
Zerihun Degebasa*1, Dawit Zenebe2, Taklu Marama3

Corresponding author*
1Department of maternal and child health, Yaya Gulele woreda, North Shoa Zonal Health Department, Oromiya, Ethiopia
2Department of Epidemiology, College of health sciences, Mekelle University, Mekelle, Togray, Ethiopia
3Department of Midwifery, College of Health sciences and Medicine, Wolaita Sodo University, Wolaita Sodo, SNNPR, Ethiopia

Abstract:
Purpose: The aim of this study was to assess under-five diarrheal status and associated factors among implemented and not implemented Community-led total sanitation and hygiene in Yaya Gulele woreda, Ethiopia, 2017.
Methods: Community-based comparative cross sectional study-involving 380 households from each implemented and not implemented community-led total sanitation and hygiene (CLTSH) area was conducted from December 1 to June 30, 2017. Pretested structured questionnaire and a complete observational checklist were used to collect data. Qualitative data were collected via focus group discussions and analyzed manually. Data were checked and entered to Epi info 3.5.4 and analyzed by SPSS version 20. Bivariate and multivariable logistic regression analyses were computed
Results: In this study, of the households of participants, 88% in implemented and 66% in not implemented Community-Led Total Sanitation and Hygiene (CLTSH) had latrine. Of latrine owned households, 85% in implemented and 75% in not implemented CLTSH utilize latrine properly. In the study area, 12% in implemented and 34% in not implemented CLTSH area practice open defecation. Two weeks period diarrhea prevalence was 13.4% (95%CI: 10.2-17.3%) in implemented CLTSH and 36.3% (95%CI: 31.7-41.6%) in not implemented CLTSH were reported. Two and above under five years old children [AOR= 2.33; 95% CI (1.09-4.96)], not clean water storage [AOR=2.36; 95% CI (1.16-4.80)], negative attitude of mothers/caregivers towards diarrhea [AOR=2.07; 95% CI (1.06-4.04)], presence of feces in the compound [AOR=1.88; 95% CI (1.10-3.22)] and lack of hand washing facility in the compound [AOR=2.64; 95% CI (1.47-4.74)] were associated factors of the outcome. Conclusions: implementation of CLTSH is the applicable tool to reduce diarrhea prevalence. Having more than two under five years old children, not clean water storage, negative attitude of mothers towards diarrheal status, existence of feces in the compound and lack of handwashing facility in the compound were associated factors to under five years old diarrheal status. Health workers and local authorities inspire the community to clean water storage and the environment, to change mothers’ behaviour towards diarrheal as well as construct handwashing facility in the compound.
Keywords: CLTSH, diarrhea, under-five children, Yaya Gulele woreda.
Introduction

According to the definition of the World Health Organization (WHO), diarrhea is the passage of three or more loose or watery stools within a day or unusual frequency of diarrhea episodes\textsuperscript{1-3}. Globally, about 1.7 billion cases of diarrheal disease occurred annually. It is the second leading cause of death in children under five years old worldwide, mainly in developing countries. Eighteen percent (18\%) of all the deaths of children under five years old are dying every day as a result of diarrheal diseases. Of all the child deaths from diarrhea, 78\% occur in the African and South-East Asian regions. In Africa due to poor sanitation diarrhea accounting about 4 billion cases annually\textsuperscript{4-7}. Poor sanitation and unimproved drinking water have a grim impact on child mortality in particular and public health in general which associated with the adverse nutritional outcomes, diarrhea, and tropical enteropathy\textsuperscript{8,9}.

