with diarrheal status in the bivariate analysis. But the associations disappeared in the multivariate analysis. The method of refuse disposal was associated with diarrhea in Meskenena Mareko (6).

Source of water was independently associated with diarrheal morbidity. The odds of developing diarrheal morbidity was 9.79 (95% CI: 4.58, 20.97) times higher among children whose families used unprotected well/spring/river as compared to those who used piped water. The odds of developing diarrheal morbidity among those who used protected well was 3.4 times higher as compared to those who used piped water. Similar result obtained in other studies (25, 26). But it was not consistent with studies conducted in Jimma (29), Egypt (27) and Mekenena Mareko, Ethiopia (6). However, unlike another study (25), availability of water source in the dwelling had no significant association in this study. This difference might be attributed to methodological variation and socio-demographic variations of study subjects.

In the bivarate analysis, the way drinking water was transported to the house from the source was associated with diarrheal morbidity. Children from households who reported to transport their drinking water using uncovered container had higher odds of getting diarrhoea than children from households who transported their drinking water using covered container. However, the association disappeared in multivariate analysis. The association of water transportation with diarrhea was, however, independently observed in the study done in Nekemte, Ethiopia (7). This disagreement might be attributed to methodological difference as the study done in Nekemte used cross sectional study design.

Type of water collection container was found to be independent factor of diarrheal morbidity in this study. Children whose families had pot as water collection container were found to have higher odds of developing diarrheal morbidity as compared to children whose families had jerry can as water collection container. The fact that jerry can is suitable to keep water covered in might contribute for this association. Hence, it is important to use jerry can as water collection container instead of pot to reduce diarrheal morbidity.

Availability of home drinking water treatment was independently associated factor of diarrheal morbidity in this study. Children whose families didn't use home drinking water treatment such as wuha-agar, boiling or filtering were found to have higher odds of getting diarrhea when

compared to children whose families used water treatment method (AOR=2.34; 95%CI=1.33, 4.14). In the study conducted in Multan (32), use of boiled water was found to reduce childhood diarrheal incidence.

Frequency of household meat consumption was independently associated with diarrheal morbidity in the study conducted in Egypt (27). In the present study, children whose families reported to eat meat less than four times per month were found to have higher odds of developing diarrheal morbidity. However, this association disappeared in the multivariate analysis.

In the study done in Multan (32), hand washing at three critical times (after use of toilet, after cleaning the child and before food handling) was reported to reduce childhood diarrheal incidence. A meta-analysis of hand washing studies conducted in developing countries showed that hand washing could reduce diarrhea in general population by about 42% (34). It was also reported elsewhere (4) that hand washing with soap could reduce diarrheal incidence by 35% to 47%. Similarly, the present study showed that reported hand washing practice of mothers/caretakers at critical times was independently and significantly associated with diarrheal morbidity. Respondents were asked a question about the times at which they washed their hands. These hand washing times were before eating, after eating, after cleaning the child, before feeding the child and before preparing food. Regardless of the use of soap, the odds of developing diarrheal morbidity was higher among children whose mothers/caretakers reported that they washed their hands at only one of the five critical hand washing times as compared to children whose mothers/caretakers reported that they washed at four and above critical hand washing times. This result implies that it is possible to reduce diarrheal morbidity by washing hands at critical times. Therefore, awareness creation among mothers/caretakers about importance of hand washing should be given attention.

Knowledge of mothers/caretakers on the cause of diarrheal morbidity was significantly associated with diarrheal morbidity in the bivariate analysis. But the association disappeared when the effect of other variables was controlled in the multivariate analysis.

Knowledge of mothers/caretakers on transmissions of diarrheal morbidity was also independently and significantly associated with diarrheal morbidity. Respondents were asked a

question about transmission modes of diarrheal morbidity. These transmission modes were contaminated food, contaminated water and flies. The odds of developing diarrheal morbidity was higher among children whose mothers/caretakers answered none of the three transmission modes, and among children whose mothers/caretakers answered one of the three as compared to children whose mothers answered all the three. Knowing these common means of diarrhea transmissions might help mothers/caretakers to take care of their children from consuming contaminated food and water, and from flies that are known to be transmission route for diarrhea. This result shows the importance of health information dissemination to the mothers/caretakers on transmission modes of diarrhea.

Generally, the findings of the study have paramount implications for control of diarrheal morbidity of under-five children. It would provide helpful insights for policy makers and program implementers in to the potential risk factors of diarrheal morbidity to take priority interventions to prevent and control the disease.

Strength and limitation of the study

Strength of the study: The design being case control, study subjects being from the community are the strong sides of the study

Limitation of the study: As any other epidemiological study, this study acknowledges recall bias and the outcome of interest preceded the occurrence of factors measured

7. Conclusion and recommendations

7.1 Conclusion

This study came up with the conclusion that potential factors of diarrheal morbidity among under-five children in Wolaita Soddo town were

- Low educational status of fathers
- Unavailability of toilet facility, poor human waste management, and unsafe source of water and its poor utilization,
- Poor personal hygiene, and lack of knowledge about transmission of diarrheal morbidity

7.2 Recommendations

The following recommendations are forwarded based on the main findings of the study:

- Government and other responsible bodies should strive in letting the community have at least common toilet facilities, and common safe source of drinking water
- Educating households how to manage human waste and how to use drinking water safely should be given emphasis.
- Health education should be given to females who take care of children on personal hygiene and transmission modes of diarrheal morbidity.

