

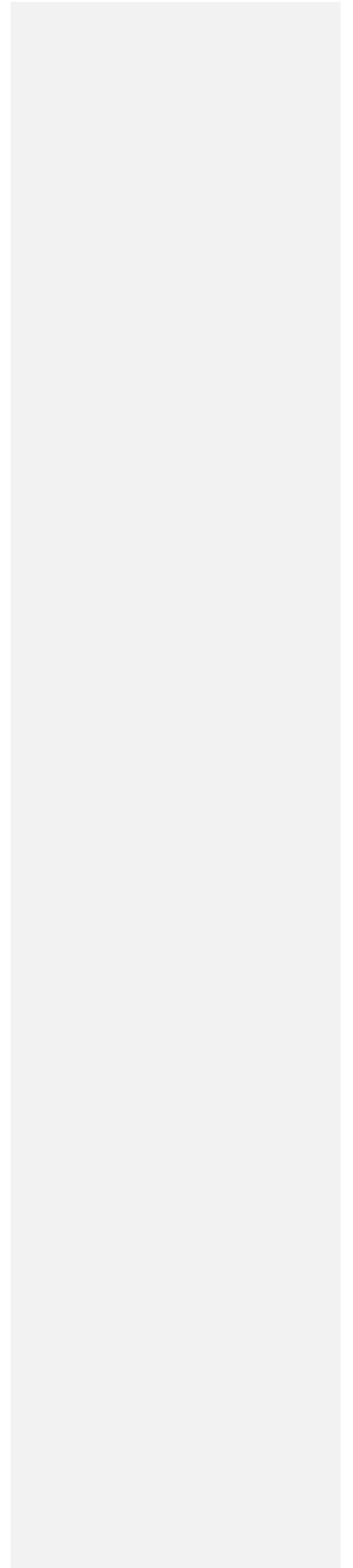
**Factors associated with access to basic households' water, sanitation and hygiene in  
Ngorongoro cholera epidemic villages, Arusha**

**Boniphace Jacob, BSc. EHS, MISM**

**MSc. Applied Epidemiology Dissertation  
Muhimbili University of Health and Allied Sciences**

**October~~July~~, 2019**

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**Muhimbili University of Health and Allied Sciences**  
**Department of Epidemiology and Biostatistics**



**FACTORS ASSOCIATED WITH ACCESS TO BASIC HOUSEHOLDS' WATER,  
SANITATION AND HYGIENE IN NGORONGORO CHOLERA EPIDEMIC  
VILLAGES, ARUSHA**

**By**

**Boniphace Jacob, BSc EHS, MISM**

**A Dissertation Submitted in Partial Fulfilment of the Requirements for  
Degree of Master of Science in Applied Epidemiology of the  
Muhimbili University of Health and Allied Sciences  
October, 2019**

**CERTIFICATION**

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences, a dissertation entitled: ***Factors associated with access to basic households' water, sanitation and hygiene in Ngorongoro cholera epidemic villages, Arusha***, in partial fulfilment of the requirements for the MSc Degree (Applied Epidemiology) of Muhimbili University of Health and Allied Sciences.

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**DEDICATION**

To my wife Ms. Jane Suku Joseph for her encouragement and for taking care of our children when I was away pursuing Master of Sciences in Applied Epidemiology.

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## ABSTRACT

**Background:** Water, sanitation and hygiene have a great role in public health especially for prevention and control of diarrhoeal diseases. Between April and August, 2018 Ngorongoro District had 1007 reported cases of cholera and a case fatality rate of 1.1%. The outbreak investigation teams reported that persistence was fuelled by inadequate and unsafe water as well as poor sanitation and hygiene. We used analytical cross-sectional study to determine access to basic households' Water, Sanitation and Hygiene (WASH) status and associated factors after interventions as a response to Cholera outbreak.

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**Methodology:** Heads of households provided the current information on household water, sanitation and hygiene. The two-stage cluster sampling technique was used to recruit the study participants. An interview schedule and observational checklist was used to collect data. "Access to basic household WASH" was a composite variable constructed with; a household having a toilet not shared with other household(s), having a functional hand washing facility and having drinking water treated. Variables that had  $p \leq 0.2$  in bivariate analysis were subjected to stepwise multiple logistic regressions. Odds ratio and 95% CI was used to estimate factors associated with access to basic household WASH.

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**Results:** The proportion of households treating drinking water, with access to sanitation and hand functional hand washing facility was 60%, 90% and 12% respectively. Over 90% of respondents had high knowledge on about cholera. However, only 8% of households had access to basic WASH. Access to basic household WASH was significantly associated with household monthly income (aOR (95%CI) = 4.7(1.1, 20.1), 6.5 (1.3, 32.9) and 12.8 (2.9, 55.9) for monthly income 22-43 USD, 44-65 USD and  $\geq 66$

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USD respectively) and young age (18-30yrs) of heads of households (aOR (95%CI) = 0.2 (0.1, 0.9)).

**Conclusion:** The risk of human contact with faeces in Ngorongoro was still high because most of sanitation facilities were traditional pit latrine (i.e. without slab). Promotions of access to household WASH need to be integrated with strategies to overcome issues of “access” associated with income.

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**LIST OF ABBREVIATIONS**

aOR	Adjusted Odds Ratio
CDC	Centres for Disease Control and Prevention
CFR	Case Fatality Rate
CHW	Community Health Workers
CI	Confidence Interval
CLTS	Community Led Total Sanitation
cOR	Crude Odds Ratio

DED	District Executive Director
DMO	District Medical Officer
IEC	Information Education Communication
mL	Millilitre
MUHAS	Muhimbili University of Health and Allied Sciences
NTU	Nephelometric Turbidity Unit
PPS	Probability Proportion to Sample
RAS	Regional Administrative Secretary
RRT	Rapid Response Team
TDHR	Tanzania Human Development Report
TFELTP	Tanzania Field Epidemiology and Laboratory Training Program
TTC	Thermotolerant Coliform
UV	Ultraviolet
WASH	Water Sanitation and Hygiene

## DEFINITION OF TERMS

### **Cholera**

Cholera is an acute intestinal infection caused by ingestion of food or water contaminated with the bacterium *Vibrio cholerae*. It has a short incubation period, from less than one day to five days, and produces an enterotoxin that causes copious, painless, watery diarrhea that can quickly lead to severe dehydration and death if treatment is not promptly given. Vomiting also occurs in most patients

### **Household**

A household is defined as a person or a group of persons, related or unrelated, who live together and share a common source of food (i.e. they eat from one pot) (1).

### **Hygiene**

World Health Organization (WHO) defines hygiene as “conditions and practices that help to maintain health and prevent the spread of diseases”. This study concentrates more on hands hygiene.

### **Sanitation**

Sanitation refers to the provision of facilities and services for the safe disposal of human urine and faeces. The term also refers to the maintenance of hygienic conditions, through services such as collection and disposal of solid and liquid wastes (2).

### **Tippy taps (kibuyu chirizi)**

Tippy Taps are simple and economical hand-washing stations, made with commonly available materials and not dependent on a piped water supply (3).

### **WASH artisan**

Artisan is defined as a skilled worker who makes things by hands (4). For this study purpose, an artisan is a person trained on WASH facilities and how to construct or make them. The national sanitation campaign has a component of training at least two local artisans in each village.

### **Functional hand washing facility**

Functional hand washing facility is comprised of presence of hand washing facility installed or provided with water and soap.

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## CHAPTER ONE

### 1. INTRODUCTION

#### 1.1. Background

Water, sanitation and hygiene have a great role in public health especially for prevention and control of diarrhoeal diseases. Diarrhoeal diseases remain among entities of public health importance accounting for mortality of more than 1.8 million children of under 5 years of age globally each year (5,6). In the year 2016, 38 countries reported more than 130,000 cases of cholera and close to 2500 deaths with CFR of 2%. Haiti, Democratic Republic of Congo (DRC), Yemen, Somalia and Tanzania accounted for 80% of all cases (7). In a period of 4 years (between August, 2015 and July, 2018) Tanzania had reported more than 31,500 cases with a Case Fatality Rate (CFR) of 1.7%.

During a London cholera outbreak in 1854, John Snow associated water safety and cholera cases. The outbreak was thereafter controlled. The estimated 85% burden of diseases in Africa is attributed to faecal-oral transmission and can be prevented by improving water supply (8). Household water treatment has shown promising positive impact in improving water quality as well as reducing the prevalence of diarrhoea (9).

A recent Tanzania study on household WASH indicates reduction by more than 92% of thermotolerant coliforms (TTC) in treated household drinking water regardless of whether treatment is by boiling or chlorination (10). Studies conducted during Severe Acute Respiratory Syndromes (SARS) pandemic suggested that washing hand with soap at least 10 times a day can decrease the spread of SARS coronavirus by 55% (11). Generally the important of hand washing with soap goes beyond prevention of diarrhoea and respiratory diseases. Even during the West Africa Ebola outbreak in 2015 hand washing with soap was one of the most effective intervention that was emphasised to the public (12).

In developing countries like Tanzania, annual net costs of diarrhoea and pneumonia amount up to more than \$12 billion per year while estimated annual budget of a national hand hygiene program would be below \$100 million and with a benefit of \$2 to 5 billion in savings (13).

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Tanzania has been conducting the National Sanitation Campaign since the year 2013. The campaign has covered every part of the country. The campaign uses Community Lead Total Sanitation (CLTS) approach. The emphasis is on construction and utilization of improved toilets and hand washing with running water and soap.

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With the unrest counting of cholera cases since August 2015, the country has put more emphasis on WASH. The public is sensitized on safe excreta disposal, household water treatment and hand washing.

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## 1.2. Problem statement

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In the period between April and August, 2018 Ngorongoro District had reported more than 1000 cases of Cholera and a case fatality rate of slightly more than 1%. In the National Cholera Task Force Meeting on 20th, July, 2018 which was preceded by Cholera outbreak investigation in Rukwa and Arusha regions, among other things it was decided that persistence of Cholera in Ngorongoro was fuelled by inadequate and unsafe water as well as poor sanitation and hygiene.

The Ministry of Health Community Development Gender Elderly and Children (MoHCDCGEC) in collaboration with the WHO, Arusha region and other stakeholders sent a rapid response team to ten cholera affected villages in Ngorongoro District to combat the epidemic. The team used various methods for community engagement such as Community Led Total Sanitation (CLTS), different Information, Education and Communication (IEC) strategies, local Maasai leader educators, Community health workers and village government leaders. The emphasis was on environmental water protection, total sanitation, household water treatment and hand hygiene. Nevertheless after the intervention the district reported more than 100 cholera cases and two deaths. It was hypothesised that, persistence of cholera in the district was probably attributed to a number of various factors including low level of knowledge on cholera, low coverage of basic household water sanitation and hygiene, low household income and low education level attained by household head.

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Therefore the main objective of this study was to describe households' water, sanitation and hygiene statistics in Ngorongoro District following cholera interventions and as well determine factors associated with access to basic household WASH.

### 1.3. Conceptual framework

Previous studies had shown that water treatment at household level is associated with quality of water, water not treated at the source, tap water perceived to have low quality, educational attainment, age and gender of household head (14,15).

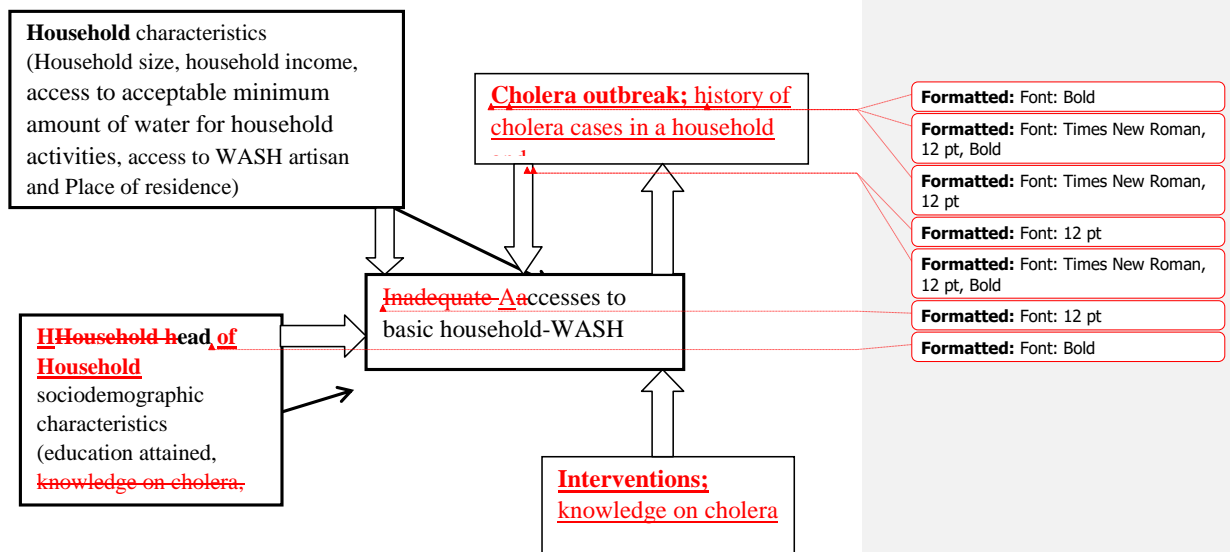


Figure 1.1: Conceptual framework showing accesses to basic household - WASH and selected independent variables.

Reviews of studies conducted in various countries around the world including Tanzania had shown that access to sanitation and hygiene is attributed to many factors. To be examined in this dissertation, we indicate the dependent and selected independent variables (Figure 1). These factors include age of household head, gender, educational attainment, household size, household income, and access to adequate water. Other factors are place of residence (urban or rural), behavioural and experience of a particular community, access to electricity, housing condition, availability of materials (cement, soap and water), knowledge on infectious disease, contamination sensitivity and many others (2)

## **1.4. Rationale**

Sustainable Development Goals (SDG) number six seeks to ensure availability and sustainable management of water and sanitation for all. This study enlightens decision makers on factors associated with access to basic household WASH. We as well provided recommendations on appropriate public health intervention to further improve water sanitation and hygiene in Ngorongoro and elsewhere in the globe.