Inadequate and unsafe water, lack of sanitation and poor hygiene practices is a complex issue for different diseases and 90\% accountable for the occurrence of diarrheal disease. Approximately, 1.5 to 2.2 million peoples dies each year from diarrhea and related diseases due to sanitation. Open defecation (ODs), lack of access to safe disposal of human excreta, lack of awareness of hygienic practices and using contaminated water were strong linkage with these deaths\textsuperscript{6,7,10-13}. Since the adoption of Millennium development Goals (MDGs), access to improved sanitation has increased around the globe. Despite significant investments made during recent decades by governments, non-government organization, bilateral and multilateral agencies to reduce diarrhea and sanitation problem, diarrhea remains the dire problem. Approximately, 37\% of the world’s population lacks improved sanitation. Eleven percent of the global population is not drinking improved water and 319 million of whom live in sub Saharan Africa (SSA)\textsuperscript{14-16}. Diarrhea is preventable and treatable feco-oral disease and one of the prevention strategies is Community Led Total Sanitation and Hygiene (CLTSH). Community-Led Total Sanitation and Hygiene (CLTSH) is an important innovative approach to change collective behavior of the community. It is used to change the communities’ collective behavior to utilize emotions, participatory approaches, and visual tools, based on the principle of triggering to enable communities to analyze their sanitation situations. Since 2000, emerged from Bangladesh, CLTSH has been implemented in 50 countries with at least 15 integrating CLTSH into their national policy including Ethiopia\textsuperscript{17,18}, \textsuperscript{3,10,14,19}. There is no evidence of the CLTSH intervention reduced child diarrhea prevalence, which impair the effect of CLTSH\textsuperscript{20,21}. In African countries, including Ethiopia, each child on average suffers from five episodes of diarrhea per year. The ranges of two weeks diarrhea prevalence from 10 to 40\% in different parts of Ethiopia resulted from poor Water, Sanitation and Hygiene (WASH)\textsuperscript{13,22-24}. Ethiopian Ministry of Health has been struggling to control the morbidity and mortality of children towards to poor sanitation, inadequate safe water and hygiene practices by formulating and implementing different policies and strategies. In 2002/03, health service extension package strategies and in 2006, CLTSH approach adopted and linked to the national policy. Despite these continues efforts, still challenge to overcome the dire problem which is 50,000 to 112,000 children under five years of age perish annually due to diarrheal diseases related to poor environmental sanitation and hygiene practices\textsuperscript{14,25,26}. In study area, despite 50\% of total kebeles implemented CLTSH and 90\% rotavirus and measles vaccination achieved, diarrheal disease is the second leading top five morbidity with 36.7\% second to pneumonia in 2016\textsuperscript{11}. Therefore, this study was aimed to assess Diarrheal status and associated factors among under five years old children in implemented and not implemented community led-total sanitation and hygiene children in Yaya Gulele District.
Methods and Materials:
The study was conducted in Yaya Gulele “District 1” (District or the third-level administrative divisions of Ethiopia) which is purposely selected. Yaya Gulele is 114 kilometers far away from Addis Ababa (Capital city of the country) to North direction. The District is found at geographical coordination of 9°30’N latitude and 38°40’E longitude. This District has sixteen rural and one urban kebeles (the smallest administration in Ethiopia) with four health centers and sixteen health posts.

The total estimated population of the district were 71,682 of which 36,703 (51.2%) were males, which projected from 2014-2017 population projection of Ethiopia. Among the total population, 2,308 (3.22%) and 11,777 (16.43%) were under one and under five years, respectively. The community have homogenous culture, and socio demographic characteristics. The woreda report indicated that 89, 82 and 72% were latrine coverage, latrine utilization and safe water coverage, respectively.

Study design and period:
Community-based comparative cross sectional study design was triangulated with qualitative method of focus group discussions was conducted from December 1 to June 30, 2017.

Study population:
All households of Yaya Gulele District who have at least one under-five years old child and live for more than 6 months were the participated during the study period. The Mothers/caregivers of the under-five years old child were the respondents in the households. However, Mothers or Spouses who are mentally ill, seriously ill, hearing and speaking problem were excluded from the study.

Sample size Determination:
The sample size was determined by using two-population proportion formula based on the assumptions: Significance level of 95% (\(\alpha = 0.05\)), 11.1% and 21.6% wew the proportion of diarrhea in implemented and not implemented CLTSH respectively. Power of the study 80% (\(\beta = 0.2\)), 1:1 ratio and 2-design effect and 10% of none response rate 380 households recruited from each implemented and not implemented CLTSH in this study.