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Annexes

Annex 1. Conceptual framework

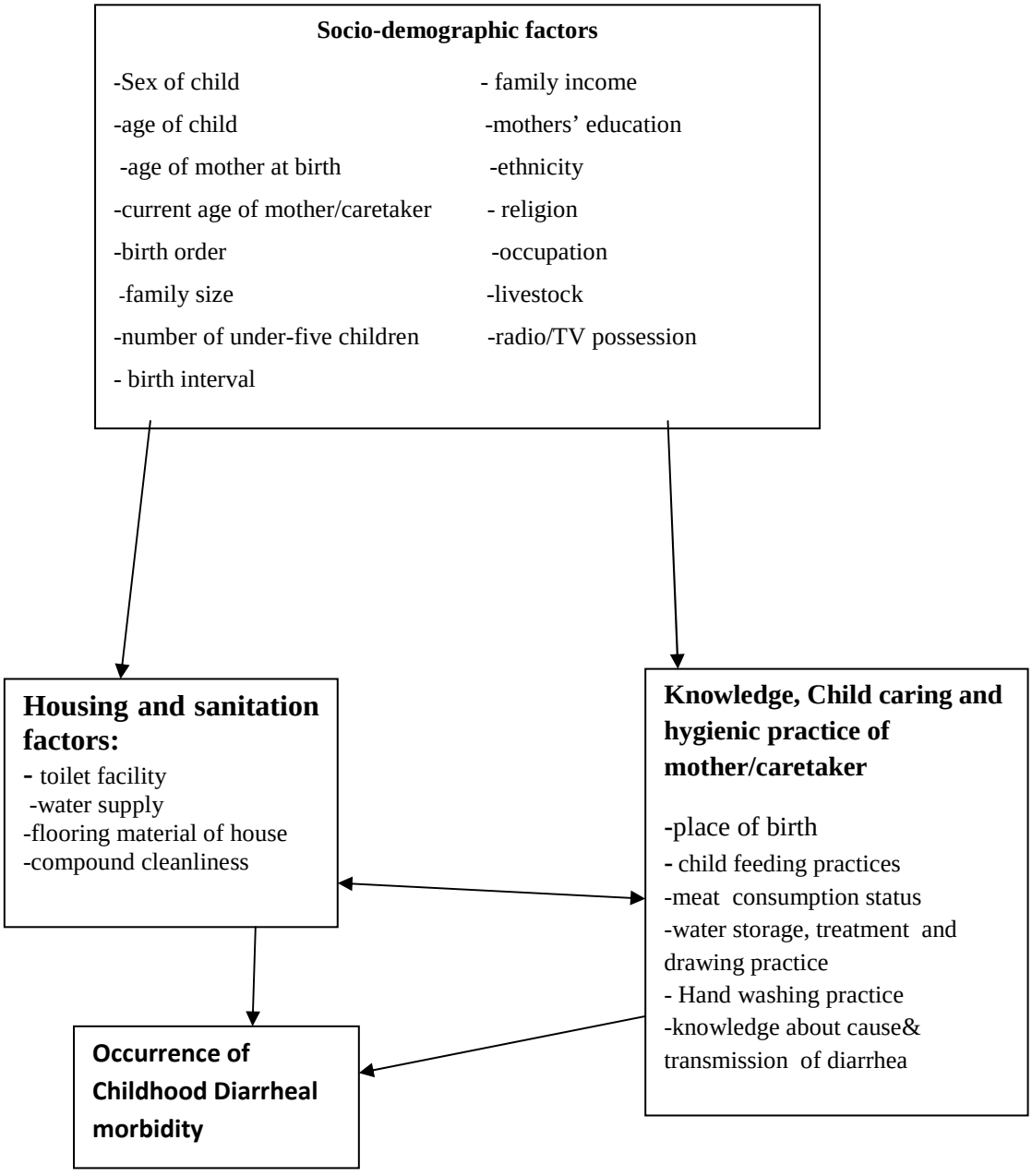

Figure. Conceptual framework on the determinant factors of childhood diarrheal morbidity, Wolaita Soddo, 2010.

Annex 2. Questionnaire

Questionnaire prepared to collect information to study factors of diarrheal morbidity among under-five children in Wolaita Soddo town, Southern Ethiopia.

To be filled by PI only
Control----------00
Case----------01

Identification

001. Id number of HH/ Questionnaire----------

002. Subcity----------

003. Kebele----------

Part I. demographic and socio- economic characteristics

No	Question	Response	Skip to
Q101	Family size	---------in number	
Q102	Number of under-five children in the HH	-------- in number	
Q103	Age of the index child	----------month	
Q104	Sex of the index child	Male----------1 Female----------2	
Q105	The place of birth of the index child	Health institution-----1 Home----------2 Other(specify)---------96	
Q106	Birth order of the child	First----------1 Second----------2 Third----------3 Fourth &above--------4	Q108
Q107	Birth interval of the child	-------months	
Q108	Relation of the respondent to the child	Mother----------1 Caretaker----------2	
Q109	Age of the mother at birth of the index child	---------years	
Q110	Current age of the mother/caretaker	----------years	
Q111	Marital status of the mother/caretaker	Married----------1 Single----------2 Divorced----------3 Widowed----------4	
Q112	Religion of mother/caretaker	Protestant----------1 Orthodox----------2 Catholic----------3 Other(specify)--------96	