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### **1.4.1.5. Research questions**

1. What proportion of households had access to safe drinking water, sanitation facilities and hand washing facilities in Ngorongoro cholera epidemic villages?
2. What proportion of households in Ngorongoro cholera epidemic villages reporting cholera cases since April, 2018?
3. What were the factors associated with access to basic household-WASH in Ngorongoro District 2018?

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## **1.6 Objectives**

### **1.6.1. Broad objective**

To describe households water, sanitation and hygiene status and associated factors after interventions as response to Cholera outbreak in Ngorongoro District in year 2018

### **1.6.2. Specific objectives**

The specific objectives were to:

1. Determine the proportion ~~of households of households~~ treating drinking water.
2. Determine proportion ~~of households of households~~ with sanitation facilities.
3. Determine proportion ~~of households of households~~ with functional hand washing facilities.
4. Determine household heads ~~of household's~~ knowledge level on cholera.
5. Determine the proportion of households that reported cholera cases since April, 2018.

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5.

6. Identify factors associated with access to basic household WASH in Ngorongoro District.

## CHAPTER TWO

### 2. LITERATURE REVIEW

#### 2.0. Household water sanitation and hygiene (WASH)

WASH is defined as access to safe water for drinking, hand washing and other domestic activities, the safe removal of waste (toilets and waste disposal) and health promotion activities to encourage protective healthy behavioural practices amongst the affected population (16).

#### 2.1 Household drinking water treatment

Globally, more than 2 billion people have no access to improved drinking water sources. In Tanzania, six in ten (61%) households have access to an improved water source (17). It is estimated that more than 500,000 diarrhoeal deaths in developing countries are attributed to inadequate quality of drinking water (9). Faecal contaminated drinking water is one of the main sources of typhoid, hepatitis and opportunistic infection among people living with HIV/AIDS (18).

Household water treatment improves the quality of water at the point of consumption. It is therefore effective public health intervention to reduce the prevalence of diarrhoeal diseases and other infections attributed to contaminated drinking water (19). Previous studies have shown that household water treatment and storage is twice as effective intervention for preventing diarrhoeal diseases than improved water sources (18,20). The more recent study found that household water treatment can reduced the incidence of diarrhoeal disease by more than 90% (21).

The main household water treatment methods include boiling, chlorination, filtration, solar disinfection and combination of flocculation and disinfection (22).

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**Boiling water:** Heat based technologies including boiling and pasteurization. Pasteurization of contaminated water involves heating water at a temperature of higher than 63°C for 30 minutes (22). Boiling is an effective way of killing most of pathogens and parasites in water. Previous studies had shown that more than 75% of boiled water meets the WHO guidelines of 0TTC/100mL (22) The remaining percent of inactivated TTC is probably due to partial boiling or post contamination.

The disadvantages of this method include the inability to prevent post contamination, fuel cost and unable to reduce turbidity. The chance of post contamination can be reduced by storage of boiled water in a clean covered container (22,23)

**Chlorinating water:** chlorination is the second most used method of household water treatment after the boiling method. Chlorine for household water treatment is found in liquid form as sodium hypochlorite (24,25) (e.g. bottled liquid Water Guard), and in solid forms as calcium hypochlorite (e.g. Water Guard tablets) or sodium dichloroisocyanurate (NaDCC) also known as aquatabs (26).

Chlorination is done by either adding 1 or 2 capful of Water Guard liquid to 20L of water (depending on whether water is clean or cloudy) or by adding 1 or 2 Water Guard tablets or aquatabs to 20L of water (depending on whether water is clean or cloudy) (26). Water is then stirred and left for 30 minute for the treatment process to be completed (26). Treated water is kept in a clean, covered container with narrow opening to reduce the chances of recontamination.

Chlorination has the advantages of long treatment effect due to residual chlorine in water. It is capable of deactivating more than 99% of enteric pathogens. More than 62% of water treated by aquatabs can meet the WHO guidelines of 0TTC/100mL (18).

Chlorination has the disadvantage of not providing protection against cryptosporidium, mycobacterium, virus, parasite cysts and oocysts. It is also less effective for water contaminated with ammonia. Changes test and odor of water and has the concern of small possibility of long-term carcinogenic effects (18).

**Filtration:** Ceramic filters treated with bacteriostatic silver reduce both bacteria and waterborne protozoa by more than 99.9% and be used as a public health intervention

during emergencies (18). Another filtration method used is slow sand filters. It filters out suspended solids and microbes with the help of the schmutzdecke (slimy layer formed within the top few centimetres of sand). Slow sand filters can remove more than 99% of enteric pathogens if well constructed, operated and maintained (18). The most improved slow sand filter which is suitable for household application is known as the “bio-sand” filter (18,27)

Household water treatment by filters presents certain advantages over other methods. They introduce no chemicals into the water that may affect use due to concern about odour and taste, can easily be used, improve the quality of water and little effort is required to promote behavioural change towards water treatment (18,27).

Slow sand filters and BioSand filters has disadvantage of not being capable to remove color or dissolved compounds. It is not effective against virus and can lead to recontamination as it lacks chlorine residual. The method are characterized with clogging and hence require frequent maintenances (28).

**Solar disinfection:** The process involve placing low turbid (<30NTU) water in clear and clean transparent plastic bottles after aerating it to increase oxygenation. Water filled bottles are then exposed to the sun, usually by placing them on roofs for 6 to 48 hours depending on the intensity of sunlight (18,22).

Studies had documented that household water treatment by solar disinfection method which combines thermal and UV radiation is effective to eliminating microbial pathogens and reduce diarrhoeal diseases cholera epidemic included (18,22,29). Solar disinfection is the cheapest way to treat water at the household level. Its disadvantage is an inability to provide residual protection against recontamination like it is for filters and thermal disinfection (18,29)

**Combination of flocculation and disinfection:** Turbid water is a challenge to a number of household water treatment methods. For instance; solids deplete the chemicals used for treating household water, lead to clogging of sand filters and abstract UV radiation from reaching the microbes. To solve those challenges, sedimentation or flocculation is done by using alum or other low cost options. This process reduces microbes, including protozoa which may not well be deactivated by chemical disinfectants (18,22,30)

Flocculation alone is not enough; the process should be followed by other methods of water treatment. Also flocculants with a time-released disinfection in a single product that is sold in sachets can be used and has been shown to reduce waterborne cysts, viruses and bacteria by more than 99.9% (30,31). Advantage of flocculation over other methods of household water treatment, is the ability to reduce arsenic and non-microbial contaminants (30).

During the first quarter of the year 2018, just before the cholera outbreak in Ngorongoro, the households treating drinking water were 16.78% (n=45867) (32). One of the RRT activities was to improve the source of drinking water. A total of 31 sources were identified and 32 samples tested for faecal coliforms. More than 65% of the samples tested positive for faecal coliforms. Tanks were provided at water points and water treated with chlorine. The main sources of water were fenced by thorns to protect them from animals and human contamination.

Another activity was to mobilize the community on behaviour change toward water treatment. RRT integrated community members to promote household water treatment. Chlorination was mostly emphasised, demonstration of the method was done and 155,000 aquatabs were distributed to the community as an emergency cholera intervention.

## **2.2 Household sanitation facilities**

Sanitation refers to the provision of facilities and services for the safe disposal of human urine and faeces. The term also refers to the maintenance of hygienic conditions, through services such as collection and disposal of solid and liquid wastes (2).

Globally, inadequate sanitation attributes to 280 000 diarrhoeal deaths annually (2) and is a major factor in several neglected tropical diseases, including intestinal worms, schistosomiasis and trachoma. In 2015; 68% of the world's population (5.0 billion people) used at least a basic sanitation service (2). Globally, 2.3 billion people still have no access to basic sanitation facilities and of these, 892 million practice open defecation (e.g. in street gutters, behind bushes or into open bodies of water ).

A part from reducing the impacts of diarrhoeal disease, neglected tropical disease and malnutrition, a community with improved sanitation has the advantage of promoting dignity, boosting safety especially among girls and women and promote school attendance among girls. It can also recover water, renewable energy and nutrient from faecal waste. Literature has shown that for every US\$ 1.00 invested in sanitation, there is a return of US\$ 5.50 in lower health costs, more productivity, and fewer premature deaths (33).

In March, 2018; the national coverage for improved household sanitation has reached 46% (of 5536280 inspected) and 6% had no sanitation facilities. The situation in Ngorongoro District is quite different. In the same period of the year, 27772 households were inspected in the district where only 6% had improved sanitation facilities and more than 80% did not have sanitation facilities (32). During intervention of cholera outbreak, RRT mobilized the community on household sanitation. Integration of methods including Community Lead Total Sanitation Technique (CLST) was used (34).

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### **2.3 Household hand hygiene**

Hand washing with soap is estimated to lower the prevalence of diarrhoea diseases by 50% (35). It also reduces respiratory infections by 23% (36) bearing in mind that pneumonia is the leading cause of mortality among children under five years old, killing about 1.8 million each year globally.

Household hand washing practice is still not promising in the Tanzania. In March 2018; only 14% of 5536280 households inspected country wide had hand washing facilities located outside a toilet. The facilities were functional with a soap provided at the washing points. The coverage is more worse in Ngorongoro District where only less than 0.5% of households had hand washing facilities with water and soap (32).

During intervention of Cholera outbreak, RRT mobilized the community on hand washing practices. Integration of methods including distribution of Information Education Communication (IEC) materials and Community Lead Total Sanitation (CLTs) technique was used (34). The emphasis was on critical moments for hand washing, proper ways of hand washing and how to construct a simple household hand washing facility (tip tap).

## 2.4 Knowledge on cholera

Knowledge is defined as information or skills acquired through experience or education. It can also be defined as awareness or familiarity gained by experience (4). Interventions focusing involving awareness campaigns raise household's knowledge on cholera transmission and prevention (37). Knowledge intervention is significantly associated with low risk of cholera infection (37,38).

This study could not find evidence on the level of community knowledge on cholera in Ngorongoro District. However to raise community awareness on cholera was one of the intervention done by the RRT in the distinct.

The RRT had 9 objectives of which 2 were on imparting community with knowledge about cholera. The first objective was to create awareness of the community on cholera through community acceptable approaches which involve religious and clan leaders. The second objective was to deploy more IEC materials to raise community awareness (34).

## 2.5 Households affected by cholera

Cholera is an acute intestinal infection caused by ingestion of food or water contaminated with the bacterium *Vibrio cholerae*. The main toxic *V. cholerae* existing in Tanzania environments are of two strains namely O1 and O139 respectively. The dominating *V. cholerae* which has persisted in the country since the year 2015 is O1 (39).

From April to mid September, 2018 Ngorongoro District had reported a prevalence of more than 0.6% (more than 1112 cases) of cholera with a case fatality rate of 1.2%. Children under 5 years of age contributed to more than 20% of all cases (40). The district has 42 villages of which more than 16% was strike by the outbreak. The magnitude of cholera was not measured at the household level.

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## 2.6 Access to basic household water, sanitation and hygiene

The word “access” is defined as the right or opportunity to use something (4). A household is said to have access to basic WASH if it gets water from improved source (household water treatment will be used instead), has a sanitation facility which is not shared with other households and has hand washing facility provided with water and a soap (41,42).

## CHAPTER THREE

### 3. METHODOLOGY

#### 3.1 Study design

The design was analytical cross-sectional. It was the best design for making a snapshot of household-WASH after various cholera interventions. The study was conducted in March, 2019 in Ngorongoro cholera epidemic villages namely Endulen, Esere, Kesile and Meshili.

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#### 3.2 Study area

Ngorongoro District is predominantly habited by Maasai ethnic groups and the minority Watemi. It has a population of 174,278 people with 52.6% female accordance to the 2012 Population and the Housing Census. The district is administratively divided into 28 wards, 42 villages and 36,308 households (an average of 865 households per village) with the mean household size of 5 people. Part of the population lives inside Ngorongoro National Park. However is forbidden to bring construction materials or to permanent settlements in the National Park. The district has inadequate supply of clean and safe water; only 37% of the population has access to clean water within five kilometres radius (43). More than 80% of the population is engaged in animal husbandry. The district attracts more than 600, 000 tourists a year of which 49% are domestic tourists (44).

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#### 3.3 Study population

Study population was heads of household in the 2018 cholera epidemic villages of Ngorongoro District. These villages were visited by the Rapid Response Team and received various integrated interventions for cholera control in August, 2018.

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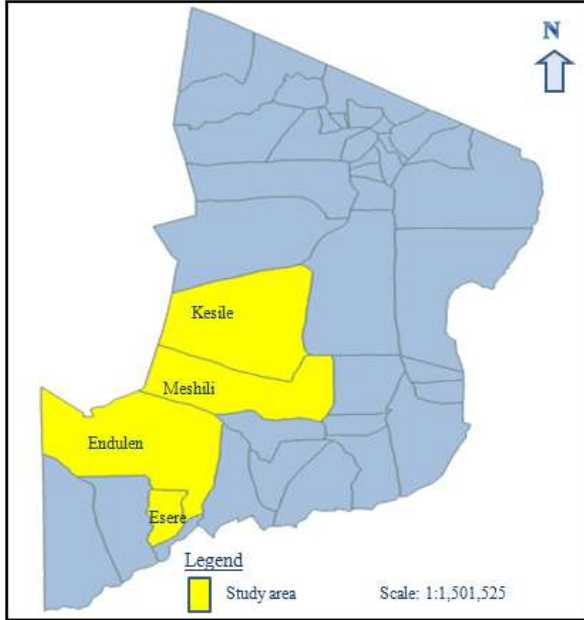


Figure 3.1: Ngorongoro district map showing the four villages of the study area

### 3.4 Inclusion criteria and exclusion criteria

Inclusion criteria were; a household head whose household had stayed in the village for a period of at least six months and was able to communicate either in Swahili or Maasai or Kisonjo languages. Exclusion criteria were; a household head who was seriously ill unable to participate.