Sampling Techniques:
Multistage sampling method was conducted to select study participants. The woreda divided into implemented and not implement CLTSH kebeles. Four kebeles were selected from each total kebeles of implemented CLTSH and not implemented CLTSH by a simple random sampling technique using lottery method as a primary sampling unit (PSU). Afterwards, sampling frame of the households who have at least one under-five years old child obtained from monthly updated family folders in the health posts of respective kebeles. Finally, a total of 760 sample size (380 households from implemented CLTSH and 380 households from not implemented CLTSH) was allocated to all randomly selected kebeles proportionally based on population size (number of households who have at least one under-five years old child) in the kebeles. Systematic sampling method was used to select study participants from each selected kebeles as a secondary sampling unit. The total number of households (households with at least one under five years old children) in each kebele was divided by the allocated sample size to get sampling interval. The first participant picked by lottery method and the next was drawn (with the fifth interval in implemented CLTSH and eighth interval in not implemented CLTSH) walking in the direction of the spinned sharp pen. One time additional attempt was made to interview the participants who were not present during data collection. Schematic presentation of multistage sampling frame (figure 2).

Data collection Tools and Techniques:
Data were collected face to face interview through pretested interviewer administered structured questionnaire and observational checklist. Variables in socio demographic, environmental factors, behavioral factors, knowledge of mothers/caregivers towards to diarrhea, and attitude of mothers/caregivers towards to diarrhea.
and childhood diarrhea; 2 weeks prior to the survey were incorporated into the questionnaires. Observational checklist was used to observe water container storage, availability and utilization of the latrine, sanitation of the compound and absence or presence of hand washing facility. A questionnaire was adopted from WHO core questions for water and sanitation and reviewing other materials related to the topic.

Furthermore, four sessions of focus group discussions (FGD) (two from each implemented and not implemented CLTSH area) carried out to augment quantitative finding. Eight participants involved in each Focus Group Discussions (FGDs). Mothers/caregivers who had under-five years old children and not take part in the questionnaire survey were participated in this FGD. Purposive sampling technique was used to select the participants by considering age and residence (implemented CLTSH and not implemented CLTSH) of the participants. The mothers/caregivers of the age group 25-35 years were selected, because they are supposed to have some prior experiences of taking care of their children and could actively participate in the discussions to reveal additional interactions and insights. It was conducted semi-structured topic guide to understand the phenomena of mothers’ knowledge on the causes and prevention of diarrhea, the importance of having hand washing facility and perception of hand washing to prevent diarrhea. These FGDs carried out by expert of health office with the qualification of master in public health by taking notes and audio records via mobile throughout the process. Expert from health office of maternal and child health department were acted as moderator. The sessions were arranged at the participants’ convenience of time and place. Ten trained diploma nurses and two BSc Environmental health professionals were employed for data collection and supervision, respectively.

Childhood diarrhea prevalence was measured using the WHO-recommended definition, namely if a child had three or more loose stools or watery diarrhea in 24 hours during the 2 weeks preceding the survey as reported by mothers/caregivers. Knowledge of the respondents towards to diarrhea was measured via computed the mean score. Each correct response scored as one (1) whereas other responses like “incorrect” or “don’t know” scored as zero. There are 22 variables in the knowledge section of the questionnaire. Using the mean score, respondents scored below the mean defined as poor knowledge and respondents scored above the mean considered as good knowledge. Importance of hand washing has seven items. It was dichotomized into “know” was assigned if the respondents scored above the mean and not know when the respondents scored below the mean. Attitude of the mothers/caregivers towards to diarrhea was measured by 10 questions. The questions were dichotomized to positive (strongly agree and agree) and negative (strongly disagree and disagree). Accordingly, respondents scored above the mean considered as positive and respondents scored below the mean considered as a negative attitude towards to diarrhea.