Q113	Ethnicity of mother/caretaker	Wolaita----------1 Gurage----------2 Hadya----------3 Gamo----------4 Oromo----------5 Amhara----------6 Other(specify)---------96	
Q114	Educational level of mother/caretaker	illiterate----------1 read and write ----------2 Elementary completed----3 High school completed ---4	
Q115	Educational level of the father	illiterate----------1 read and write ----------2 Elementary completed----3 High school completed ---4	
Q116	Occupation of the mother/caretaker	housewife----------1 Government employee--2 Private work----------3 Merchant ----------4 Other(specify)----------5	
Q117	Occupation of the father	Government employee--1 Private work----------2 Merchant----------3 Jobless----------4 Other(specify)----------96	
Q118	Average monthly income of the family	Eth.Birr---------	
Q119	Perceived economy(compared to the neighbors)	Very poor----------1 poor----------2 Average ----------3 rich----------4 No response----------99	
Q120	Does the family own radio/TV?	yes----------1 No----------2	
121	Does the family have livestock	Yes ----------1 No----------2 →	Q123
Q122	If yes for Q121 do the livestock stay with people at the same living house?	Yes ----------1 No----------2	

Part II. Housing and sanitation factors

Q123	Ownership status of the house	Private----------1 Rented----------2 Other(specify)------96	
Q124	Type of floor material of the living house (**Observation)**	Cement----------1 Mud----------2 Wood----------3 Other(specify)-------96	
Q125	Number of rooms in the house	----------(in number)	
Q126	Is there separate kitchen?	Yes ----------1 No----------2	
Q127	Is latrine available?	Yes ----------1 No----------2 →	Q131

Q128	Ownership status of the latrine	Privately owned----------1 Shared with neighbors-----2	
Q129	Type of latrine	Traditional pit----------1 VIP latrine----------2 Water flush----------3 Other(specify)----------96	
Q130	Is feces seen around pit-hole (floor) (**Observation)**	Yes----------1 No----------2	
Q131	Is feces seen in the compound (**Observation**	Yes----------1 No----------2	
Q132	If no latrine, where do you dispose human waste?	Open field----------1 Other(specify)----------96	
Q133	How do you dispose refuse?	Pit----------1 Burning----------2 Open field----------3 Other(specify)----------96	
Q134	Is refuse seen around the compound?	Yes----------1 No----------2	
Q135	What is the source of water?	Pipe----------1 Protected well----------2 Unprotected well-------3 Other(specify)----------96	
Q136	Is there source of water in the compound?	Yes----------1→ No----------2	Q138
Q137	Distance of water source from house	-----minutes	
Q138	Type of water collection container	Jerrycan----------1 Pot----------2 plastic bucket----------3 Iron bucket----------4 Other(specify)----------96	
Q139	Do you have separate storage container for drinking water	Yes ----------1 No----------2	
Q140	How did you transport the collected drinking water yesterday?	In a covered container----1 In uncovered container----2 Other(specify)----------96	
Q141	How do you draw the collected water	by pouring----------1 by dipping----------2 other(specify)----------96	
Q142	Do you have home drinking water treatment	Yes----------1 No----------2→	Q144
Q143	What is the method of treatment?	wuha agar----------1 boiling ----------2 filtering through clothes----3 Other(Specify)----------96	

Part III. Child caring, hygienic practices and knowledge of mothers/caretakers			
Q144	What is the current breastfeeding status?	Exclusive breastfeeding-------1 Partially breastfeeding---------2 Not breastfeeding----------3	
Q145	At what time after delivery did you star giving breast milk?	----------hours	
Q146	If 3 is circled for Q144, for how long have you breastfed your child?	-------month	
Q147	If 2or3 is circled for Q144,at what age did the child start weaning/complementary food	--------months	
Q148	If 2or3 is circled for Q144,what is/was the complementary food**(more than one answer may be possible)**	Cow's milk----------1 Powder milk----------2 Adult's food----------3 Other(specify----------96	
Q149	If 2or3 is circled for Q144, what do/did you use to feed the child? **(more than one answer may be possible)**	Hand----------1 Bottle----------2 Cup----------3 Spoon----------4 Other(Specify)----------96	
Q150	Did the child receive measles vaccine? *Only for child of age greater than nine months*	Yes (by checking the card)---1 Yes (by report)----------2 No----------3	
Q151	When do you wash your hands? **(more than one answer may be possible)**	Before eating----------1 After eating ----------2 After toilet visit----------3 After cleaning the child------4 Before preparing food-------5	
Q152	Cleansing material for hand washing?	Soap ----------1 Ash----------2 Water only----------3	
Q153	How often do you eat meat	----------week/month/year	
Q154	What is the cause of diarrhea**?(more than one response is possible)**	Microorganisms----------1 Flies ----------2 Contaminated food---------3 Contaminated water--------4 I do not know----------88 Other(specify)----------96	
Q155	How is diarrhea transmitted? **(more than one response is possible)**	by eating contaminated food----1 by flies----------2 by drinking contaminated water-3 by physical contact with diseased person----------4 I do not know----------88 Other(specify)----------96	
	We have finished, thank you very much.		