### 3.5 Sample size

The Cochran method was used to calculate sample size was calculated: ~~by~~

$$n = g \frac{(Z_{\alpha/2})^2 \times p(1-p)}{d^2} \quad n = g \frac{(Z_{\alpha/2})^2 \times p(1-p)}{d^2}$$

Where:

n = Sample size

g = Design effect set at 1.5

$Z_{\alpha/2}$  = Standard normal deviate set at 1.96

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d = Absolute precision at 5%

p = proportion of households without toilet in Ngorongoro =80% (32)

$$\begin{aligned} n &= 1.5 \frac{1.96^2 \times 0.8(1 - 0.8)}{0.05^2} \\ &= 1.5 \frac{3.8416 \times 0.8 \times 0.2}{0.0025} \\ &= 369 \end{aligned}$$

With the consideration of none respondents, the sample size was adjusted using:-

$$\begin{aligned} \text{Sample size} &= \frac{n}{1 - 0.1} \\ &= \frac{369}{0.9} \\ &= 410 \end{aligned}$$

Therefore estimated sample of households that was involved in this study was 410.

### 3.6 Sampling procedures

Selection of Ngorongoro District was done purposively due to the history of cholera outbreak in the district, low coverage of household water, sanitation and hygiene as well as to evaluate impacts of interventions following the outbreak. Two stage cluster sampling technique was used where the first stage involved selection of villages and the second stage was the selection of households.

**First stage:** A list of ten cholera affected villages was obtained from the Ngorongoro DMO office. The list had Nasiporiang, Esere, Ngoile, Piyaya, Ormainia, Endulen, Meshili, Kesile, Malambo and Alailelai village. Random number generator in an OpenEpi software was used to select four villages; Endulen, Esere, Kesile and Meshili.

**Second stage:** Systematic random sampling (with Probability Proportional to Size) was used to select households in each selected village (45). The lists of household heads were obtained from village sanitation registers. The first household to start with was selected randomly from the numbers less than sampling interval (K=19 households) using random numbers. The direction to begin with was determined by bottle spinning method from the geographical centre of the village.

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### 3.7 Data collection tools and procedures

#### 3.7.1 Tool for data collection

Two data collection instruments were used. The first was an interview schedule which was for interviewing the household heads. It had closed-ended questions with few items left open to allow household heads to elaborate more on some issues related to household WASH. The second instrument was an observational checklist. It was used for documenting observations on the households WASH. The instruments were written in English, translated into Swahili and back to English to check discrepancy in meaning when in Swahili.

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#### 3.7.2 Recruitment and training of research assistants

Research assistants were ten community health workers (CHW) influent in Maasai, Kisonjo and Kiswahili. They had a one day orientation on study objective, methodology, tools for data collection, data collection techniques and ethical issues.

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#### 3.7.3 Pre-testing of data collection tools

The tools were pre-tested in Piyaya village which was not earmarked for the study. The testing involved 20 household heads. The aim of pre-testing was to check validity and reliability of the tools (applicability of the tools with the study area and whether the questions in the tools were clear and understood by participants).

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### 3.8 Study variables

Dependent variable of this study was access to basic household-WASH. The household was said to have access to basic household-WASH if it qualifies for the three components;

1. **Water quality:** the concentration was on access to safe drinking water and therefore the household was considered having access to basic WASH if had drinking water treated.
2. **Sanitation:** if the household had a toilet facility such as traditional pit latrine without slab, improved traditional pit latrine with slab, ventilated pit latrine, poor flash toilet, water closet or composite toilet. Further more, the household was not

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suppose to be practicing open defecation or sharing a sanitation facility with another household.

3. **Hygiene:** if the household had a functional hand washing facility with water and soap or ash. The facilities are such as a tip tap (kibuyu chirizi), water tap, water storage container or a hand washing basin.

The key-independent variables were divided into four categories; where the first was about the outbreak; heads of households were asked about a history of cholera case(s) or death(s) in the household if any. The second category was about intervention; in this study included characteristics of respondents were assessed on the knowledge such as knowledge of household heads on cholera. They Respondents were asked four questions on cholera. The knowledge was categorised into high, medium or low knowledge if a participant scored 3-4, 2 or 0-1 question respectively. Third category included other socio-demographic characteristics of heads of households such as were age, sex and education level.

The last category of variables included

Other variables were of social demograpic household characteristics of a household such as income. The household heads provided information on how much the household earns in Tanzanian shillings (conevrteed to USD during the analysis) on monthly bases. The household income was the amount earned by the household heads plus the amount earned by other members of same household. It was ordinal categorical variable and the median income was considered the minimum household monthly income (reference category). The second household characteristic was access to acceptable minimum amount of water for household activities. It was measured by assessing whether each member of the household has access to at least 20 litres of water per day. The third variable was household size and was measured by asking about the number of people who have been staying in the household since January 1 2018. The study also looked into access to WASH artisan. The participants were asked whether they knew a local artisan who can help them in the construction of a toilet or a hand washing facility.

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### 3.9 Data processing and analysis

#### 3.9.1 Processing

Data processing entails editing, coding, classification and tabulation of data before the analysis.

Before leaving field site, completed questionnaires were reviewed for accuracy, improbable values, completeness, consistency (with other information collected) and uniformity of data entry.

The interview form was created with Epi Info 7 Form design canvas. Numerical codes were used to simplify data entry and to reduce errors. Data was entered in the study project created in Epi Info 7. A copy of data set was made and stored in secure drive before data cleaning. One copy of the data was corrected for missing data, improbable values and outliers by running frequencies of variable, displaying line list of variables in spread sheet or searching individual code of variable and updating the data set with the information from hard copies questionnaires.

#### 3.9.2 Descriptive analysis

Frequency distributions were generated for both continuous and categorical variables. Categorical variables were summarized using frequency tables. Proportion estimates were determined for categorical variables. Continuous variables in specific objective number six were summarized by using either mean and associated standard deviations or median and associated range.

#### 3.9.3 Bivariate analysis

Two-way tables were used to identify the factors associated with access to basic household WASH in Ngorongoro District. The crude odds ratio (cOR) was used to quantify statistical association while precision of the association was determined by the associated 95% CI.

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### 3.9.4 Multivariate analysis

Step wise logistic regression method was used to obtain the best model that explains well the relationship between outcome, exposures and cofounders. Entry criteria were all variables with at most p-values of 0.2 in the bivariate analyses.

### 3.10 Ethical consideration

Ethical clearance was obtained from the Muhimbili University of Health and Allied Sciences Research Ethical Committee. Permission to conduct the study in the local area was obtained from the Regional Administrative Secretary (RAS) and the District Executive Director (DED) through the District Medical Officer (DMO) and leaders of selected areas. The ethical obligation to protect the privacy and confidentiality of any information provided by respondents was maintained. Before initiating any interview, it was carefully explained that participation was voluntary and that research participants were allowed to withdraw from the study at any moment they wished so. Participants were also informed that information they provided would be kept confidential throughout data collection and data analysis and that the information would not be linked to their identity in any way. Respondents were asked to sign an Informed Consent Form as proof that they voluntarily decided to participate in the study.

### 3.11 Budget

This study spent more than 1,651 USD~~TSh 3,800,000/=~~. A part of the fund which was 870 USD~~TSh 2,000,000/=~~ was covered by Tanzania Field Epidemiology and Laboratory Training Program (TFELTP).

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## CHAPTER FOUR

### 4.0 RESULTS

#### 4.1. Description of households and heads of households

The study involved 410 (100% participation rate) heads of households. Their mean age was 36.3 (SD = 10.4) years. The majority, 307 (75%) were females. The average household size was 5.7 (SD = 2.5) and the mean number of households sharing one toilet was 4.8 (SD = 4.2). The median household self reported monthly income was ~~24 USD~~~~TSh~~ ~~55,500~~ ranging between ~~0.4 USD~~~~TSh~~ ~~1,000~~ and ~~1,305 USD~~~~3,000,000~~.

Traditional pit latrines accounted for 326 (91.6%) of all types of sanitation facilities. Respondents up to 403 (99.8%) had high knowledge on cholera, and 78 (19.6%) had the history of cholera cases with a total number of 145 cases and 8 deaths (Table 4.1).

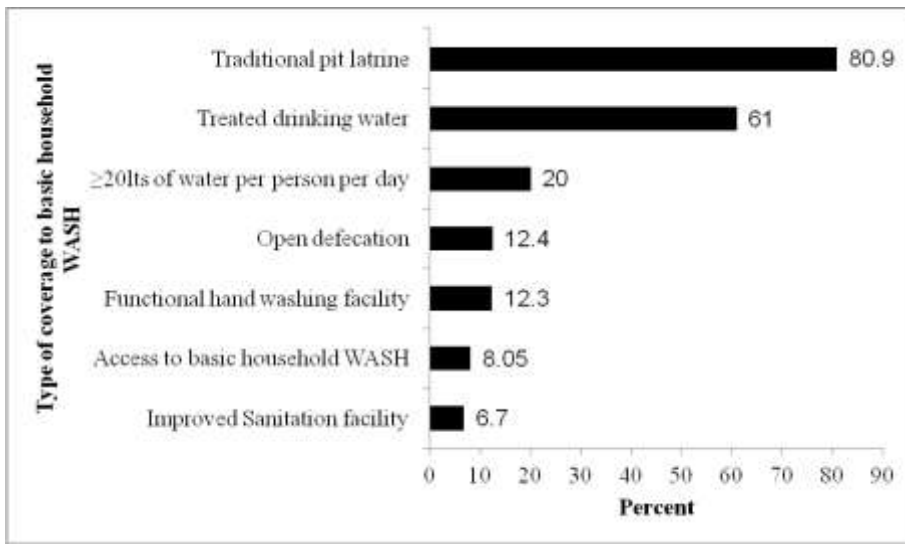
Table 4.1: Social demographic cCharacteristics of household (n=410)

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Characteristic*	Number (%)
<b>Drinking water treatment method (n= 251 )</b>	
Boil the water	162 (64.5)
Add bleach/chlorine/aqua table	50 (19.9)
Sieve it through cloth	11 (4.4)
Water filter (ceramic, sand, composite)	8 (3.2)
Let it stand and settle	20 (8.0)
<b>Types of sanitation facility (n= 403)</b>	
Traditional pit latrine /without slab	326 (80.9)
Improved traditional pit latrine/with slab	24 (5.0)
Ventilated Improved Pit latrine (VIP)	2 (0.5)
Flush/WC/pour flush toilet	1 (0.3)
None/Open air/bush/field	50 (12.4)
<b>Household sharing sanitation facility (n= 353)</b>	
Yes	196 (55.5)
No	157 (44.5)
<b>Types of hand washing facility (n=164 )</b>	
Tip tap	41 (25.0)
Storage container	115 (70.1)
Tap	7 (4.3)
Hand washing basin	1 (0.6)
<b>Knowledge level on cholera (n= 404)</b>	
Low	1 (0.3)
Medium	0 (0.0)
High	403 (99.8)

\*Number do not add up to 410 due to missing information

Proportion of households with access to functional hand washing facilities was low as compared to access to sanitation facilities and drinking water treatment. Furthermore, access to basic household WASH was only 33 (8%) despite of high coverage of sanitation facilities 353 (87.6%) and over 250 (60%) coverage of drinking water treatment (Figure 4.1).



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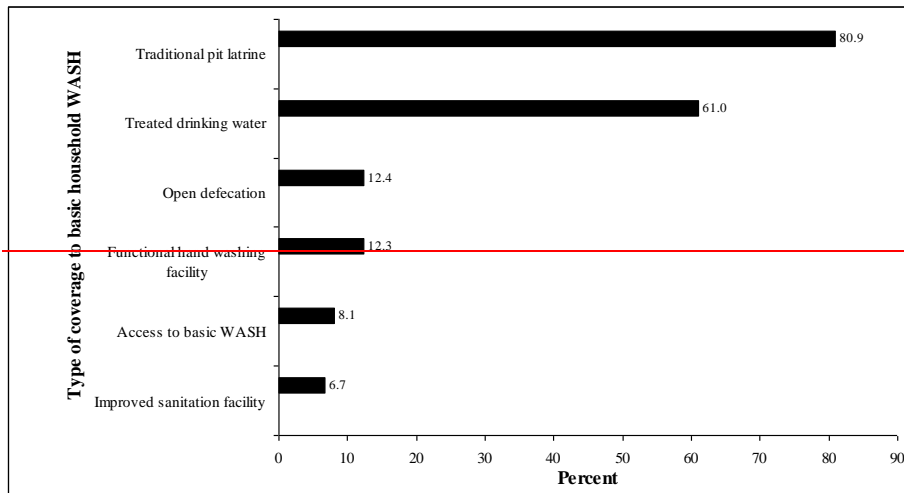


Figure 4.1: Percentage coverage of access to WASH in Ngorongoro 2019

Households with no access to basic household WASH were found to decrease with both, increased household monthly income and high level of education and vice versa (Table 4.2).