Data Quality Assurance
Two days training has been given to data collectors and supervisors on how to collect data from study participants and other technical procedures. To check the plausibility of the tool, estimate time for this interview and ensure understandability, the question is pretested on 5% (40) of participants who were not included in the study and in similar population of study area. Based on the finding of pretest the necessary correction was made on the clarity of language, a sequence of words and questioners. The collected data were checked for its completeness and consistency daily by supervisors and principal investigator before transferring into computer software. The questionnaire is originally in English and then translated to “Afan Oromo” and back to English for consistency. Incomplete questionnaire was referred back for completion.

Data Management and Analysis:
Data collected from the questionnaire were checked for completeness, entered and cleaned using Epi Info version 3.5.4 and exported to social...
package of statistical software (SPSS) version 20 for data analysis. Continuous variables coded and some coded variables recoded. Frequencies for all variables were counted and cross-tabulated using percentages. Bivariate logistic regression analyses were done for the explanatory variables with the dependent variable to select contender variables for multiple logistic regression models. Primarily variables that have p-value ≤0.2 in bivariate analysis was used to build the logistic model in order to identify predisposing factors which linked with diarrhea. Multivariable analysis has been done to find out whether or not the significant factors identified in bivariate analysis remain independently associated with the outcome variable.

Model fitness was checked via Hosmer-Lemeshow goodness of test when the P-value >0.05, model is fit. Multicollinearity between independent variables was checked via calculation of variance inflation factor (VIF). The results were presented in the form of tables, figures and summary statistics. Adjusted odds ratio (AOR) with its 95% confidence interval (CI) was used to report statistically significant at p-value<0.05. Collected qualitative data was transcribed, coded, recoded, themes developed and analyzed manually to augment quantitative findings.

Ethical consideration:

Ethical approval was obtained from Mekelle University Collage of health sciences, ethical review board (IRB). Official permission of letters was obtained from the Oromia Regional Health Bureau before commencement of the study. The participants were informed on the purpose of the study and privacy during the interview. Informed verbal consent was obtained from each study participant prior to interviewing. Participants were awared to have full right to participate or not in the study as well as to withdraw anytime during the interview. Confidentiality also maintained through anonymously.. Besides, they were also advised to take the child to the nearest health facility to get professional support.

Results:

Socio Demographic characteristics:

Seven hundred sixty (760) mothers/ caregivers who have under-five years old children were involved in this study with a 100 % response rate. Among the study participants, 380 (50%) from implemented CLTSH and the remains were from not implemented CLTSH kebeles. The mean ages of the participants were 30.07± 6.4 (SD) years old in implemented CLTSH and 31.6± 7.1(SD) years old in not implemented CLTSH kebeles. Orthodox Christianity was the predominant Religion in both implemented [374 (98 %)] and 370 (97 %) in not implemented CLTSH area (Table 1).

Childhood Diarrhea prevalence :

Two weeks period childhood diarrhea prevalence was 13.4% (95% CI: 10.2- 17.3%) in implemented and 36.3% (95% CI: 31.7-41.6%) in not implemented CLTSH area. The mean ages of the children with diarrhea were 29.9±17.7 (SD) months in implemented and 28.8 ±16.7 (SD) months in not implemented CLTSH kebeles. The overall mean age of children was 29.01±17.03 (SD) months (Table 2).

Environmental Characteristics Related to Diarrhea:

More than two third of the participants, 333 (88%) in implemented and 280 (74%) not implemented CLTSH area were used protected water source as the main sources. Two hundred eighty nine (76%) in implemented and 247(66%) not implemented CLTSH kebeles got water less than thirty minute walking from their home. Of the participants, 303 (91%) in implemented and 107 (43%) not implemented CLTSH kebeles had improved pit latrine in the study area. More than half of the participants, 179 (54%) in implemented and 159 (63%) in not implemented CLTSH kebeles had no hand-washing facility in or close to the latrine (Table 3).