Name of the interviewer _____signature _____date_____

Name of the supervisor _____signature _____date_____

Amharic version of the questionnaire

3. መጠይቅ

በአዲስ አበባ ዩኒቨርሲቲ በሜዲከል ፋካልቲ የሕብረተሰብ ጤና ት/ቤት በወላይታ ሶዶ ከተማ ከአምስት አመት ዕድሜ በታች ባሉ ሕጻናት ላይ የሚከሰተውን የተቅማጥ በሽታ ዋና ዋና ምክንያቶች ለማወቅ ለሚድረገው ጥናት መረጃ መሰብሰቢያ የተዘጋጀ መጠይቅ

መለያ/መታወቂያ

001.**የቤተሰብ/የመጠይቅ መለያ ቁጥር** ----------

002. **ክፍለ ከተማ**----------

003. **ቀበሌ** ----------

በተመራማሪው ብቻ የሚሞላ
ማነጣፀሪያ----------00
ህመምተኛ----------01

ክፍል አንድ፡ ማህበራዊ ስነ-ህዝባዊ እና ኢኮኖሚያዊ ጉዳዮች

No	ጥያቄ	ምላሽ	ይለፉ
Q101	**የቤተሰብ ብዛት**	**--------በቁጥር**	
Q102	**እድሜያቸው ከአምስት አመት በታች ያሉ ህጻናት ብዛት**	**--------በቁጥር**	
Q103	**የተመረጠው ህጻን ዕድሜ**	**----------ወር**	
Q104	**የተመረጠው ህጻን ጾታ**	**ወንድ----------1** **ሴት----------2**	
Q105	**የተመረጠው ህጻን የተወለደበት ቦታ**	**ጤና ተቋም---------1** **መኖሪያ ቤት--------2** **ሌላ(ይገለጽ)---------96**	
Q106	**የተመረጠው ህጻን ስንተኛ ልጅ ነው?**	**የመጀመሪያ----------1** **ሁለተኛ----------2** **ሶስተኛ----------3** **አራተኛ እና ከዚያ በላይ--4**	
Q107	**የተመረጠው ህጻን ከቀዳሚው ልጅ ከስንት ወር በኋላ ተወለደ**	**----------ወር**	
Q108	**የዚህ ጥናት ተሳታፊ ከተመረጠው ህጻን ጋር ያላቸው ግንኙነት**	**እናት----------1** **አሳዳጊ----------2**	
Q109	**የህጻኑ እናት ህጻኑን ሲ.ዎልዱ ዕድሜያቸው ስንት ነበር**	**----------ዓመት**	
Q110	**የህጻኑ እናት/አሳዳጊ ዕድሜ**	**----------ዓመት**	
Q111	**የህጻኑ እናት/አሳዳጊ የጋብቻ ሁኔታ**	**ያገባች----------1** **ያላገባች----------2** **የፈታች----------3** **የሞተባት----------4**	
Q112	**የህጻኑ እናት/አሳዳጊ ኃይማኖት**	**ፕሮቲስታንት------1** **ኦርቶዶክስ----------2** **ካቶሊክ ----------3** **ሌላ(ይገለጽ)--------96**	
Q113	**የህጻኑ እናት/አሳዳጊ ብኄር**	**ወላይታ----------1** **ጉራጌ----------2** **ሀድያ ----------3** **ጋሞ----------4** **ኦሮሞ----------5**	

		አማራ----------6 ሌላ(ይገለጽ)----------96	
Q114	የህጻኑ እናት/አሳዳጊ የትምህርት ሁኔታ	ያልተማሩ----------1 ማንበብና መጻፍ የሚችሉ----2 አንደኛ ደረጃ ያጠናቀቁ--------3 ሁለተኛ ደረጃ ያጠናቀቁ--------4	
Q115	የህጻኑ አባት የትምህርት ሁኔታ	ያልተማሩ----------1 ማንበብና መጻፍ የሚችሉ----2 አንደኛ ደረጃ ያጠናቀቁ--------3 ሁለተኛ ደረጃ ያጠናቀቁ--------4	
Q116	የህጻኑ እናት/አሳዳጊ ስራ	የቤት እመቤት----------1 የመንግስት ሰራተኛ----------2 የግል ተቀጣሪ----------3 ነጋዴ----------4 ሌላ (ይገለጽ)----------96	
Q117	የህጻኑ አባት ስራ	የመንግስት ሰራተኛ----------1 የግል ተቀጣሪ----------2 ነጋዴ----------3 ስራ የሌለው----------4 ሌላ (ይገለጽ)----------96	
Q118	የቤተሰብዎ አማካይ የወር ገቢ መጠን	በብር----------	
Q119	ከጎረቤትዎ ጋር ሲያነጻጽሩ የዕርስዎን የኑሮ ደረጃ ከየትኛው ይመድቡታል?	በጣም ደሃ----------1 ደሃ----------2 መከከለኛ----------3 ሃብታም----------4 ለመመለስ ፍቃደኛ አይደለሁም-99	
Q120	ቤተሰብዎ ሬዲዮ አለው?	አዎ----------1 የለውም----------2	
Q121	ቤተሰብዎ የቤት እንሰሳ አለው?	አዎ----------1 የለውም----------2 → Q123	
Q122	እንስሳ ካለ ከሰው ጋር በመኖሪያ ቤት ነው የሚኖረው?	አዎ----------1 አይደለም----------2	
ክፍል ሁለት፡ የቤትና የጽዳት ሁኔታዎች			
Q123	የመኖሪያ ቤት የባለቤትነት ሁኔታ	የግል ቤት----------1 የክራይ ቤት----------2 ሌላ(ይገለጽ)---------- 96	
Q124	የመኖሪያ ቤቱ ወለል ሁኔታ(**ይመልከቱ**)	ሲሚንቶ----------1 አፈር----------2 እንጨት----------3 ሌላ(ይገለጽ)----------96	
Q125	ቤቱ ስንት ክፍሎች አለት?	በቁጥር----------	
Q126	የተለየ ኩሽና ቤት አለ?	አዎ----------1 የለም----------2	
Q127	መጸዳጃ ቤት አለ?	አዎ----------1 የለም----------2 → Q131	
Q128	የመጸዳጃ ቤቱ የባለቤትነት ሁኔታ	የግል----------1 ከጎረቤት ጋር የጋራ----------2	
Q129	መጸዳጃ ቤቱ ምን ዓይነት ነው? (**ይመልከቱ**)	ባህላዊ ጉድጋድ----------1 ንፋስ ማስገቢያና ማስወጫ ያለው(ቪአይፒ)----------2 በውሃ የሚሰራ(ወተር ፍላሽ)-3 ሌላ(ይገለጽ)----------96	

