BEHAVIORAL FACTORS ASSOCIATED WITH CHOLERA OUTBREAKS IN KILOSA,TANZANIA

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BEHAVIORAL FACTORS ASSOCIATED WITH CHOLERA OUTBREAKS IN KILOSA DISTRICT

By

John Bosco Lindi

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Public Health of Muhimbili University of Health and Allied Sciences

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CERTIFICATION

The undersigned certify that he has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled **Behavioural Factors Associated with Cholera Outbreaks in Kilosa, Tanzania** in partial fulfillment of the requirements for the degree of Master of Public Health of Muhimbili University of Health and Allied Sciences.

Prof. M.T Leshabari
(Supervisor)

Date June 7th 2010

DECLARATION

AND

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I, **John Bosco Lindi,** declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature..... Date June 7th 2010

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DEDICATION

I dedicate this work to my lovely wife Margreth who shouldered the pain of caring for the family on her own with joy and prayer while missing me and my support. Her sacrifice and love enabled me to pursue this course with undivided mind. Special thanks go to my son Hans who missed my smile and tender love.

ABSTRACT

The purpose of this study was to determine behavioral factors associated with cholera outbreaks in Kilosa district, Morogoro region. Specifically to determine awareness of cholera among heads of households, to assess the availability of latrines in the households, to determine water sources for domestic purposes and exploring different methods used for waste disposal within a household.

This was a cross-sectional study involving 400 heads of households. Structured interview guide was used for generating data. Results of the study revealed that only 39.6% of respondents were aware of causes, mode of transmission and prevention of cholera. Females were better informed about the disease (44.2%) than males (32.9%). Although 88.3% of respondents had latrines, only three out of five washed their hands after latrine use.

Regarding clean and safe water provision, the study revealed that only two-third of respondents had access to tap water for drinking, 56.6% of respondents use tap water for washing domestic utensils and 56% of respondents use tap water for washing their clothes. For waste management, the study revealed that 52.3% of respondents were disposing domestic waste haphazardly around the houses.

Regardless of having latrines and accessibility to clean and safe water by most of the households, cholera outbreaks were still rampant. Poor knowledge on the mode of transmission and preventive measures of cholera among community members posed a challenge to control measures of the disease in the District. Based on these findings, it is clear that there are poor community based programmes on methods of pit latrine reinforcement and poor supportive supervision to villagers on environmental sanitation. Therefore the researcher recommends that there should be Awareness and advocacy campaign on cholera disease as well as community participation on planning, implementation and evaluation of cholera control prevention strategies.

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LIST OF ABBREVIATIONS

DMO	District Medical Officer
CCHP	Comprehensive Council Health Plan
WHO	World Health Organization
MUHAS	Muhimbili University of Health and Allied Sciences
PHC	Primary Health care
SPHSS	School of public health and social sciences

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

The word cholera is derived from a Greek term that means "flow of bile" (Sajeev, 2007) and latin word "cholera" which means bilious diarrhea. Cholera is an acute diarrhea disease caused by the gram negative bacillus Vibrio cholerae. Cholera is one of the few bacterial diseases capable of pandemic and explosive spread (Kosek et al.2003). Seven distinct pandemics of cholera have been recorded since 1817 (WHO, 2008). The first six pandemics originated from Ganges Delta of India. Thereafter, the disease spread by trade routes (land and sea) to Russia, then to Western Europe, and from Europe to North America. The seventh pandemic originated from Island of Sulawesi in Indonesia in 1961 (Park et al, 1989) and spread to the Indian subcontinent and later to other countries including Latin America.

A study conducted in Malaysia revealed that living in squatter areas in urban settings exposed large numbers of people to the disease (Patrick et, al 2005). Another study on cholera outbreak in Manilla, Phillipine found that food contamination was the major source of transmission (Quizon et, al 1994). From Iran, drinking beverages from street vendors, illiteracy, poor hand washing habits before meals and after toilet use, eating left over meals without heating were risk factors for transmitting the disease (Shahrokh.I et al. 2006).

Between 1923 and 1970s, Africa experienced cholera outbreaks mainly in Northern part of the continent. Risk factors of cholera in Africa include poor sanitation, contaminated food and water (Roger et, al. 1999). In Guinea West Africa, a cholera like disease occurred in a funeral gathering where a rice meal was served without heating (Louis et al 1990). It has been observed that many cases of severe cholera have been associated with eating foods which have been contaminated with V. cholera (Louis et al. 1990).

The history of the disease in East Africa goes back to the first epidemic in1921 (Stock, 1976) when a slave ship carrying infected individuals arrived in Zanzibar from Muscat and Oman. In Tanzania, cholera is among the major notifiable public health problems. Outbreaks have been occurring every year since 1977 resulting in high morbidity and mortality. An adult man in Rufiji District believed to be a host to a merchant from Asia where cholera was been reported at that time, was the first person to be fatally infected with the disease. Soon after the burial of this victim, outbreak of the disease began to appear in several adjoining villages of the district (Mhalu, 1991). Between 1977 and 1979, the disease spread to Dar es Salaam, Coast, Morogoro, Dodoma, Mbeya, Ruvuma, Iringa, Kigoma and Kilimanjaro Regions (Mhalu, 1991). To date, cholera disease spread to all the regions in Tanzania.