More than two third of participants in implemented CLTSH were mentioned latrine discomfort as the main reason of not having the latrine as compared to not implemented CLTSH area, 3.1 % (Figure 1). Of 760 participants, more than two third of implemented CLTSH and 72%
of not implemented CLTSH were described that they dispose wastes in an open pit in the compound, whereas 13.7% of implemented CLTSH and 15.3% of not implemented CLTSH kebeles dump wastes in open field (Figure 2).

**Behavioral Characteristics Related to Diarrhea**

Of the participants, 331 (87%) in implemented and 240 (63%) in not implemented CLTSH kebeles treated their drinking water sources. The Majority of participants, 377 (99%) in implemented and 320 (84%) in not implemented CLTSH kebeles, stored their water in Jerry can and practiced pouring method to draw water from the container. More than two third of the participants, 283 (75%) in implemented and 282 (74%) in not implemented CLTSH kebeles practiced incomplete hand washing at critical times. Nearly two fifth of the participants, 146 (38%) in implemented and 161 (42%) in not implemented CLTSH area, had poor knowledge towards to diarrhea (Table 4).

**Attitude of participants toward diarrhea**

More than half of the participants, 205 (54%) in implemented and 291 (77%) in not implemented CLTSH kebeles strongly agree that diarrhea is the harmful disease in the community. More than half of the participants, 201 (53%) in implemented and 248 (65%) in not implemented CLTSH kebeles strongly agree that hand washing at the critical time is prevent diarrheal disease (Table 5). Overall, positive attitude of the respondents towards to diarrhea among implemented and not implemented CLTSH were 48 percent and 22%, respectively (Table 6).

**Factors associated with diarrhea among under-five children.**

Variables in the bivariate analysis of socioeconomic status, environmental and behavioral characteristics, composition of knowledge towards to diarrhea, attitude of mothers/caregivers towards to diarrhea and the importance of hand washing items which found at p-value ≤ 0.2 was further considered in final multivariable logistic regression analysis via backward elimination methods. Variables like two and above under-five years old children, not clean water container and negative attitude of mothers/caregivers towards to diarrhea in CLTSH as well as the presence of feces in the compound and not having hand washing facility in or adjacent to the latrine in not implemented CLTSH were independently statistically significant in multivariable analysis. The odds of developing diarrhea were two times higher among children whose parents with two and above under five years old children compared to the children whose parents with only one child in implemented CLTSH area [AOR=2.33;95%CI(1.09-4.96)]. The children whose parents had not cleaned water storage were 2.36 times more likely to have diarrhea than those whose parents cleaned water storage [AOR=2.36;95%CI(1.16-4.80)]. The odds of children having diarrhea were two times higher among children whose mothers/caregivers had negative attitude towards to diarrhea as compared to children whose mothers/caregivers with positive attitude towards to diarrhea in implemented CLTSH area [AOR=2.07;95%CI (1.06-4.04)]. The children lived where the feces seen in the compound were 1.88 times more likely to have diarrhea than those the children lived where the feces not seen in the compound [AOR=1.88; 95%CL (1.10-3.22)]. The odds of children developing diarrhea were 2.64 times higher among children whose parents didn’t have hand washing facility to adjacent the latrine as compared to those children whose parents had hand washing facility to adjacent the latrine [AOR=2.64;95%CI(1.47-4.47)]. Overall, the likelihoods of Diarrhea among under five years old children was 68% less developed in implemented CLTSH than not implemented CLTSH area [AOR=0.32; 95%CL (0.20-0.52)] (Table 7).