Q130	መጸዳጃ ቤቱ መቀመጫ/ወለል አካባቢ ሰገራ ይታያል?(**ይመልከቱ**)	አዎ----------1 አይታይም----------2	
Q131	መኖሪያ ቤቱ ግቢ ውስጥ ሰገራ ይታያል? (**ይመልከቱ**)	አዎ----------1 አይታይም----------2	
Q132	መጸዳጃ ቤት ከሌለዎት ቤተሰብዎ የት ይጸዳዳል?	ሚዳ ላይ----------1 ሌላ ቦታ(ይገለጽ)----------96	
Q133	ደረቅ ቆሻሻን እንዴት ያስወግዳሉ?	ጉድጋድ ውስጥ እቀብራለሁ--1 አቃጥላለሁ----------2 ሚዳ ላይ እጥላለሁ ----------3 ሌላ ቦታ(ይገለጽ)----------96	
Q134	ግቢ ውስጥ ደረቅ ቆሻሻ ይታያል?(**ይመልከቱ**)	አዎ----------1 አይታይም----------2	
Q135	ውሃ ከየት ያገኛሉ?	ከቧንቧ ውሃ----------1 ከተጠበቀ የጉድጋዳ ውሃ--2 ካልተጠበቀ የጉድጓድ ውሃ--3 ሌላ(ይገለጽ)----------96	
Q136	ግቢ ውስጥ ውሃ አለ?	አዎ----------1→ የለም----------2	Q138
Q137	ከሌለ ውሃ በሚቀዱበት እና በቤትዎ መካከል ያለው ርቀት	----------ደቂቃ	
Q138	የውሃ መቅጃዎ ምን ዓይነት ነው?	ጀሪካን----------1 የሸክላ እንስራ----------2 የፕላስቲክ ባልዲ----------3 የብረት ባልዲ----------4 ሌላ(ይገለጽ)----------96	
Q139	ለመጠጥ ውሃ የተለየ መቅጃ/ማጠራቀሚያ አለዎ?	አዎ----------1 የለኝም----------2	
Q140	በትናንትናው ዕለት የቀዱትን የመጠጥ ውሃ እንዴት ነበር ያመጡት?	ክዳን ባለው መያዣ----------1 ክዳን በሌለው መያዣ----------2 ሌላ(ይገለጽ)----------96	
Q141	የተቀዳውን/የተጠራቀመውን ውሃ ለመጠቀም ሲፈልጉ እንዴት ነው የሚቀዱት?	በማፍሰስ----------1 በመጥለቅ----------2 ሌላ(ይገለጽ)----------96	
Q142	ቤትዎ ውስጥ የውሃ ማከሚያ አለዎ?	አዎ----------1 የለኝም----------2→	Q144
Q143	ከለዎት ለማከሚያ የሚጠቀሙበት ምንድን ነው?	ውሃ አጋር----------1 ማፍላት----------2 በጨርቅ ማጣራት----------3 ሌላ(ይገለጽ)----------96	

ክፍል ሶስት፤የእናት/አሳዳጊ እውቀት፤ የልጅ አያያዝ እና የንጽህና ሁኔታዎች

Q144	የህጻኑ በአሁኑ ሰዓት የጡት አጠባብ ሁኔታ	ሙሉ በሙሉ ጡትበመጥባት ላይ ነው ----------1 በከፊል ጡት በመጥባት ላይ ነው ----------2 ጡት በመጥባት ላይ አይደለም ----3	
Q145	ህጻኑን ከተወለደ ከስንት ሰዓት በኋላ ጡት አጠቡት?	----------ሰዓት	
Q146	ህጻኑን ለምን ያክል ጊዜ ጡት አጠቡት?	----------ወር	
Q147	ከጡት ተጨማሪ ምግብ መስጠት የጀመሩት የህጻኑ ዕድሜ ስንት ሲሆን ነው?	----------ወር	
Q148	ከጡት ተጨማሪው ምግብ ምንድን	የላም ወተት ----------1	