Table 4.2: Relationship between access to basic household water sanitation and hygiene (WASH) and both; characteristics of households and that of the head of household (n=410)

Characteristics*	Access to basic WASH		$\chi^2$	P-Value
	Yes n (%)	No n (%)		
<b>Age (n= 360)</b>				
<del>18-30</del> 31-45	7 (23.3)	121 (36.7)	4.3	0.117
>45	14 (46.7)	155 (47)		
	9 (30)	54 (16.3)		
<b>Sex (n= 403)</b>				
Male	8 (24.2)	95 (25.2)	0.0	0.903
Female	25 (75.8)	282 (74.8)		
<b>Education level (n=394)</b>				
None	18 (58)	247 (68)	7.6	0.022
Primary	7 (22.6)	94 (26)		
Above primary	6 (19.4)	22 (6)		
<b>Household size (n=400)</b>				
<6	15 (45.5)	200 (54.5)	0.9	0.318
<del>&gt;6</del>	18 (54.5)	167 (45.5)		
<b>Monthly income (USD/Tsh) (n=380 )</b>				
<del>≤2150,000</del>	4 (12.5)	184 (52.9)	34.5	0.000
<del>2251,000-43100,000</del>	9 (28.1)	96 (27.5)		
<del>44101,000-65150,000</del>	6 (18.8)	34 (9.8)		
<del>≥66151,000</del>	13 (40.6)	34 (9.8)		
<b>Use of water/person/day (Liters) (n= 387)</b>				
<20	19 (67.9)	290 (80.8)	2.7	0.101
≥20	9 (32.1)	69 (19.2)		
<b>Awareness of WASH artisan (n= 400)</b>				
Aware	13 (39.4)	128 (34.9)	0.3	0.603
Not aware	20 (60.6)	239 (65.1)		

\*Number do not add up to 410 due to missing information

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#### 4.2. Factors associated with access to basic household WASH (bi-variate analysis)

The odds of access to basic household WASH for the household heads with post primary education (i.e. some secondary, secondary and post secondary) ~~were~~ times 3.7 (95%CI = 1.4, 10.4) significantly higher as compared to those with no education (p=0.011). Likewise, the odds of access to basic household WASH for the households with monthly income (in ~~USD~~TSh) ~~22-51,000-43100,000~~, ~~44101,000-65150,000~~, and ~~≥66151,000~~ were times 4.3 (95%CI=1.3, 14.4), 8.1(95%CI =2.2, 30.3) and 17.6 (95%CI=5.4, 57.2) significantly higher as compared to those with monthly income ≤ ~~TSh 21USD50,000~~ (p<0.01). Contrary ~~to~~ ~~it~~, ~~household~~ heads of households aged 18-30 years had 60% significant chance of not having access to basic household WASH as compared to those aged 45 years and above (p=0.046). However, sex of household head, household size, amount of water a member of a household uses per day (Litres) and household head being aware of WASH artisan had no significant association with access to basic household WASH (Table 4.3).

Table 4.3: Relationship between access to basic household water sanitation and hygiene (WASH) and characteristics of household and its head (n=410)

Characteristics*	Access to basic WASH	cOR (95%CI)
<b>Age group (n= 360)</b>		
<del>18-30</del> <31	7 (23.3)	0.4 (0.1, 0.9)
31-45	14 (46.7)	0.5 (0.2, 1.3)
>45	9 (30)	Ref
<b>Sex (n= 403)</b>		
Male	8 (24.2)	Ref
Female	25 (75.8)	1.1 (0.5, 2.4)
<b>Education level (n=394)</b>		
None	18 (58)	Ref
Primary	7 (22.6)	1 (0.4, 2.5)
Above primary	6 (19.4)	3.7 (1.4, 10.4)
<b>Household size (n=400)</b>		
<6	15 (45.5)	0.7 (0.3, 1.4)
≥6	18 (54.5)	Ref
<b>Monthly income (USD Tsh) (n=380 )</b>		
≤ <del>2150,000</del>	4 (12.5)	Ref
<del>2251,000-43100,000</del>	9 (28.1)	4.3 (1.3, 14.4)
<del>44101,000-65150,000</del>	6 (18.8)	8.1 (2.2, 30.3)
≥ <del>66151,000</del>	13 (40.6)	17.6 (5.4, 57.2)
<b>Use of water/person/day (Liters) (n= 387)</b>		
<20	19 (67.9)	Ref
≥20	9 (32.1)	2 (0.9, 4.5)
<b>Awareness of WASH artisan (n= 400)</b>		
Aware	13 (39.4)	1.2 (0.6, 2.5)
Not aware	20 (60.6)	Ref

\*Number do not add up to 410 due to missing information

#### 4.3. Factors associated with access to basic household WASH (multivariate analysis)

Independent variables ~~which that~~ met the criteria for multivariate analysis ~~were~~ amount of water a member of a household uses per day (Litres), household monthly income, education level and age of household head. Household monthly income and age of household head were the predictors of access to basic household WASH with the ~~final~~ logistic regression model (Table 4.4).

Table 4.4: Logistic regressions of the factors predicting access to basic household WASH (n=410)

Factors*	Access to basic WASH	OR (95%CI)	
		cOR (95%CI)	aOR (95%CI)
<b>Age (n= 360)</b>			
<del>18-30</del> <31	7 (23.3)	0.4 (0.1, 0.9)	0.2 (0.1, 0.9)
31-45	14 (46.7)	0.5 (0.2, 1.3)	0.5 (0.2, 1.6)
>45	9 (30.0)	Ref	Ref
<b>Education level (n=394)</b>			
None	18 (58.0)	Ref	Ref
Primary	7 (22.6)	1 (0.4, 2.5)	1.6 (0.5, 4.7)
Above primary	6 (19.4)	3.7 (1.4, 10.4)	3.1 (0.7, 14.5)
<b>Monthly income (USD/Tsh) (n=380)</b>			
<del>≤2150,000</del>	4 (12.5)	Ref	Ref
<del>2251,000-43100,000</del>	9 (28.1)	4.3 (1.3, 14.4)	4.7 (1.1, 20.1)
<del>44101,000-65150,000</del>	6 (18.8)	8.1 (2.2, 30.3)	6.5 (1.3, 32.9)
<del>≥66151,000</del>	13 (40.6)	17.6 (5.4, 57.2)	12.8 (2.9, 55.9)
<b>Use of water/person/day (Liters) (n= 387)</b>	<b>19 (67.9)</b>	<b>Ref</b>	<b>Ref</b>
<20	<b>9 (32.1)</b>	<b>2 (0.9, 4.5)</b>	<b>1.9 (0.6, 6.5)</b>
≥20			

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With ~~sub~~seuency alternating elimination process of independent variables in logistic regression models, amount of water a member of a household uses per day (Litres) was found to be not significantly associated with access to basic household WASH. Age of household head was the confounding factor. However, in the final logistic regression model education level of household head and household monthly income were the predictors of access to basic household WASH (Table 4.5)

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~~Table 4.5: Multiple logistic regressions of the factors predicting access to basic household WASH: the best model (n=410)~~

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Factors*	Access to basic WASH	OR (95%CI)	
		eOR (95%CI)	aOR (95%CI)
<b>Education level (n=394)</b>			
None	18 (58)	Ref	Ref
Primary	7 (22.6)	1 (0.4, 2.5)	1.2 (0.5, 3.1)
Above primary	6 (19.4)	3.7 (1.4, 10.4)	4.1 (1.3, 13.1)
<b>Monthly Income (TZS) (n=380)</b>			
≤50,000	4 (12.5)	Ref	Ref
51,000-100,000	9 (28.1)	4.3 (1.3, 14.4)	3.8 (1.1, 13.2)
101,000-150,000	6 (18.8)	8.1 (2.2, 30.3)	6.2 (1.6, 24.8)
≥151,000	13 (40.6)	17.6 (5.4, 57.2)	15.6 (4.7, 51.6)

\*Some information was not provided during data collection

Logistic regression ————— Number of obs = 365  
 ————— LR chi2 (5) = 33.68  
 ————— Prob > chi 2 = 0.0000  
 Log likelihood = -86.853014 ————— Pseudo R2 = 0.1624

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## CHAPTER FIVE

### 5.0. DISCUSSION

#### 5.1. Household drinking water treatment

~~-We found that, The~~ proportion of households treating drinking water in the villages which had the outbreak ~~had increased by 44.2% as compared to that in was 250 (61%). However,~~ literature ~~show that~~ before the outbreak, ~~that was only~~ 770 (16.8%) (32) ~~households had their drinking water treated.~~ The ~~big 44.2%~~ difference was probably attributed to persistence of cholera in the district for almost a year, consistence of cholera interventions in the districts and high knowledge of cholera (health beliefs related to untreated water (46)).

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#### 5.2. Households with sanitation facilities

It was found that proportions of households with sanitation facilities had increased by 67.7% that is from ~~around 550055~~ (20%) (32), before the outbreaks and interventions and 354 (87.7%) after the outbreak and cholera interventions. The outbreak had an impact on household sanitation coverage. This statement is also supported by Nyanza et al, 2018 (47) who did a household survey on WASH at Ngorongoro. One of the dertaminant for access to household sanitation facility was the history of diarrhoea. The same study indicated that 44 (50.3%) of the household practiced open defecation however after the outbreak, open defecation had dropped to 50 (12.4%).

#### 5.3. Households with functional hand washing facilities

The proportion of household with access to functional hand washing facilities had increased by 11.8 % from 139 (0.5%) (32) before cholera outbreak and interventions to 49 (12.3%) after cholera outbreak and interventions. Nevertheless this coverage is below the national coverage which was 1,260,000 (19.5%) (32) in the first quarter of the year 2019. A survey on hand washing behaviour in Vietnam(48) found that people who had access to improved sanitation facilities were more likely to practice hand washing. The low coverage of household hand washing facilities in the Ngorongoro study area can probably be explained the same way because only 6.7% of households had improved sanitation facilities.

#### 5.4. Households head knowledge levels on cholera

Almost all respondents had high knowledge on cholera disease. Probably the high level on cholera is explained by the existence of the outbreak and interventions conducted in the affected areas. For instance local leaders (Laigwanan) who are much respected were used to mobilize the community. Other interventions included Community Lead Total Sanitation (CLTS) and distribution of Education Information Communication materials.

#### 5.5. Households with a history of cholera cases

~~In accordance with this survey,~~ the attack rate at the household level during cholera outbreak in Ngorongoro reached 20% (i.e median number of cases was one ranging from one to nine cases in a household with the mean household size of five people). The case fatality rate (CFR) at the four villages was 5.5% (i.e. 8 deaths out of 145 cases). The World Health Organization (WHO) suggests that CFRs above 1% is associated with low accessibility of health care facilities or cholera camps, inconsistent case management, underlying factors such as malnutrition and important contamination(49).

#### 5.6. Access to basic household water, sanitation and hygiene

~~Education level of the household~~~~Young age~~~~head of heads of households~~ and household monthly income were the predictors of access to basic household WASH with both cross tabulation and multivariate analysis. The income factor as predictor of access to basic household WASH was supported by Flora Kessy & Richard Mahali(42). In their Tanzania Demographic and Health Survey (THDR) 2017: Background Paper No. 11, recommend that there was a need to develop a comprehensive framework that situates “access to WASH” in the wider poverty reduction context. The framework should take into account the demand and supply aspects of the WASH sector, including the availability, accessibility, adequacy, acceptability, and affordability of WASH services. They placed these five as crucial for WASH programme design. On the other hand Sifat E Rabbi and Nepal C Dey(50), Nyanza(47), and Dongo (51) in their studies found that access to WASH services was associated with socio-economic status largely education of a household head.



## CHAPTER SIX

### 6.1. CONCLUSION

Young age of heads of households and household monthly income were the predictors of access to basic household WASH.

The cholera outbreak and interventions had great impact in raising access to sanitation facilities, drinking water treatment and household hand washing facilities. Nevertheless, the risk of human contact with faeces in Ngorongoro was still high because ~~over~~ 90% majority of sanitation facilities were traditional pit latrine (i.e. without slab).

Having low coverage of access to functional hand ~~washing~~ washing facilities (that is also affected by low coverage of improved sanitation) -as compared to sanitation facilities and drinking water treatment, was one of the reasons for low coverage of access to basic household WASH

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Low access to basic household WASH requires more description especially that will include  
~~This study could not ascertain the temporal relationship between the predictors (monthly income and education of household head) and outcome (access to basic household WASH). Neither did it cover issues related to “cultural factors”, “awareness” and “attitudes” toward access to household WASH.~~

## 6.2. RECOMMENDATIONS

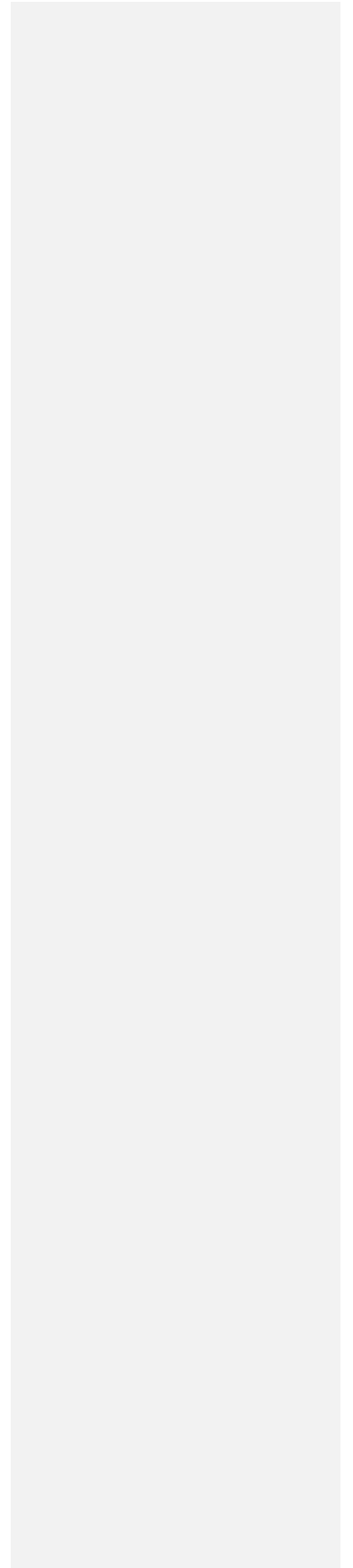
~~Basing on the findings of this study, the following are recommendations:-~~

~~We recommend that p~~Promotions of access to household WASH in Ngorongoro district and ~~other part of Tanzania~~elsewhere in the globe should be integrated with strategies to overcome issues of “access” (i.e. materials and resources) associated with household income.