**Qualitative study associated with knowledge, hand washing facility with its importance and latrine utilization of mothers towards to diarrhea.**

In the focus group discussions some participants in both implemented and not implemented
Community led total sanitation and hygiene said that they faced the challenge to prevent diarrheal disease. Thirty (30) years old mother who cannot read and write of focus group discussions (FGD) participant in not CLTSH implemented kebele said, “Most of households who owned latrine have no hand washing facility to adjacent the latrine which raised raw material and water scarcity as the challenge to install it. Households also use open field due to odor and discomfort of the latrine. The presence of Bush and institutional latrine around their house is the great challenge which impair to construct their own latrine. Only adults go to the bush and institutional latrine to defecate, but the females and the children defecate in the garden and in the compound mostly at night”. Also the literate FGD participant of 28 years in implemented CLTSH support the idea that “Soil condition also one challenge to construct latrine and lead the people to open defecate which is the primary source of diarrhea”. This FGD indicates that presence of Institutional latrine and Bush/shrub around the house, scarcity of water for hand washing at hand washing facility and soil condition which was challenge to construct the latrine and lead to defecate open field were the challenge to prevent diarrheal disease.

Knowledge and attitude of the mothers/caregivers towards to Diarrhea.

Thirty five (35) years old mother who cannot read and write of FGD participant in not implemented CLTSH kebele said, “…the health extension workers are now teaching us about the importance of hand washing facility. However, most of the households are inconvenient on the importance of hand washing facility next to the latrine and properly utilize the utilization. Mostly they assume that if the children use the latrine they exposed to adult feces and may fall in the latrine via the hole of latrine”. Majority of Focus group discussion from implemented and not implemented area raised the idea that “……. Some households’ children defecate in open field adjacent to the house and the mothers perceive the infants and the child’s feces less dirty than adults because of less size and odorless”. Another participant of FGD in not implemented CLTSH area also strengthens this one “…. I do not blame and influence my family to use the latrine, because of its odor and discomfort. My child developed diarrhea last week and I took to health facilities and paid forty-five birr for this discomfort. There is a bush surrounding us. My family used that bush for defecation. Therefore, installing hand washing facility is not important because we do not use the latrine”. The result of this FGD indicates that the mothers/caregivers have a negative attitude towards to child feces in the compound perceived as no matter how whether it is present or not related to diarrhea. However, Some FGD participants in both CLTSH and not CLTSH implemented kebeles explained that, “….As we learnt from health extension workers, we are washing our hands and our children’s hand before feeding and after visit the toilet. Since we apply, education obtained from health extension workers about the importance of hand washing our children is not suffering from diarrhea. Hence, having hand washing facility is one mechanism of diarrhea prevention”. This FGD reflects that the mother have positive attitude towards to hand washing and having hand washing facility towards to prevent diarrhea

A FGD participant of 30 years who cannot read and write in implemented CLTSH explained that “… When the children exposed to hot weather they may get diarrhea. For instance, since I am a farmer, I do the household responsibilities, including baking injera in the kitchen, carrying my child on my back. Diarrhea not caused by germs. Germ present in German. Therefore, if the child is exposed to hot weather he/she gets diarrhea”. Another 30 years and not read and write of FGDs participant in not implemented CLTSH said “… diarrhea is caused when evil eyes people watch the child. When those people watch the child, they become sad and weak. Sometimes he/she suffers from headache, cries all the time, and cannot sleep. The stools are green, soft and accompanied by vomiting. Thus, evil eyes cause
under-five years old childhood diarrhea. “Therefore,

Discussion:

Diarrheal diseases remain a major cause of morbidity and mortality in low-income countries like Ethiopia. This study revealed that implementing CLTSH reduce childhood diarrhoeal illness. Two and above under-five years old children in the family. Not a cleaned water container, negative attitude towards diarrhea in CLTSH and presence of feces in the compound and lack of hand washing facility adjacent to the latrine in not implemented CLTSH were associated factors for occurrence of diarrheal disease among under-five years old children.

Results in previous literature on CLTSH in Ethiopia revealed that a substantial reduction in diarrheal incidences and nearly no acute watery diarrhea (AWD) incidences were achieved in the area where CLTSH was implemented. In this study, last two weeks period diarrhea prevalence during the study period was 13.4% (10.2-17.3%) in implemented CLTSH and 36.3% (31.7-41.6%) not implemented CLTSH area which reveal diarrhea prevalence in implemented was lower as compared to diarrhea prevalence in not implemented CLTSH. This disparity might be due to increases latrine coverage and utilization with improved types of latrine and behaviour change towards to open defecation.