	ነው/ነበር?	የዱቄት ወተት----------2 የወጣት ምግብ----------3 ሌላ(ይገለጽ)----------4	
Q149	ከጡት ተጨማሪውን ምግብ በምን መገቡት?	በእጅ----------1 በጡጦ----------2 በስኒ ----------3 በማንኪያ ----------4 በስኒና በማንኪያ ----------5 በሌላ(ይገለጽ)----------96	
Q150	ህጻኑ የኩፍኝ ክትባት ተከትባል? (ዕድሜው ከ 9 ወር በላይ ለሆነ ብቻ)	አዎ(ካርዱን በማየት)----------1 አዎ(በሪፖርት)----------2 አልተከተበም ----------3	
Q151	እጆዎን የሚታጠቡት መቸ ነው?	ከምግብ በፊት----------1 ከምግብ በኋላ----------2 ከመጸዳጃ ቤት መልስ----------3 ህጻን ካጸዳዱሁ በኋላ----------4 ምግብ ከማዘጋጀቱ በፊት----------5	
Q152	እጆዎን ለመታጠብ ምን ይጠቀማሉ?	ሳሙና----------1 አመድ----------2 ውሃ ብቻ----------3	
Q153	ስጋ ምን ያክል ጊዜ ይመገባሉ?	----------በሳምንት/ወር/ዓመት	
Q154	የተቅማጥ መንስኤ ምንድን ነው? **(ከአንድ በላይ መልስ ሊኖር ይችላል)**	በዓይን የማይታዩ ጥቃቅን ህዋሳት----------1 ዝንብ----------2 የተበከለ ምግብ----------3 የተበከለ ውሃ----------4 አላውቅም----------88 ሌላ(ይገለጽ)----------96	
Q155	ተቅማጥ እንዴት ከበሽተኛ ወደ ጤነኛ ሰው ይተላለፋል? (**ከአንድ በላይ መልስ ሊኖር ይችላል)**	የተበከለ ምግብ በመመገብ----------1 የተበከለ ውሃ በመጠጣት----------2 በዝንብ----------3 ከበሽተኛ ሰው ጋር አካላዊ ንክኪ በማድረግ----------4 አላውቅም----------88 በሌላ(ይገለጽ)----------96	
	እግዚአብሔር ይስጥልኝ፤አመሰግናለሁ::		

የመረጃ ሰብሳቢው ስም_____ **ፊርማ** _____**ቀን** _____

የተቆጣጣሪው ስም _____ **ፊርማ** _____ **ቀን** _____

Questionnaire for enumeration of cases and controls

1. for cases

Id number of the household----------

Name of under-five child who had diarrhea within the last two weeks----------

(if there are 2 or more take one who had diarrhea most recently)

Age of the child----------(months)

2. for controls

-Id number of the house----------

-Name of under-five child who had no diarrhea within the last two weeks----------

(if there are 2 or more take one who best matches(in age) the case)

-Age of the child----------(months)

Name of the enumerator----------signature----------date----------

Name of the supervisor---------- signature----------date----------

ህመምተኛና ጤነኛ ህጻናቶችን ለመቁጠርና ለመለየት የተዘጋጀ መጠይቅ

1. ለህመምተኛ

-የቤቱ መለያ ቁጥር----------

-የበሽተኛው ህጻን ስም----------(ሁለትና ከዚያ በላይ ሕጻን ከለ በቅርብ ጊዜ የታመመውን ውሰድ)

-ዕድሜ(በወር)----------

2. ለጤነኛ

--የቤቱ መለያ ቁጥር----------

-የህጻኑ ስም----------(ሁለትና ከዚያ በላይ ሕጻን ከለ ለህመምተኛው በዕድሜ የሚቀርበውን ውሰድ)

-ዕድሜ (በወር)----------

የቆጣሪው ስም----------ቀን----------ፊርማ----------

የተቆጣጣሪው ስም----------ቀን----------ፊርማ----------

Annex 3. Information sheet and consent form

1. Information sheet: This sheet is to be read for the participants of the study.

Good morning/afternoon, my name is --------- and I am one of the data collectors for the study being conducted by Addis Ababa University, faculty of medicine on factors of diarrheal morbidity among under- five children in Wolaita Soddo town. You are selected scientifically to be participant of this study if you give me consent after you have understood the following information sheet:

Title of the study: A case control study on factors of diarrheal morbidity among under-five children in Wolaita Soddo town

Back ground of the study: Diarrheal disease is the most common cause of illness and the second leading cause of child death in the world. The burden of the disease is greatest in the developing world including Ethiopia.

Objective of the study: to assess risk factors of diarrheal morbidity among under-five children in Wolaita Soddo town, Southern Ethiopia

Benefit of the study: -the participant will not get any direct benefit for being participant

-the result can be used as a baseline for further studies that can be done in this town.

- the result will be used to design prevention and control measures of the disease.

-the result will be disseminated to the Wolaita Zone Health department

- if anybody is found to be sick during the survey, health information will be given to visit the nearby health institution

Harm of the study: the study has no any harm except that participant will spend up to 30 minutes in the interview.

Rights of the participant: -participation is the full right

-not participating is the full right

- the participant can stop participating in the study at any time

-the participant can skip question which she does not want to respond

-during the interview, the participant can ask questions which are not clear

Confidentiality: - the secrecy of any information forwarded will be maintained

Do you have any question?