Cholera is currently no longer considered a pressing health threat in Europe and North America due to improved socioeconomic status and related living conditions. However, the disease is still very prevalent in developing countries. To date more than 98 countries in Asia, Africa and Europe (WHO, 1993) suffer from cholera outbreaks causing considerable socioeconomic disruption as well as loss of life.

Vibrio cholerae bacteria are excreted in faeces and vomits. If these bacteria come into contact with drinking water, they can infect people. Bacteria can also spread to food if people do not wash their hands thoroughly after using the toilet. If latrines are not used and cleaned properly, faeces containing bacteria may easily contaminate drinking water sources and food. Flies can carry the bacteria from a contaminated water source and food to a new host. In this case the main vehicles of cholera transmission are water and foods which is contaminated by v. cholerae bacteria. (Mhalu, 1991; Mandara and Mhalu, 1981). The other mode of transmission is reported to be eating raw or undercooked sea food especially oysters (Klontz, 1987). Since vibrio bacteria naturally found in warm marine waters and attach themselves on the crustacean (Lowry et al. 1989).

The mode of transmission of cholera can be explained by the six Fs, namely, feaces, fingers, fields, fluids flies and food (Curtis et al, 2000). Vibrio cholera bacteria are carried from faeces and vomit by flies and fingers to infect a person.

Contaminated food and fluids such as drinking water from contaminated rivers and swamps can also carry the bacterial which infect people as show in fig 1 (Curtis et al 2000).