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Strategies and interventions used to raise access to household WASH in Ngorongoro district during the cholera outbreak should be adopted in other areas especially to nomadic community during the outbreak.

~~QCohort and~~ qualitative studies are needed ~~to ascertain temporality and~~ for more description of the situation, ~~and other~~ cultural factors and attitudes affecting ~~associated with~~ access to household WASH in Ngorongoro.



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## APPENDICES

### Appendix 1A: Interview schedule-English version

#### FACTORS ASSOCIATED WITH ACCESS TO BASIC HOUSEHOLDS' WATER, SANITATION AND HYGIENE IN NGORONGORO CHOLERA EPIDEMIC VILLAGES, ARUSHA

Interviewer's Name \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_

Village \_\_\_\_\_ Sub-village \_\_\_\_\_

Household ID \_\_\_\_\_

#### Introduction

Good morning/afternoon/evening. My name is ..... and I am carrying out research on behalf of Mr. Boniphace Jacob, a resident of Muhimbili University of Health and Allied Science/an employee of Simanjiro District and I am carrying out research as part of my studies at Muhimbili University of Health and Allied Sciences. I would like to speak to the household head.

The aim of the research is to gain knowledge about household's water supply and sanitation facilities and related issues. As part of the questions I would like to see your household's water and sanitation facilities, and in addition to the questions I ask, I will take notes about the facilities you show me.

Your household has been chosen for the interview by random and only a certain number of households in this village will be interviewed. The purpose is to obtain a general view of the situation and all the information your give remains strictly confidential. The interview will take about 30 minutes.

Q1. Would you agree to participate in the interview?

~~2.1.~~ No (write location of household on the list of respondents who are refusing to participate)

~~3.2.~~ Yes (GO TO QP1)

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**Head of household characteristics**

Let us start with you;

**QP1. Sex (please don't ask this question, observe and cycle one answer only)**

- |         |           |   |   |
|---------|-----------|---|---|
| 1. Male | 2. Female | 1 | 2 |
|---------|-----------|---|---|

**QP2. How old are you?**

\_\_\_\_\_years

**QP3. What is your highest educational level completed? (Cycle one answer only)**

- |                   |   |
|-------------------|---|
| 1. None           | 1 |
| 2. Some primary   | 2 |
| 3. Primary        | 3 |
| 4. Some secondary | 4 |
| 5. Secondary      | 5 |
| 6. Post secondary | 6 |

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**Household characteristics**

And now let us talk about your household;-

**QHC1. How many people live in this household permanently including you? .....**

**QHC2. What is the main source of household income? (Cycle one answer only)**

<del>0</del> .1. Livestock/livestock product sale	1
<del>1</del> .2. Own agriculture/horticultural product sale	2
<del>2</del> .3. Employment	3
<del>3</del> .4. Tour guide	4
<del>4</del> .5. Others (specify).....	5

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**QHC3. What is the average total monthly income of the household? This includes income earned by all members of the household and all sources (income from employment, own production, received from other family members etc.) \_\_\_\_\_Tsh**

**GO TO THE CHECK LIST TO FILL QHC4**

**Knowledge of causes, prevention, and treatment of cholera**

This part will ask you questions related to your knowledge on cholera:-

**QKC1. Did you receive education about cholera prevention or treatment within the past 6 months? (Cycle one answer only)**

<del>1</del> .0. _____ No	1. Yes	0	1
---------------------------	--------	---	---

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**QKC2. How can a person get cholera? (Do not read the answers, cycle ALL mentioned answers)**

<del>2</del> .1. _____ Drinking untreated water	1
<del>3</del> .2. _____ Eating cold food	2
<del>4</del> .3. _____ Unwashed fruits/vegetable	3
<del>5</del> .4. _____ Flies/insects	4
<del>6</del> .5. _____ Poor hygiene	5

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**QKC3.** What are the symptoms of cholera? (**Do not read the answers, cycle ALL mentioned answers**)

- |                           |   |
|---------------------------|---|
| 1. Vomiting               | 1 |
| 2. Watery diarrheal       | 2 |
| 3. Stomach/abdominal pain | 3 |
| 4. Dehydration            | 4 |

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**QKC4.** How can someone avoid cholera? (**Do not read the answers, cycle ALL mentioned answers**)

- |                                       |   |
|---------------------------------------|---|
| 1. Wash hands with soap and water     | 1 |
| 2. Cook food thoroughly               | 2 |
| 3. Boil water                         | 3 |
| 4. Wash fruits/vegetables             | 4 |
| 5. Clean cooking utensils/vessels     | 5 |
| 6. Treat water                        | 6 |
| 7. Drink cooled, boiled water         | 7 |
| 8. Dispose of human waste properly    | 8 |
| 9. Cover food to keep away from flies | 9 |

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**QKC5.** How is a cholera patient treated? (**Do not read the answers, cycle ALL mentioned answers**)

- |  |    |                 |
|--|----|-----------------|
| <del>0</del> 1. _____ Go   | to | clinic/hospital |
| 1  |    |                 |
| <del>1</del> 2. _____ Use oral rehydration solution/salt-sugar solution, coconut-salt solution |    |                 |
| 2  |    |                 |

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**Access to water/household water treatment**

I would like to ask you question about access to and treatment of drinking water in your household;-

**QW1.** What is the main source of drinking water for members of your household?  
**(Do not read answers, cycle one answer only)**

- |  |   |          |
|--|---|----------|
| <p><del>0.1.</del> Piped water into dwelling<br/>9</p> | <p>9. Rainwater collection in closed containers</p> | <p>1</p> |
| <p><del>1.2.</del> Piped water to yard/plot<br/>10</p> | <p>10. Rainwater collection in open containers</p>  | <p>2</p> |
| <p><del>2.3.</del> Public tap/standpipe<br/>11</p>     | <p>11. Bottled water</p>                            | <p>3</p> |
| <p><del>3.4.</del> Tube well/borehole<br/>12</p>       | <p>12. Small-scale vendor</p>                       | <p>4</p> |
| <p><del>4.5.</del> Protected dug well<br/>13</p>       | <p>13. Tanker-truck</p>                             | <p>5</p> |
| <p><del>5.6.</del> Unprotected dug well<br/>14</p>     | <p>14. Surface water</p>                            | <p>6</p> |
| <p><del>6.7.</del> Protected spring<br/>15</p>         | <p>15. Other (specify).....</p>                     | <p>7</p> |
| <p><del>7.8.</del> Unprotected spring</p>              |   | <p>8</p> |

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**QW2.** How long does it take to go there, get water and come back?  
 .....hours.....minutes **(Instruct respondent to exclude time used to other household errands. Make sure that the answer is for one roundtrip only)**

**QW3.** What is the size of the container(s) you are using to fetch the water?  
**(Ask to see the containers and note the size)**

Size of container, type 1.....litres  
 Size of container, type 2.....litres  
 Size of container, type 3.....litres

**QW4.** How many containers does your household usually use per day (for all purposes and sources)?

Number of containers per day, type 1.....

Number of containers per day, type 2.....

Number of containers per day, type 3.....

QW5. One person in this household uses approximately .....litres of water per day (Interviewer: find total amount of water in QW4 and divide by number of people in QHC1)

QW6. How frequently (per day/week) was the drinking water from the main source available to your household during the last two weeks? \_\_\_\_\_

QW7. Do you do anything to the water to make it safer to drink?(Cycle one answer only)

~~1~~0. \_\_\_\_\_ No                      1. Yes                                      0                      1

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QW8. What do you usually do to the water to make it safer to drink? (cycle one answer only)

~~2~~1. \_\_\_\_\_ Boil the water                                      1  
~~3~~2. \_\_\_\_\_ Add bleach/chlorine/aqua table                                      2  
~~4~~3. \_\_\_\_\_ Sieve it through cloth                                      3  
~~5~~4. \_\_\_\_\_ Water filter (ceramic, sand, composite)                                      4  
~~6~~5. \_\_\_\_\_ Let it stand and settle                                      5  
~~7~~6. \_\_\_\_\_ Other (specify).....                                      6  
~~8~~7. \_\_\_\_\_ Don't know                                      7

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QW9. When was the last time your household treated the water using this method?

~~0~~1. \_\_\_\_\_ Today                                      4. Less than one month ago                                      1                      4  
~~1~~2. \_\_\_\_\_ Yesterday                                      5. More than one month ago                                      2                      5  
~~2~~3. \_\_\_\_\_ Less than one week ago                                      6. Don't know                                      3                      6

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QW10. Does your household have a water storage container for drinking water?

0. No                      1. Yes                                      0                      1

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**QW11.** I would very much like to see your household's drinking water storage container; would you kindly show it to me?

0. No (refused)      1. Yes                      0              1

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**QW12.** How does your household remove water from your drinking water storage container?

1. Tap	5. Pitcher	1	5
2. Cup/dipper/ladle/scoop	6. Pour from the container	2	6
3. With hands	7. No specific means	3	7
4. With bottle	8. Others (specify).....	4	8

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**QW13.** How often does your household usually clean the drinking water storage container?

1. Daily	5. Once every half year	1	4
2. Several times per week	6. Less often than half yearly	2	5
3. Once a week	7. Don't know	3	6
4. Once a month		4	7

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**GO TO THE CHECK LIST TO FILL QW14-QW19**

### Household sanitation

We have completed 2/3 of the questionnaire. Now I will ask you a number of questions regarding your household's toilet facilities

**QHS1.** Does your household have a toilet? (**Cycle one answer only**)

~~0.~~ No (go to QHS3)      1. Yes (go to QHS2)      0              1

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**QHS2.** What kind of toilet does your household use? (**cycle one answer only**)

<del>2.</del> 1. Traditional pit latrine /without slab	1
<del>3.</del> 2. Improved traditional pit latrine/with slab	2
<del>4.</del> 3. Ventilated Improved Pit latrine (VIP)	3
<del>5.</del> 4. Flush/WC/pour flush toilet	4
<del>6.</del> 5. Ecosan/compositing toilet	5
<del>7.</del> 6. None/Open air/bush/field	6

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**QHS3.** Where do members of your household usually go for defecation?

- |                       |  |   |
|-----------------------|--|---|
| <del>0</del> 1. _____ | Traditional pit latrine /without slab      | 1 |
| <del>1</del> 2. _____ | Improved traditional pit latrine/with slab | 2 |
| <del>2</del> 3. _____ | Ventilated Improved Pit latrine (VIP)      | 3 |
| <del>3</del> 4. _____ | Flush/WC/pour flush toilet                 | 4 |
| <del>4</del> 5. _____ | Ecosan/compositing toilet                  | 5 |
| <del>5</del> 6. _____ | None/Open air/bush/field                   | 6 |

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**QHS4.** I would very much like to see your toilet - would you kindly show it to me?

- |                 |        |   |   |
|-----------------|--------|---|---|
| 0. No (refused) | 1. Yes | 0 | 1 |
|-----------------|--------|---|---|

**QHS5.** Do you share this toilet facility with other households?

- |                    |        |   |   |
|--------------------|--------|---|---|
| 0. No (go to QHS7) | 1. Yes | 0 | 1 |
|--------------------|--------|---|---|

**QHS6.** How many households use this toilet facility? \_\_\_\_\_ households

**GO TO THE CHECK LIST TO FILL QHS7-QHS14**

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### Household hygiene

Now I will ask you a number of questions regarding your household's hygiene

**QHN1.** Is there a specific place to wash hands within the dwelling, yard or plot?

- |       |        |   |   |
|-------|--------|---|---|
| 0. No | 1. Yes | 0 | 1 |
|-------|--------|---|---|

**GO TO THE CHECK LIST TO FILL QHN2-QHN4**

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**QHN5.** Have you used soap today or yesterday?

- |                       |    |        |   |   |
|-----------------------|----|--------|---|---|
| <del>1</del> 0. _____ | No | 1. Yes | 0 | 1 |
|-----------------------|----|--------|---|---|

**QHN6.** Do you have soap or something else that you use for hand washing in your household?

- |       |                                 |   |   |
|-------|---------------------------------|---|---|
| 0. No | 1. Yes ( <b>ask to see it</b> ) | 0 | 1 |
|-------|---------------------------------|---|---|

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**QHN7.** When you used soap today or yesterday, what did you use it for?

**(Do not read out the answer, multiple responses allowed)**

<del>0</del> 1. _____	Washing clothes	1
<del>1</del> 2. _____	Washing my body	2
<del>2</del> 3. _____	Washing child's bottom	3
<del>3</del> 4. _____	Washing child's hands	4
<del>4</del> 5. _____	Washing hands after defecating	5
<del>5</del> 6. _____	Washing hands after cleaning child	6
<del>6</del> 7. _____	Washing hands before feeding child	7
<del>7</del> 8. _____	Washing hands before preparing food	8
<del>8</del> 9. _____	Washing hands before eating	9
<del>9</del> 10. _____	Washing hands before going out	10
<del>10</del> 11. _____	Washing hands before receiving visitors	11
<del>11</del> 12. _____	Other (write down.....)	12

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### **Technical aspect of sanitation**

**QTS1.** Do you know any person with special training on how to construct improved toilet and hand washing facilities in your village?

0. No	1. Yes	0	1
-------	--------	---	---

**QTS2.** Where do you buy materials for the construction of a toilet or a house?

1. In our village	1
2. In a neighbouring town	2
3. Not available	3
4. Don't know	4

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### **Cholera**

We are about to finish. Now will ask you few questions regarding your household's history of cholera

QC1. Has anyone in your household had cholera in the past 12 months?