2. የጥናቱ መግለጫ

(መረጃ በመስጠት ለሚሳተፉ ግለሰቦች የሚነበብ)

ጤና ይስጥልኝ እንደምን አደሩ/ዋሉ? ስሜ----------ይባላል፤ የመጣሁት ከዚሁ ከምላይታ ሶዶ ከተማ ሲሆን ከአምስት አመት ዕድሜ በታች ባሉ ሕጻናት ላይ በሚከሰተው የተቅማጥ በሽታ ዋና ዋና ምክንያቶች ላይ በአዲስ አበባ ዩኒቨርሲቲ ሜዲካል ፋካልቲ ለሚካሄደው ጥናት መረጃ በመሰብሰብ ላይ ከሚገኙት መረጃ ሰብሳቢዎች መካከል አንዱ ነኝ፡፡ እርሰዎ ከዚህ በታች የማነብለወትን የጥናቱን መግለጫ ተገንዝበው ፍቃደኛ ከሆኑ መረጃ በመስጠት የዚህ ጥናት ተሳታፊ እንዲሆኑ ሳይንሳዊ በሆነ መንገድ ተመርጠዋል፡፡

የጥናቱ ርእስ፡- በወላይታ ሶዶ ከተማ ከአምስት አመት ዕድሜ በታች ባሉ ሕጻናት ላይ

የሚከሰተው የተቅማጥ በሽታ ዋና ዋና ምክንያቶች

መግቢያ፡- የተክማጥ በሽታ በአለማቀፍ ደረጃ ህጻናትን ለህመም ከሚዳርጉ በሽታዎች አንደኛ ደረጃን የያዘ ሲሆን ለሞት ከሚያደርሱ ደግሞ የሁለተኛ ደረጃን የያዘ በሽታ ነው፡፡ የበሽታው አስከፊነት እነደ ኢትዮጵያ ባሉ ታዳጊ ሀገሮች የከፋ ነው፡፡

የጥናቱ ዓላማ፡- በወላይታ ሶዶ ከተማ ከአምስት አመት ዕድሜ በታች ባሉ ሕጻናት ላይ

የሚከሰተውን የተቅማጥ በሽታ ዋና ዋና ምክንያቶች ማወቅ

የጥናቱ ጥቅም፡ - ተሳታፊው ተሳታፊ በመሆናቸው የሚያገኙት ምንም ጥቅም የለም

-ከዚህ ጥናት የሚገኘው ውጤት በከተማው ወደፊት ለሚጠኑ ተመሳሳይ

ጥናቶች ዕንደመነሻ ግብአት ያገለግላል

-የጥናቱ ውጤት በሽታውን ለመከላከልና ለመቆጣጠር የሚያስችሉ መፍትሄዎችን ለመንደፍ ይጠቅማል

-የጥናቱ ውጤት ለወላይታ ዞን ጤና መምሪያ ይገለጻል

-ይህ መረጃ በሚሰበሰብበት ወቅት የታመመ ሰው ከተገኘ በቅርብ ወደሚገኝ ጤና ተቋም ሄዶ እንዲታከም ምክር ይሰጣል

የጥናቱ ጉዳት፡ የቃለ መጠይቁ ተሳታፊ እስከ 30 ደቂቃ የሚደርስ ጊዜ ከማባከን ውጭ በጥናቱ ተሳታፊ በመሆናቸው የሚደርስባቸው ምንም ዓይነት ጉዳት የለም

የቃለ መጠይቁ ተሳታፊ መብቶች፡- በዚህ ጥናት መሳተፍ ሙሉ መብት ነው

- በዚህ ጥናት አለመሳተፍ ሙሉ መብት ነው፤በመሳተፍ ላይ እያሉ በማንኛውም ሰዓት ማቋረጥ ይቻላል፤ ከጥያቄዎቹ ውስጥ ለመመለስ የማይፈልጉትን ጥያቄ አለመመለስ ይቻላል

-በቃለ መጠይቁ ወቅት ግልጽ ያልሆነን ነገር መጠየቅ ይቻላል

የጥናቱ ሚስጥራዊነት፡- የተሳታፊው ማንነት በሚስጥር ይያዛል

ጥያቄ አለዎት?

2. Informed consent form

I --------have well understood the study information sheet read above.

And now I am in a position -------- to participate in the study by giving information.

To be voluntary ⟶sign below and conduct interview

Not to be voluntary-⟶ go to the next household

Signature of the interviewer ----------

(Signature of the interviewer certifies that informed consent has been given verbally by the respondent)

Questionnaire identification number _____

Name of the Interviewer _____Signature_____date _____

Name of the supervisor _____Signature _____date _____

Address of the investigator:

- Mob. =0912-05-67-67

-email =mulat_epi@yahoo.com

For further question/ information use the address of the IRB medical faculty:

-Addis Ababa University, Faculty of medicine

-Phone number= 011-5-53-87-34

-email= aaumfirb@yahoo.com

2. የፍቃደኝነት መጠየቂያ ቅጽ

እኔ---------የጥናቱ መግለጫ ተነቦልኝ/አንብቤ እና ተገንዝቤ መረጃ በመስጠት የጥናቱ ተሳታፊ ለመሆን፡-

ፍቃደኛሁኛለሀ ⟶ ፈርመህ/ሽ መጠይቁን ሙላ

ፍቃደኛ አልሆንኩም ⟶ወደሚቀጥለው ቤት እለፍ/ፊ

የመረጃ ሰብሳቢው ፊርማ----------

***(የመረጃ ሰብሳቢው ፊርማ መኖር ግለሰቧ የጥናቱ ተሳታፊ ለመሆን ፍቃደኛ መሆናቸውን ያመለክታል*)**

የመጠይቁ መለያ ቁጥር----------

የመረጃ ሰብሳቢው ስም---------- ፊርማ---------ቀን----------

የተቆጣጣሪው ስም---------- ፊርማ----------ቀን----------

የተመራማሪው አድራሻ፡-

ሞባይል፡ 0912-05-67-67

ኢሜል፡ mulat_epi@yahoo.com

ለበለጠ ጥያቄ/መረጃ የሚከተለውን የተቋሙን ገምጋሚ ቦርድ አድራሻ ይጠቀሙ
-አዲስ አበባ ዩኒቨርሲቲ ሜዲካል ፋካልቲ
-ስልክ= 011-5-53-87-34
ኢሜል፡ aaumfirb@yahoo.com