According to this study, two weeks period diarrhea prevalence in CLTSH was lower as compared to 19% in implemented CLTSH and 22.4% in not implemented CLTSH in Jimma zone, 32.6% in Burundi, 22.5% in Eastern Ethiopia and 27.3% in Somali Region, Jigjig district. This disparity might be due to study sample size, study period, coverage of latrine and utilization, access of safe water for drinking. However, The result of this study consistent with study 11.1% in implemented CLTSH in Kenya and 12% in 2016 Ethiopian Demographic Health Survey (EDHS) and 15% in implemented CLTSH in Eastern Ethiopia. This consistence might be due to intervention of CLTSH and study period.

This study revealed that 12% in implemented CLTSH practiced open defecation as compared to 34% in not implemented CLTSH area. This variation may be due to CLTSH approach influence the community to analysis their local sanitation situation and impact of it on health. The result of this study in implemented CLTSH and not implemented CLTSH were lower when compared to study conducted by Plan International Ethiopia in collaboration with the Institute of Water at the University of North Carolina and EDHS in 2016 showed 37% and 38.1% were open defecate, respectively. This disparity may be due to sample size, sensitization of the community via CLTSH.

The children whose parents lived in implemented CLTSH were 68% less likely developed diarrhea as compared to the children whose parents lived in not implemented CLTSH area. This study consistent with study in Kenya. This might be due to CLTSH contribute hygiene promotion and behavioural change towards to sanitation which is converge to prevent and reduce diarrhea via reduced environmental feco-oral contamination.

In this study, having two and above under-five years old children was statistically significant for the occurrence of diarrheal disease in implemented CLTSH and not significant in not implemented area. As the number of children increased, the frequency of diarrhea increased significantly. This finding is supported by the studies done in Eastern, North-West and Southern Ethiopia. When the number of children in the households increases, it is expected that children could be more vulnerable to contamination because the quality of care and attention from parents decreases. Furthermore, children who get diarrheal disease may easily transmit the disease to others who live in the same area. This might be due to crowding which worsens the hygiene condition and increases the chance of contact with pathogens and incapable of mothers/caregivers to care for a large number of children.

In this study, the children where their family not clean water stoprage were more likely develop
diarrhea than the children where their family clean water storage in implemented CLTSH and not significant in not implemented CLTSH area. This study supported by study in India\textsuperscript{20} and study in Nigeria\textsuperscript{41} showed that transmission of diarrhea occurs easily when in-house water storage facilities are contaminated. Despite the use of water from protected sources and practice water treatment, many people do not wash their hands before getting water from storage containers. This occurrence of diarrhea may be due to the drips of water from unwashed hand during get water from the sources and dipping unwashed cup. During transportation also water may be contaminated in water container, which causes diarrheal disease. Attitude of the mothers/caregivers towards to diarrhea is statistically significant for diarrhea contraction. Children whose mothers /caregivers’ had negative attitude towards to diarrhea were more likely to have diarrhea than children whose mothers /caregivers’ attitude was positive. The result of FGD was support this finding as those mothers whohad negative attitude affected via diarrhea. This result consistent with study done in Shebedino woreda ,southern Ethiopia \textsuperscript{42} reported that the children whose mothers have misconception about diarrhea and sanitation are more affected by diarrhea. This may be due to misconception of mothers/caregivers’ towards to diarrhea and educational background of the mothers/caregivers which causes unable to identify factors which induce diarrhea and reduce exposure of contaminated environment.