~~1.~~0.  No      1. Yes       0       1

QC2. How many? \_\_\_\_\_ people

QC3. Age (note the age of all mentioned cholera cases) \_\_\_\_\_ Years

QC4. Sex (note the gender of all mentioned cholera cases)

~~2.~~1.  Male

~~3.~~2.  Female

QC5. Outcome (note the outcome of all mentioned cholera cases)

1. Died

2. Recovered

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**THANK YOU FOR YOUR PERTICIPATION IN THIS RESEARCH**

I confirm that this interview is completely confidential

End Time: \_\_\_\_\_

**Appendix 1B: Dodoso la utafiti (Interview schedule-Swahili version)****UPATIKANAJI MAJI, CHOO NA USAFI NGAZI YA KAYA NA VISABABISHI  
KATIKA WILAYA YA NGORONGORO, VIJJI VYENYE MLIPUKO WA  
KIPINDUPINDU, ARUSHA**

Jina la mtafiti/mtafiti msaidizi \_\_\_\_\_ Tarehe \_\_\_\_\_ Muda \_\_\_\_\_

Kijiji \_\_\_\_\_ Kitongoji \_\_\_\_\_

Namba ya kaya (ID) \_\_\_\_\_

**Utangulizi**

Habari za asubuhi/ mchana/jioni. Jina langu ni \_\_\_\_\_ ninafanya utafiti kwa niaba ya Boniphace Jacob ambaye ni mwajiriwa wa halmashauri ya wilaya ya Simanjiro. Kwa sasa ni mwanafunzi wa uzamili katika sayansi ya ufuatiliaji na udhibiti wa magonjwa (MSc Applied Epidemiology) katika chuo kikuu cha afya na sayansi shirikishi Muhimbili. Naomba kuzungumza na mkuu wa kaya hii.

Dhumuni la utafiti huu nikupata uelewa kuhusu upatikanaji wa waji safi, wasuala ya vyoo na usafi wa kaya kwa ujumla. Nitakuuliza maswali kuhusu choo, maji ya kunywa na sehemu ya kunawia mikono. Nitaomba pia kuona vitu hivyo na kunakiri pembeni mambo nitakayoyaona.

Kaya yako ni moja ya kaya chache za kijiji hiki zilizochaguliwa kwa bahati kushiriki katika utafiti huu. Ushiriki wako na taarifa utakayotoa ni siri. Usaili unatarajiwa kutumia muda wa dakika 30

Q1. Je ungependa kushiriki katika usaili?

- |   |   |
|---|---|
| +0. _____ Hapana (ingiza kwenye orodha ya waliokataa kushiriki) | 0 |
| +1. _____ Ndiyo (nenda QP1)                                     | 1 |

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**Mkuu wa kaya**

Nguja nianze kuuuliza maswali yanayo kuhusu wewe;

**QP1. Jinsi (usiulize swali hili, mwangalie mkuu wa kaya kasha ujaze)**

- |             |             |   |   |
|-------------|-------------|---|---|
| 1. Mwanaume | 2. Mwanamke | 1 | 2 |
|-------------|-------------|---|---|

**QP2. Una umri wa miaka mingapi?**

Miaka \_\_\_\_\_

**QP3. Je unaelimu gani? (usitaje majibu, zungushia jibu moja lililotajwa)**

- |                               |   |
|-------------------------------|---|
| 1. Sijasoma                   | 1 |
| 2. Sikumaliza shule ya msingi | 2 |
| 3. Nilimaliza shule ya msingi | 3 |
| 4. Sikumaliza sekondari       | 4 |
| 5. Nilimaliza sekondari       | 5 |
| 6. Zaidi ya sekondari         | 6 |

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**Masuala ya kaya**

Sasa ngoja tuongeele kaya yako;-

**QHC1.** Ni watu wangapi ukijumlisha na wewe ambao kwa kawaida wanaishi hapa kwenye kaya yako?

Watu \_\_\_\_\_

**QHC2. Je ni nini chanzo kikuu cha kipato (kiuchumi) katika kaya hii? (usitaje majibu)**

- |   |   |
|---|---|
| <del>0</del> .1. _____ Mifugo                 | 1 |
| <del>1</del> .2. _____ Kilimo                 | 2 |
| <del>2</del> .3. _____ Ajira                  | 3 |
| <del>3</del> .4. _____ Kuongoza watalii       | 4 |
| <del>4</del> .5. _____ Kingine (elezea) _____ | 5 |

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**QHC3.** Kwa wastani kaya yako ina kipato cha shilingi ngapi kwa mwezi?. Kipato hicho ni jumla ya fedha zote ambazo watu wote wa kaya yako wanapata kutoka vyanzo vyote

vya mapato (kipato kutokana na ajira, mifugo, kilimo, kuongoza watalii, fedha zilizotoka kwa ndugu etc.)

Shiling \_\_\_\_\_

#### NENDA KWENYE FOMU YA UKAGUZI UJAZE QHC4

#### Uelewa kuhusu ugonjwa wa kipindupindu

Hapa kuna maswali kuhusu ugonjwa wa kipindupindu;-

**QKC1.** Je umewahi kupata elimu ama kusikia kuhusu ugonjwa wa kipindupindu ndani ya miezi 6 iliyopita?

<del>1</del> 0. _____ Hapana	1. Ndiyo	0	1
------------------------------	----------	---	---

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**QKC2.** Je mtu anawezaje kupata ugonjwa wa kipindupindu? (usitaje majibu, zungushia MAJIBU yote yaliyotajwa)

1. Kunywa maji ambayo hayajachemshwa/kuwekewa wotagadi	1
2. Kula chakula cha baridi	2
3. Matunda/kachumbali ambayo hayajaoshwa	3
4. Nzi/ wadudu	4
5. Uchafu	5

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**QKC3.** Mtu mwenye kipindupindu anakuwa na dalili gani? (usitaje majibu, zungushia MAJIBU yote yaliyotajwa)

<del>2</del> 1. _____ Kutapika	1
<del>3</del> 2. _____ Kuharisha maji	2
<del>4</del> 3. _____ Tumbo kuuma/kuvuruga	3
<del>5</del> 4. _____ Kuishiwa maji mwilini	4

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**QKC4.** Mtu anawezaje kujikinga na ugonjwa wa kipindupindu? (usitaje majibu, zungushia MAJIBU yote yaliyotajwa)

1. Kunawa mikono kwa maji na sabuni	1
2. Kupika chakula kiive vizuri	2

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- |  |   |
|--|---|
| 3. Kuchemsha maji                      | 3 |
| 4. Kuosha matunda/kachumbali           | 4 |
| 5. Kuosha vyombo vya kupikia           | 5 |
| 6. Kutibu maji                         | 6 |
| 7. Kunywa maji yaliyochemchwa na kupoa | 7 |
| 8. Kuwa na choo na kukitumia vizuri    | 8 |
| 9. Kufunika chakula kuzuia nzi         | 9 |

**QKC5.** Je mgonjwa wa kipindupindu anatibiwaje? (usitaje majibu, zungushia MAJIBU yote yaliyotajwa)

- |  |   |
|--|---|
| 1. Zahanati/Hospitali/kituo cha kutolea huduma za afya.  | 1 |
| 2. Kunywa ORS/maji yaliyotengenezwa kwa chunvi na sukari | 2 |

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**Upatikanaji/kutibu maji ya kunywa katika kaya**

Naomba kukuuliza kuhusu upatikanaji na kutibu maji ya kunywa katika kaya yako

**QW1.** Kaya yako inachota wapi maji ya kunywa (chanzo kikuu)?

(usitaje majibu, zungushia jibu moja)

- |  |   |
|--|---|
| <del>0</del> -1. _____ Maji ya bomba ambalo liko ndani ya nyumba | 1 |
| <del>1</del> -2. _____ Maji ya bomba hapa nje                    | 2 |
| <del>2</del> -3. _____ Bomba la jumua                            | 3 |
| <del>3</del> -4. _____ Kisima kirefu                             | 4 |
| <del>4</del> -5. _____ Kisima kifupi kinachohifadhiwa            | 5 |
| <del>5</del> -6. _____ Kisima kifupi kisichohifadhiwa            | 6 |
| <del>6</del> -7. _____ Chemichemi inayohifadhiwa                 | 7 |

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	<del>7.8.</del> Chemichemi	isiyohifadhiwa
	8	
	<del>8.9.</del> Maji ya mvua yanayohifadhiwa katika chombo chenye mfumiko	
	9	
	<del>9.10.</del> Maji ya mvua yanayohifadhiwa katika chombo kisicho na mfumiko	
	10	
	<del>10.11.</del> Maji ya chupa (ya kununua dukani)	
	11	
	<del>11.12.</del> Watu wanaotembeza maji mtaani	
	12	
	<del>12.13.</del> Gari kubwa la maji	
	13	
	<del>13.14.</del> Maji ya uso wa ardhi (mito, bwawa, dimbwi, ziwa, mfereji)	
	14	
	<del>14.15.</del> Mengineyo (elezea) _____	
	15	

**QW2.** Mtu wa kaya yako anayekwenda kuchota maji, anatumia dakika/masaa mangapi kwenda na kurudi? **(-mwelekeze mkuu wa kaya kuwa ni ni safari ya maji peke bila kuhusisha mizunguko mingine. Hakikisha kuwa jibu ni la safari moja tu ya kwenda na kurudi)**

Masaa \_\_\_\_\_ dakika \_\_\_\_\_

**QW3.** Chombo/vyombo vinavyotumika kufuata maji katika kaya yako vina ujazo wa lita ngapi?

**(Omba uvione na ujaze ukubwa hapa chini. Jaza ukubwa wa vyombo vyote vinavyotumika)**

Ujazo wa chombo, aina ya 1 lita \_\_\_\_\_

Ujazo wa chombo, aina ya 2 lita \_\_\_\_\_

Ujazo wa chombo, aina ya 3 lita \_\_\_\_\_

**QW4.** Ni idadi ngapi ya vyombo vilivyojaa maji vinatumika katika kaya yako kwasiku? (kwa matumizi yote na kutoka katika vyanzo vyote)

Idadi ya vyombo aina ya 1 huwa vinatumika \_\_\_\_\_ kwa siku



Idadi ya vyombo aina ya 2 huwa vinatumika \_\_\_\_\_ kwa siku

Idadi ya vyombo aina ya 3 huwa vinatumika \_\_\_\_\_ kwa siku

**QW5.** Kwa makadilio mtu mmoja katika kaya hii hutumia lita \_\_\_\_\_ za maji kwa siku (Mtafiti/mtafiti msaidizi: tafuta jumla ya ujazo wa maji yote katiaka kaya kwa siku kwa kutumia maelezo ya QW3 na QW4 kisha gawia idadi ya watu katika kaya iliyotajwa kwenye QHC1 ili kupata kiasi kinachotumiwa na mtu mmoja kwa siku)

**QW6.** Ni mara ngapi (kwa siku/wiki) ndani ya kipindi cha wiki mbili zilizopita maji ya kunya yalipatikana katika chanzo kikuu cha maji ya kunywa? \_\_\_\_\_

**QW7.** Je kaya yako inafanya chochote ili maji ya kunywa yawe salama? (**Zungushia jibu**)

0. Hapana                      1. Ndiyo                      0                      1  
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**QW8.** Kaya yako huyafanya nini maji ili yawe salama kwa ajili ya kunywa? (**usitaje majibu, zungushia jibu moja**)

2.1. \_\_\_\_\_ Kuchemsha maji  
 1  
 3.2. \_\_\_\_\_ Kuweka wotagadi wa maji/vidonge  
 2  
 4.3. \_\_\_\_\_ Kuchuja kwa kitambaa safi  
 3  
 5.4. \_\_\_\_\_ Kuweka kwenye chupa za maji na kuweka juani  
 4  
 6.5. \_\_\_\_\_ Kuyaacha yatulie  
 5  
 7.6. \_\_\_\_\_ Njia nyinginezo (elezea) \_\_\_\_\_  
 6  
 8.7. \_\_\_\_\_ Sijui  
 7

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**QW9.** Mara yamwisho kaya yako kutibu maji kwa kutumia njia hii ilikuwa lini? (usitaje majibu, zungushia jibu moja)

- |  |   |
|--|---|
| <del>0</del> .1. _____ Leo                           | 1 |
| <del>1</del> .2. _____ Jana                          | 2 |
| <del>2</del> .3. _____ Ndani ya wiki hii             | 3 |
| <del>3</del> .4. _____ Ndani ya mwezi huu            | 4 |
| <del>4</del> .5. _____ Zaidi ya mwezi mmoja uliopita | 5 |

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**QW10.** Je kaya yako ina chombo cha kuhifadhi maji ya kunywa?

- |           |          |   |   |
|-----------|----------|---|---|
| 0. Hapana | 1. Ndiyo | 0 | 1 |
|-----------|----------|---|---|

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**QW11.** Ningependa kuona chomba cha kuhifadhi maji ya kunywa katika kaya yako, je unaweza kunionyesha?