Annex 4.Guidelines and responsibilities of data collectors and supervisors

Guidelines of data collectors

-before you enter the house, you have to get permission

-make sure the number of the selected house is with you when you collect the data

-extend your greeting; introduce yourself by quoting your name

-if the person you get is not mother/caretaker of the child, ask that person to contact you mother/caretaker

- if you get mother/caretaker, ask her willingness by reading the information sheet and consent form

- if you do not get mother/caretaker, hold appointment and go to the next house

-data will be only if the participant is willing; if they are not willing, try to get the reason

- make sure that the questionnaire is filled completely and correctly

-ask help from your supervisor when you face difficulty

-after you have finished, thank the participant

Responsibility of data collectors

-conducting interview

-handing over the filled questionnaire to the supervisor on daily basis

-informing supervisor difficulties and their solutions on daily basis

-making corrections including revisiting the houses if request is made by supervisor/PI

Responsibilities of the supervisors

-helping data collectors

-scheduling data collectors

-ensuring that data collector collected the data in his site

- ensuring that each questionnaire is filled correctly and completely and then handing over the filled questionnaire to the PI after putting signature

የመረጃ ሰብሳቢዎችና የተቆጣጣሪዎች መመሪያና ሓላፊነት

<u>የመረጃ ሰብሳቢዎች መመሪያ</u>

-ወደ ማንኛውም ቤት ውስጥ ለመግባት መጀመሪያ ቤት ውስጥ ካለው ሰው ፈቃድ ማግኘት ይኖርብኃል።

-በመጀመሪያ በአጠቃላይ ቆጠራ ወቅት(ታማሚዎች በሚለዩበት ወቅት) ለጥናቱ የሚሆነውን ቤት ከመረጥክ በኋላ ለቤቱ ቁጥር ስጥ

-መረጃ ለመሰብሰብ በጥናቱ የተመረጠውን ቤት ቁጥር መያዝህን አረጋግጥ

- በእያንዳንዱ ቤት ስትደርስ ለሰዎች በአክብሮት ሰላምታ አቅርብ፤ ስምህን በመናገር እራስህን አስተዋውቅ፤

-በቤቱ ውስጥ ያገኘህው ሰው የህፃኑ እናት/አሳዳጊ ካልሆኑ የህፃኑን እናት እንዲያገናኙህ ጠይቅ።

-የህፃኑ እናት/አሳዳጊ ካገኘህ የጥናቱን መግለጫ በማንበብ ፈቃደኝነታቸዉን ጠይቅ።

-የህፃኑ እናት/አሳዳጊ ቤት ውስጥ ካላገኘህ መቸ እንደሚገኙ ቀጠሮ ይዘህ ወደሚቀጥለው ቤት ዕለፍ።

-መረጃዉ የሚሰበሰበው የተመረጡት ሰዎች ሲስማሙ ብቻ ነው፤ለመሳተፍ ፈቃደኛ ካልሆኑ ለምን ፍቃደኛ እንዳልሆኑ ለመጠየቅ ሞክር።

-መጠይቁ ሙሉ በሙሉና በትክክል መሞላቱን አረጋግጥ።

-አስቸጋሪ ነገር ሲገጥምህ የተቆጣጣሪህን እርዳታ ጠይቅ።

-ቃለ ምልልሱን ከጨረስክ በኋላ አመስግነህ ወደሚቀጥለዉ ቤት ዕለፍ።

<u>የመረጃ ሰብሳቢዎች ኃላፊነት</u>

1. መጠይቅ ማካሄድ
2. ለተቆጣጣሪዎች በየቀኑ የተሞሉትን መረጃዎች ማስረከብ
3. በየቀኑ ስለተፈጠሩት ችግሮችና መፍትሄዎች መረጃ መስጠት
4. እርማት ማካሄድ በተቆጣጣሪው ከታዘዘ/ከተጠየቀ ወደ መኖሪያ ቤት ተመልሶ መሄድን ይጨምራል።

<u>የተቆጣጣሪዎች ሓላፊነት</u>

1-መረጃ ሰብሳቢዎችን ማገዝ/ከነሱ ጋር በጋራ መስራት።

2-ለመረጃ ሰብሳቢዎች ፕሮግራም ማውጣትና ስራዎችን ማስተባበር።

3-መረጃ ሰብሳቢው በተመደበበት ቦታ መረጃ መሰቢሰቡን ማረጋገጥ።

4-እያንዳንዱ የመረጃ ቅፅ በትክክልና ሙሉ በሙሉ መሞላቱን ማረጋገጥና ካረጋገጡም በኋላ ፈርሞ ለተመራማሪው ማስረከብ።