Not available hand washing facility adjacent to the latrine was positively associated with childhood diarrheal disease. In this study, under five years old children from households that not had hand washing facilities were more likely to have diarrhoea than the children from households that have hand-washing facilities adjacent to the latrine. The result of FGD support this finding, under five years old children affected via diarrhea because ofwater shortage and raw materials, lack of hand washing facility adjacent to the latrine; . This study consistent with study in Jimma, Kersa district and Eastern Ethiopia\textsuperscript{22,36} where the hand washing facilities were not available, the person lack initiation to wash hand after visit the toilet and feed the child with hands exposed to fecal matters which causes diarrhea. This may be due to educational background of the mothers/caregivers and not know the importance of hand wash after visiting the toilet.

Presence of feces in the compound is the associated factor for diarrhea. This study showed that children who lived in the households where feces present in the compound were more likely have diarrhea as compared to those children who lived in the households where feces not present in the compound. This was supported by FGD Conducted that mothers/ caregivers where feces present in the compound suffered from diarrhea. This result was consistent with study in Indonesia and Bangladesh\textsuperscript{43,44} reported that the child feces disposal events in open space adjacent to the households compound and in location designated for households waste fail the children on the risk of diarrhea which support the hypothesis of unsanitary environment leads to gastroenteritis. It seems universally true that mothers perceive that the feces of infants or children are less dirty than those of adults. It seems because of its less smell, its smaller size and because of less likely to have food residuals \textsuperscript{45} though may possibly have a higher loading of pathogens. Unsanitary environmental conditions put children at increased risk of diarrhea including environmental enteropathy \textsuperscript{44} . Those children develop diarrhea where feces seen in open field may be due to when the children either crawling or walking and mouthing dirt or other contaminated objects during playing behaviour or for eating.

The participants in this FGD indicated that diarrhea occurred due to exposed to weather condition and evil eyes, as well as germ not cause the diarrhea. This was supported by qualitative study in Benishangul Gumuz\textsuperscript{34} and North West Ethiopia\textsuperscript{46}. This may be due to misconception and negative attitude of the mothers /caregivers towards to causes of diarrhea.
Conclusion:
Generally, the overall two-weeks diarrhea prevalence reduced in implemented CLTSH as compared to not implemented CLTSH approach. Moreover, this study shows that two and above under five years old children, not washing drinking water storage, negative attitude of mothers/caregivers towards to diarrhea, presence of feces in the compound and lack of hand washing facility adjacent to the latrine were the important associated factors for diarrhea occurrence. This finding indicates that despite the CLTSH approach implemented in several kebeles, the implemented kebeles were not open Defecation.. Thus, this result suggests that CLTSH implementation is applicable approach on access to sanitation and to reduce diarrhea prevalence among under-five years old children.

Recommendation:
- Health workers and local authorities should inspire the community to change their behaviour towards to construct the latrine with the full package, give health education to the mothers/caregivers on the causes and prevention of diarrhea and importance of handwashing facility with cleansing agents
- Kebeles should certify Open Defecation based on the sustainability of the approach even in one year.
- Further study with a robust research design like cohort and randomized controlled trial, which would provide evidence of cause and effect, required to identify factors accounted for diarrhea occurrence should be conducted

Acknowledgement:
First and foremost, we are very grateful to the almighty God for giving me priceless health, well-being and support throughout my life. We would like to send sincere gratitude and invaluable acknowledgments to Mekelle University for sponsoring this research and Dr. Alemayehu Bayray for his scientific guidance, encouragements, comments and suggestion. Most importantly, we would like to thank Study participants.

Author contributions:
Zerihun Degebasa has conceived the study, participated in the design of the study and performed statistical analysis, and drafting the manuscript for important intellectual content. Dawit zenebe have directly participated in the planning of the research, guided overall stage of the research, execution, and analysis of this study. Taklu Marama involved in the design and analysis of the study, helped to draft the manuscript, drafting the article or revisiting it critically for important intellectual content: All authors of this paper have read and approved the final version before submission

Disclosure
The authors report no conflicts of interest in this work

References:


40. Addisu KA. The Prevalence of Diarrheal Disease in under Five Children and associated Risk Factors in Wolitta Soddo