- |                      |          |   |   |
|----------------------|----------|---|---|
| 0. Hapana (amekataa) | 1. Ndiyo | 0 | 1 |
|----------------------|----------|---|---|

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**QW12.** Je kaya yako inatumia chombo gani kuchota maji katika chombo kikubwa cha kuhifadhi maji ya kunywa? (usitaje majibu, zungushia jibu moja lililotajwa)

- |                   |                          |   |   |
|-------------------|--------------------------|---|---|
| 1. Bomba          | 5. Jagi                  | 1 | 5 |
| 2. Kikombe/kibuyu | 6. Kumimina              | 2 | 6 |
| 3. Mikono         | 7. Hakuna chombo maalumu | 3 | 7 |
| 4. Chupa          | 8. Vingine (elezea)..... | 4 | 8 |

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**QW13.** Chombo cha kuhifadhi maji ya kunywa katika kaya yako huoshwa kila baada ya muda gani? (usitaje majibu, zungushia jibu moja lililotajwa)

- |                         |                                       |   |   |
|-------------------------|---------------------------------------|---|---|
| 1. Kila siku            | 5. Mara moja kila baada ya nusu mwaka | 1 | 6 |
| 2. Mara nyingi kwa wiki | 6. Mara moja kwa zaidi ya nusu mwaka  | 2 | 7 |
| 3. Mara moja kwa wiki   | 7. Sijui                              | 3 |   |
| 4. Mara nyingi kwa mwez |                                       | 4 |   |
| 5. Mara moja kwa mwezi  |                                       | 5 |   |

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**NENDA KWENYE FOMU YA UKAGUZI UJAZE QW14-QW19**

**Kuhusu vvo**

Tumemaliza 2/3 ya dodoso hili. Hapa kuna maswali machache kuhusu choo cha kaya yako.

**QHS1. Je kaya yako ina choo? (Zungushia jibu moja)**

~~1-0.~~ Hapana (nenda QHS3)      1. Ndiyo (endelea na QHS2)

1

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**QHS2. Je ni aina gani ya choo? (Zungushia jibu moja)**

~~2-1.~~ Choo cha asili (hakina sakafu)      1

~~3-2.~~ Choo cha asili kilichoboreshwa (kina sakafu)      2

~~4-3.~~ Choo kilichoboreshwa chenye bomba (VIP)      3

~~5-4.~~ Choo cha maji      4

~~6-5.~~ Choo chaikolojia      5

~~7-6.~~ Hakuna choo/porini      6

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**QHS3. Kwa kawaida watu wa kaya yako hujisaidia wapi haja kubw? (Zungushia jibu moja. Kaya zote razima ziulizwe swali hili)**

~~0-1.~~ Choo cha asili (hakina sakafu)      1

~~1-2.~~ Choo cha asili kilichoboreshwa (kina sakafu)      2

~~2-3.~~ Choo kilichoboreshwa chenye bomba (VIP)      3

~~3-4.~~ Choo cha maji      4

~~4-5.~~ Choo chaikolojia      5

~~5-6.~~ Hakuna choo/porini      6

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**QHS4. Ningependa kuona choo cha kaya yako. Je unaweza kunionyesha?**

0. Hapana (amekataa)      1. Ndiyo      0      1

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**QHS5. Je kaya yako inachangia hiki choo na kaya nyingine?**

0. Hapana (nenda QHS7)      1. Ndiyo (endelea QHS6)      0      1

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**QHS6. Kaya ngapi zinatumia choo hiki ukijumlisha naya kwako?**

Kaya \_\_\_\_\_

**NENDA KWENYE FOMU YA UKAGUZI UJAZE QHS7-QHS15****Usafi katika kaya**

Hapa kuna maswali machache kuhusu usafi wa kaya yako

**QHN1.** Je kuna sehemu maalumu ya kunawa mikono katika kaya yako?

±0. \_\_\_\_\_ Hapana                      1. Ndiyo    0                      1

**NENDA KWENYE FOMU YA UKAGUZI UJAZE QHN2-QHN4**

**QHN5.** Je ulitumia sabuni leo ama jana?

0. Hapana                      1. Ndiyo    0                      1

**QHN6.** Je kaya yako ina sabuni au kitu kingine mbadala kinachatumika kunawia mikono?

0. Hapana                      1. Ndiyo (**omba kuona**)    0                      1

**QHN7.** Ulipotumia sabuni leo au jana uliitumia kufanyia nini?

**(Usitaje, zungushia majibu yote yaliyotajwa)**

- |  |    |
|--|----|
| 1. Kufulia nguo                              | 1  |
| 2. Kuogea                                    | 2  |
| 3. Kutawadha mtoto                           | 3  |
| 4. Kunawisha motto mikono                    | 4  |
| 5. Kunawia mikono baada ya kutoka kujisaidia | 5  |
| 6. Kunawia mikono baada ya kumtawadha mtoto  | 6  |
| 7. Kunawia mikono kabla ya kumlisha mtoto    | 7  |
| 8. Kunawia mikono kabla ya kuandaa chakula   | 8  |
| 9. Kunawia mikono kabla ya kula              | 9  |
| 10. Kunawia mikono kabla ya kutoka           | 10 |
| 11. Kunawia mikono kabla ya kupokea wageni   | 11 |
| 12. Mengineyo (elezea.....)                  | 12 |

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**Maswala ya utaalumu**

**QTS1.** Je unamfahamu mtu mwenye mafunzo maalumu ya ujezi wa vyoo , miundombinu ya maji au vifaa vya kunawia mikono?

0. Hapana	1. Ndiyo	0	1
-----------	----------	---	---

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**QTS2.** Je kaya yako hununua wapi vifaa vya kujengea choo au nyumba?

<del>0</del> 1. _____ Hapa kijijini	1
<del>1</del> 2. _____ Mjinini karibu na kijiji chetu	2
<del>2</del> 3. _____ Havipatikani	3
<del>3</del> 4. _____ Sijui	4

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### Kipindupindu

Tunamalizia. Lakini kabla hatujamaliza kuna maswali machache kuhusu historia ya kipindupindu katika kaya yako

**QC1.** Je ndani ya miezi 6 iliyopita kaya yako imewahi kuwa na mgonjwa wa kipindupindu?

0. Hapana	1. Ndiyo	0	1
-----------	----------	---	---

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**QC2.** Wangapi?

Watu \_\_\_\_\_

**QC3.** Umri? (andika umri wa kila mgonjwa aliyetajwa)

\_\_\_\_\_ Years

**QC4.** Jinsi? (andika jinsi ya kila mgonjwa aliyetajwa)

1. Mwanaume
2. Mwanamke

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**QC5. Matokeo? (andika matokeo ya kila mgonjwa aliyetajwa)**

1. Alifariki
2. Alipona

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**ASANTE KWA USHIRIKI WAKO KATIKA UTAFITI HUU**

Nakudhibitishia kuwa mahojiano haya ni siri

**Muda wa kumaliza:** \_\_\_\_\_

**Appendix 2A: Check list for assessing household-wash**

**FACTORS ASSOCIATED WITH ACCESS TO BASIC HOUSEHOLDS' WATER,  
SANITATION AND HYGIENE IN NGORONGORO CHOLERA EPIDEMIC  
VILLAGES, ARUSHA**

**Interviewer's Name** \_\_\_\_\_ **Date** \_\_\_\_\_ **Time** \_\_\_\_\_



0. No	1. Yes	0	1
-------	--------	---	---

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### **Household sanitation**

**QHS7.** How far is the toilet facility or open defecation place from the main dwelling?  
 (Observe and measure approximate distance) \_\_\_\_\_metres

#### **Observation about access to toilet**

<b>QHS8.</b> Path is clear?	0. No	1. Yes	0	1
<b>QHS9.</b> Dense vegetation in front of a toilet?.	0. No	1. Yes	0	1
<b>QHS10.</b> Waste or debris on path?.	0. No	1. Yes	0	1
<b>QHS11.</b> Major crevice or potholes on path?.	0. No	1. Yes	0	1
<b>QHS12.</b> Mud on path?.	0. No	1. Yes	0	1
<b>QHS13.</b> Entrance to toilet is obstructed?	0. No	1. Yes	0	1

#### **Observations about toilet**

**QHS15.** Faeces seen on toilet floor/wall/door/around drop hole

0. No	1. Yes	0	1
-------	--------	---	---

### **Household hygiene**

#### **Observation about hand washing facility**

**QHN2.** Types of hand washing facility...



- |                       |   |
|-----------------------|---|
| 1. Tip tap            | 1 |
| 2. Storage container  | 2 |
| 3. Tap                | 3 |
| 4. Hand washing basin | 4 |
| 5. None               | 5 |

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**QHN3.** Is water present at the specific place to wash hands?

- |       |        |   |   |
|-------|--------|---|---|
| 0. No | 1. Yes | 0 | 1 |
|-------|--------|---|---|

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**QHN4.** Are soap/detergent/ ash available at the specific place for hand washing?

- |                   |   |
|-------------------|---|
| 1. None           | 1 |
| 2. Soap           | 2 |
| <del>3.</del> Ash | 3 |

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3.

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**Appendix 2B: Fomu ya ukaguzi wa maji, vyoo na usafi katika kaya**

**UPATIKANAJI MAJI, CHOO NA USAFI NGAZI YA KAYA NA VISABABISHI  
KATIKA WILAYA YA NGORONGORO, VIJJI VYENYE MLIPUKO WA  
KIPINDUPINDU, ARUSHA**

Jina la mtafiti/mtafiti msaidizi \_\_\_\_\_ Tarehe \_\_\_\_\_ Muda \_\_\_\_\_

Kijiji \_\_\_\_\_ Kitongoji \_\_\_\_\_

Namba ya kaya (ID) \_\_\_\_\_

### Kuhusu kaya

Kuangalia mazingira yanayozunguka kaya

**QHC4.** Je kinyesi (cha mototo/mnyama) kimetupwa katika mazingira ya kaya? (**usome kwa sauti, angalia na ujaze fomu**)

0. Hapana                      1. Ndiyo                      0                      1

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### Upatikanaji/kutibu maji ya kunywa katika kaya

**QW14.** Je chombo cha kuchotea maji (kikombe/bakuli/jagi/kibuyu) ya kunywa kutoka katika chombo kikubwa cha kuhifadhia maji ya kunywa, **kiko safi** ?

0. Hapana                      1. Ndiyo                      0                      1

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**QW15.** Je chombo cha kuchotea maji (kikombe/bakuli/jagi/kibuyu) ya kunywa kutoka katika chombo kikubwa cha kuhifadhia maji ya kunywa, **hakiko chini**?

0. Hapana                      1. Ndiyo                      0                      1

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**QW16.** Je chombo cha kuchotea maji (kikombe/bakuli/jagi/kibuyu) ya kunywa kutoka katika chombo kikubwa cha kuhifadhia maji ya kunywa, **kimewekwa mbali na watoto** ?

0. Hapana                      1. Ndiyo                      0                      1

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**QW17.** Je chombo cha kuhifadhia maji ya kunywa kimefunikwa?

0. Hapana                      1. Ndiyo                      0                      1

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**QW18.** Je chombo cha kuhifadhia maji ya kunywa kina mdomo mwembamba?

0. Hapana                      1. Ndiyo                      0                      1

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**QW19.** Je chombo cha kuhifadhia maji kina uchafu unaoonekana kwa macho?

0. Hapana                      1. Ndiyo                      0                      1

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### **Kuhusu choo**

**QHS7.** Choo au eneo la kujisaidia (hata kama ni porini) liko umbali gani kutoka katika myumba ya kulala? (**angalia halafu ukadirie umbali**)

Mita \_\_\_\_\_

### **Kuangalia utumiaji wa choo**

**QHS8.** Njia iko safi?

0. 0 Hapana                      1. Ndiyo                      0                      1

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**QHS9.** Kuna uoto na majani marefu mbele ya choo?.

0. Hapana                      1. Ndiyo                      0                      1

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**QHS10.** Kuna matakataka, magogo au mawe katika njia ya choo?

0. Hapana                      1. Ndiyo                      0                      1

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**QHS11.** Kuna shimo au ufa mkubwa katika njia ya choo?.

0. Hapana                      1. Ndiyo                      0                      1

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**QHS12.** Kuna matope kwenye njia ya choo?.

0. Hapana                      1. Ndiyo                      0                      1

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**QHS13.** Eneo la kuingilia chooni limezibwa?

0. Hapana                      1. Ndiyo                      0                      1

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cm + Indent at: 1.27 cm

### **Kuangalia choo**

**QHS15.** Kinyesi kimeonekana sakafuni/ukutani/mlangoni/kuzunguka tundu la choo?

0. Hapana                      1. Ndiyo                      0                      1

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### **Kuhuyu usafi**

**Kuangalia sehemu ya kunawaia mikono**

**QHN2.** Aina ya kifaa cha kunawia mikono ni?

- |                                     |   |
|-------------------------------------|---|
| 1. Kibuyu chirizi                   | 1 |
| 2. Chombo cha kuhifadhia maji       | 2 |
| 3. Bomba                            | 3 |
| 4. Sinki la kunawia mikono          | 4 |
| 5. Hakuna chombo cha kunawia mikono | 5 |

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**QHN3.** Je kuna maji katika sehemu la kunawia mikono?

- |                        |          |   |   |
|------------------------|----------|---|---|
| <del>1</del> 0. Hapana | 1. Ndiyo | 0 | 1 |
|------------------------|----------|---|---|

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**QHN4.** Je kuna sabuni au majivu katika sehemu ya kunawia mikono?

- |           |   |
|-----------|---|
| 1. Hakuna | 1 |
| 2. Sabuni | 2 |
| 3. Majivu | 3 |

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### Appendix 3A: Information leaflet and Informed consent Form for household heads

**FACTORS ASSOCIATED WITH ACCESS TO BASIC HOUSEHOLDS' WATER,  
SANITATION AND HYGIENE IN NGORONGORO CHOLERA EPIDEMIC  
VILLAGES, ARUSHA**

**MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES**

**INVITATION:**

Hello

How are you?

You are invited to participate in the above mentioned study. The leaflet you are reading is to provide information about this proposed study on factors associated with inadequate access to basic household-water sanitation and hygiene in Ngorongoro cholera epidemic villages, Tanzania, 2018. Together with this leaflet is the Informed Consent Form. Please read carefully the information in the leaflet, and in case you agree to participate please put your signature, a cross or tick at the designated area in the Informed consent form. In case you need additional information or clarification you are welcome to ask for more explanation.

I am an employee of Simanjiro District, currently pursuing studies in Msc. Applied Epidemiology at Muhimbili University of Health and Allied Sciences.

**PURPOSE AND DISCRPTION OF THE STUDY**

This study aims to determine the proportions of households with toilets, hand washing facilities and treating drinking water. It will also identify factors associated with inadequate access to basic household-water sanitation and hygiene (WASH) in Ngorongoro cholera epidemic villages. Results obtained from this study will be used to propose community based intervention methods for improving access to basic household water sanitation and hygiene. You will be informed of the results at the planned means of research results dissemination. The study results will be disseminated through a publication and in a thesis for academic purpose.

**STUDY PROCEDURE**

You will be interviewed on questions related to potential risk factors for inadequate access of basic household water, sanitation and hygiene such as characteristics of household

head, household characteristics, technical aspect related to household-WASH etc. Also observation and recording of household WASH using a check list will be done.

### **VOLUNTARY PARTICIPATION**

Please note that your participation in this study is voluntary and you have a right to refuse to consent. If you consent to participate you have the right to withdraw from the study at any time if you wish to do so.

### **BENEFITS**

There are no direct benefits for participating in the study. But since the study will be getting information for identify risk factors associated with inadequate access to basic household-WASH in Ngorongoro cholera epidemic villages; it will come up with recommendation to improve household-WASH. The recommendation will also help in prevention and control of cholera in Ngorongoro.

### **ALTERNATIVES**

The alternative of participating in the study is to decline to take part.

### **RISKS AND DISCOMFORT**

There are no risks but you may not be comfortable to let me see your drinking water storage containers.

### **COMPENSATION FOR TIME**

Your participation in the study will hopefully help to control the problem of inadequate access to household-WASH and cholera in the district.

### **CONFIDENTIALITY**

Your name will not appear on the questionnaire and no record of your participation as individuals will be kept.

**REVIEW AND APPROVAL**

The review and approval of the study has been done by the Ethical committee of Muhimbili University of Health and Allied Sciences (MUHAS).

**RESULTS**

The results of the study will be made available to you through a planned means of research results dissemination. Results of this study will also be compiled in a research paper for publication and as part of a partial fulfilment of a master's degree.

**CONTACTS FOR FURTHER INFORMATION**

In case you have any questions concerning the nature of this study, please contact:

**Dr. Bruno Sunguya,**  
Director of Research and Publication,  
Muhimbili University of Health and Allied Sciences,  
P.O. BOX 65001,  
Dar es Salaam.  
**Office Tel: 022-2152489**

If you agree to participate please keep this leaflet for more information during the study.

**CONSENT FORM**

I confirm that I have read carefully and I have understood the information provided in the leaflet and I here consent to participate in the study. I am aware that I can freely withdraw from this study any time I wish to do so.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Signature \_\_\_\_\_ (Research assistant)

Date \_\_\_\_\_

**Appendix 3B: Taarifa kuhusu utafiti na ushiriki wa hiari kwa wakuu wa kaya  
UPATIKANAJI MAJI, CHOO NA USAFI NGAZI YA KAYA NA VISABABISHI  
KATIKA WILAYA YA NGORONGORO, VIJJI VYENYE MLIPUKO WA  
KIPINDUPINDU, ARUSHA**

**CHUO KIKUU CHA AFYA NA SAYANSI SHIRIKISHI MUHIMBILI**



**MWALIKO**



Habari za sahihi.

Unaalikwa kushiriki utafiti tajwa hapo juu. Kipeperushi hiki unachosoma kina maelezo kuhusu utafiti huo na kimeambatanishwa na fomu ya uhiari wa kushiriki katika utafiti. Tafadhali soma kwa makini kipeperushi hiki na kama utaridhia kushiriki, weka sahihi yako au alama ya vema ama alama ya mkasi kwenye fomu ya uhiari wa kushiriki. Kama unahitaji maelezo ya ziada au ufafanuzi zaidi unakaribishwa kuniuliza.

Mtafiti anaitwa Boniphace Jacob, mtumishi wa halmashauri ya wilaya ya Simanjiro ila kwa sasa ni mwanafunzi wa shahada ya uzamili katika sayansi za ufuatiliaji na udhibiti wa magonjwa (MSc Applied Epidemiology) katika chuo kikuu cha afya na sayansi shirikishi Muhimbili.

#### **DHUMUNU NI MAELEZO KUHUSU UTAFITI**

Utafiti huu unalenga kuangalia asilimia ya kaya zenye vyoo, zinazo tibu maji ya kunywa na zenye sehemu za kunawa mikono. Utafiti utaangalia pia mambo yanayohusiana na uduni wa upatikanaji wa vitu hivyo katika kaya za Ngorongoro, vijiji vilivyo kumbwa na mlipuko wa kipindupimdu. Majibu ya utafiti huu yatatumika kuishauri serikali namna ya kuboresha upatikanaji wa vyoo, usafi na kutibu maji ya kunywa katika kaya. Unaweza kupata majibu ya utafiti huu kupitia njia za kutoa taarifa ya utafiti huu zilizopangwa.

#### **JINSI UTAFITI UTAKAVYOFANYIKA**

Utaulizwa maswali kuhusu mambo yanayohusiana na uduni wa upatikanaji wa vyoo, usafi na kutibu maji ya kunywa katika kaya. Mambo hayo ni yale yanayokuhusu wewe, kaya yako au masuala ya kitaalamu katika ujenzi wa choo, usafi au kutibu maji ya kunywa. Utafiti utahusisha kuangalia mazingira ya kaya, choo, sehemu ya kunawa mikono na chombo cha kuhufadhia maji ya kunywa.

#### **UHIARI WA KUSHIRIKI UTAFITI HUU**

Tafadhali elewa kwamba ni hiari yako kushiriki ama kutoshiriki katika utafiti huu. Kama ukihiari kushiriki, una haki ya kujitoa katika ushiriki katika hatua yoyote ile ya utafiti kama utaamua hivyo.

**FAIDA ZA KUSHIRIKI**

Hautapata faida za moja kwa moja kwa ushiriki isipokuwa majibu ya utafiti huu yatatumika kubpresha hali ya vyoo, usafi na kutibu maji ya kunywa katika kaya wilayani Ngorongoro. Majibu yatakuwa na ushauri wa namna ya kupambana na ugonjwa wa kipindupindu katika wilaya yako.

**MBADALA**

Mbadala ni kutoshiriki

**MADHARA YA KUSHIRIKI AU KUJISIKIA VIBAYA**

Hakuna madhara yoyote utakayoyapata kwa kushiriki utafiti huu isipokuwa pengine unaweza kujisikia vibaya kuonyesha chombo chako cha kuhifadhia maji ya kunywa.

**USIRI WA USHIRIKI WAKO NA TAARIFA UTAKAZOTOA**

Jina lako halitaonekana mahala popote katika dodoso hili, ushiriki wako na taarifa utakazotoa ni siri.

**MAPITIO NA KIBALI CHA UTAFITI**

Mapitio ya andiko la utafiti huu na utoaji wa kibali cha kufanya utafiti vimefanywa na kamati ya utu katika masuala ya utafiti ya chuo kikuu cha afya na sayansi shirikishi Muhimbili.

**MAJIBU YA UTAFITI**

Taarifa ya utafiti huu itachapishwa katika jarida la kisayansi kwa madhumuni ya kitaaluma pekee. Itapatikana pia katika kitabu cha utafiti kitakachopelekwa katika chuo

kikuu cha afya na sayansi sirikishi Muhimbili kama hitaji la kupata shahada ya uzamili katika sayansi ya ufuatiliaji na udhibiti wa magonjwa.

**MAWASILIONO KWA MAELEZO YA ZIADA**

Kama una maswali zaidi kuhusu namna utafiti huu unavyofanyika tafadhali wasilianana na:-

**Dr. Bruno Sunguya,**

Mkurugenzi wa Tafiti na achapisho,

Chuo kikuu cha afya na sayansi za afya Muhimbili,

S. L. P 65001,

Dar es Salaam.

**Simu: 022 -2152489**

Kama umehiari kushiriki, baki na kipeperushi hiki kwa maelezo zaidi wakati wa utafiti.

**FOMU YA UHIARI WA KUSHIRIKI**

Nadhibitisha kwamba nimesoma/somewa na nimeielewa taarifa iliyo kwenye kipeperushi na ninakubali kwa hiari kushiriki katika utafiti huu. Naelewa kuwa nina haki ya kuacha kushiriki wakati wowote nitakapoamua kama nitaona kuna haja ya kufanya hivyo.

Saini \_\_\_\_\_

Tarehe \_\_\_\_\_

Saini \_\_\_\_\_ (mtafiti/mtafiti msaidizi)

Tarehe \_\_\_\_\_

**Appendix 4: Ethical clearance**

**MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES  
OFFICE OF THE DIRECTOR OF POSTGRADUATE STUDIES**

P.O. Box 65001  
DAR ES SALAAM  
TANZANIA  
Web: [www.muhas.ac.tz](http://www.muhas.ac.tz)



Tel G/Line: +255-22-2150302/6 Ext. 1015  
Direct Line: +255-22-2151378  
Telefax: +255-22-2150465  
E-mail: [dpps@muhas.ac.tz](mailto:dpps@muhas.ac.tz)

Ref. No. DA.287/298/01.A/08

04th February, 2019

Mr. Boniphace Jacob,  
MSc. Applied Epidemiology,  
**MUHAS.**

**RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED: "FACTORS ASSOCIATED WITH ACCESS TO BASIC HOUSEHOLDS' WATER, SANITATION AND HYGIENE IN NGORONGORO CHOLERA EPIDEMIC VILLAGES ARUSHA."**

Reference is made to the above heading.

I am pleased to inform you that, the Chairman has, on behalf of the Senate, approved ethical clearance for the above-mentioned study. Hence you may proceed with the planned study.

The ethical clearance is valid for one year only, from 04th February, 2019 to 04th February, 2020. In case you do not complete data analysis and dissertation report writing by 04th February, 2020, you will have to apply for renewal of ethical clearance prior to the expiry date.

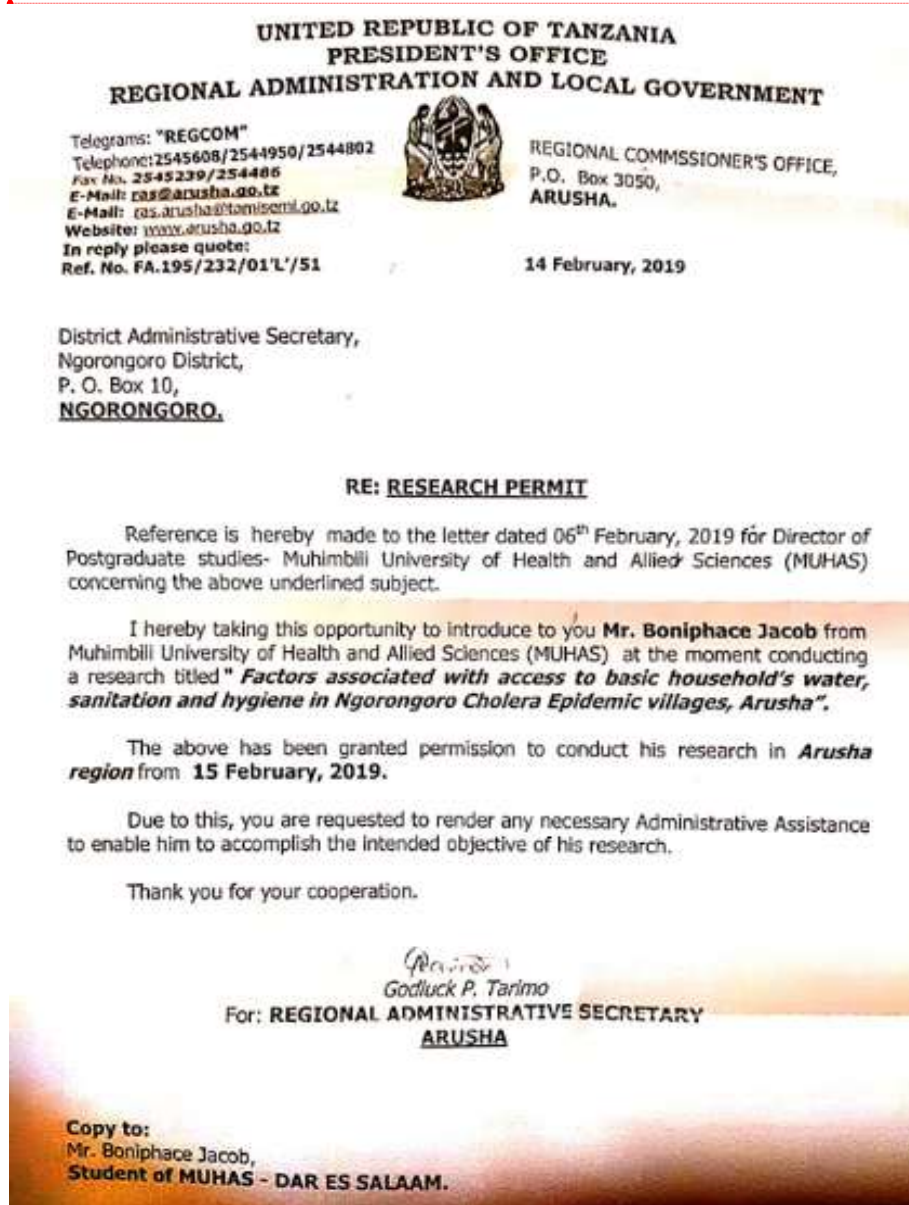
Dr. Emmanuel Balandya  
**ACTING: DIRECTOR OF POSTGRADUATE STUDIES**

cc: Director of Research and Publications  
cc: Dean, School of Public Health and Social Sciences

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**Appendix 5: Permission letter from Arusha**

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