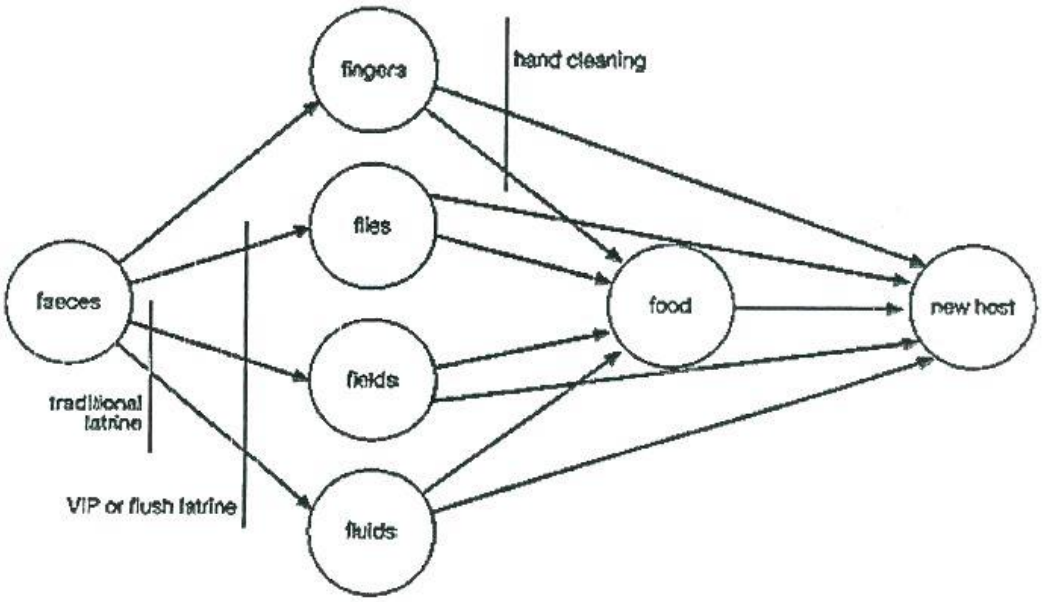


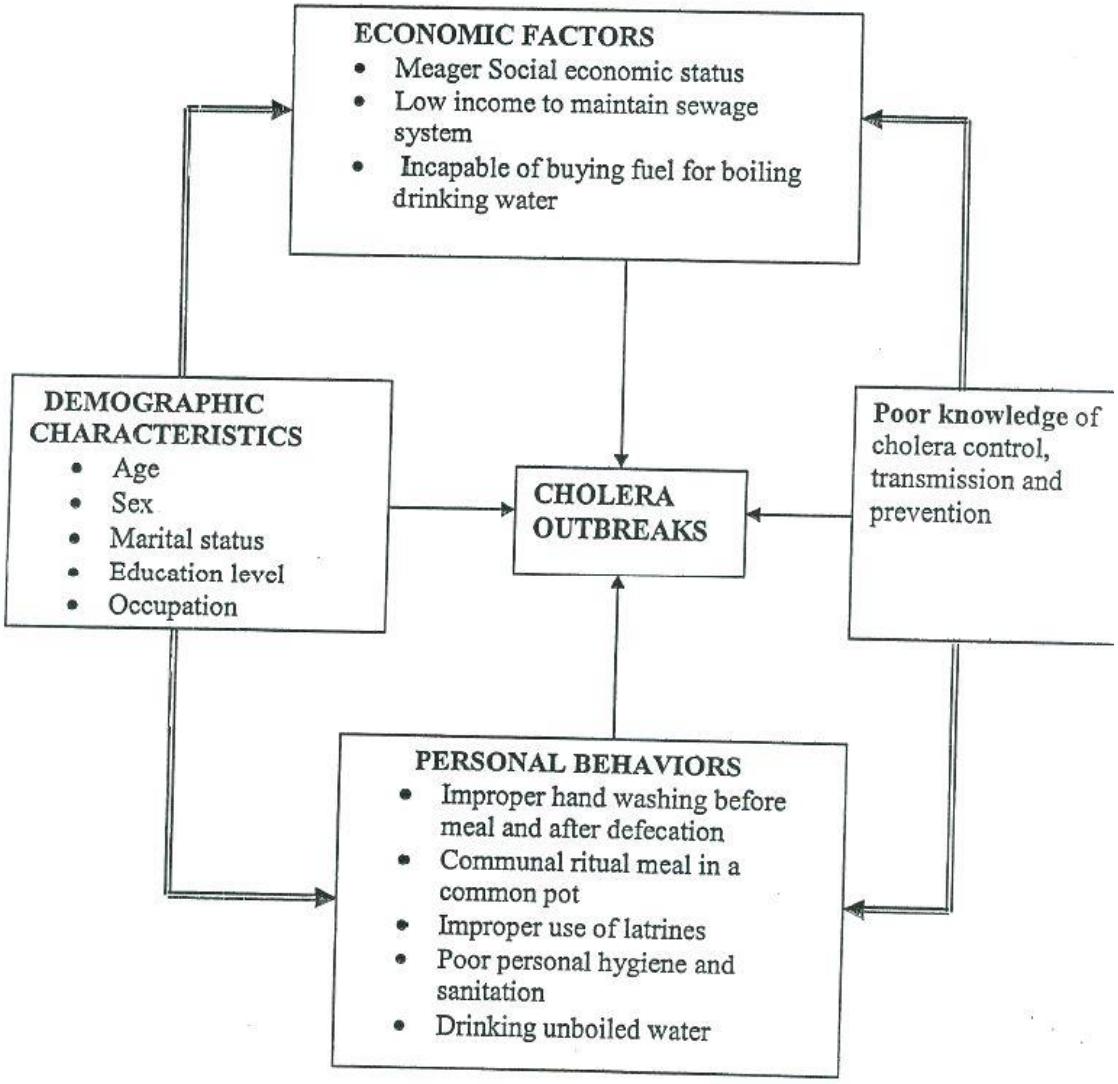
Figure1. F- diagram: transmission of a disease from the faeces.

Source: (Curtis, et al 2000)

Cholera in Tanzania shows a seasonal pattern of occurrence, high peaks of the disease correspond with the two rain seasons of December and May (Webber and Mwakalukwa, 1983). During the rain season water from hilltops may carry feaces all along to low land to contaminate open water sources such as traditional wells, rivers and other open water sources.

Problem Analysis Matrix:

This matrix shows the existence of a relationship between cholera outbreaks and four independent variables and how do they interact. These are knowledge of cholera disease, personal hygiene behaviors, demographic characteristics of the individuals and economic factors. Cholera outbreak is expected to occur when there is deterioration of either one or more of independent variables. Likewise improvement of the independent variables favors cholera control. The independent variables may influence one another.



In the problem analysis matrix above, cholera outbreak is a visible manifestation while poor economic status, low level knowledge, personal hygiene behavior and demographic factors were the major associated risk factors for the disease (Nsungu, 1996 and Yanda, 2005). The study evaluated various hygiene behaviors, selected demographic features of the people, and level of awareness of cholera disease contributing to cholera outbreaks in Kilosa district.

1.2 Statement of the problem

Cholera is still a public health problem in Tanzania. To date cholera is prevalent in all the regions in Tanzania mainland. Kilosa is one of districts which frequently experience cholera outbreaks in the country. The outbreaks have occurred annually since 2004 resulting into morbidity and mortality. Case fatality rates ranged from 4.3% in 2004 to 7.7% in 2008 (DMO annual report 2008) as shown in table1.

Table 1: trends of cholera cases and deaths in Kilosa district from 2004-2008

YEAR	CHOLERA CASES (number)	DEATH (number)	CASE FATALITY RATE (%)
2004	93	4	(4.3%
2005	111	5	(4.5%))
2006	65	3	(4.6%)
2007	115	4	(3.5%)
2008	78	6	(7.7%)

Source: DMO annual report 2008

Many factors such as improper waste and feacal disposal, inadequate environmental sanitation, drinking unsafe water pose a great risk of being infected with cholera (Makuza, 2002).

The extent to which disposal of both solid and liquid waste at household level contributes towards reported cholera epidemics in Kilosa is not known. Similarly sources of water for different domestic purposes including what is done at household level to make drinking water

safe has not bee documented in this district. Furthermore, availability and use of latrine contributes towards prevalence of diarrheal diseases including cholera but the extent an contexts surrounding latrine use behavior in Kilosa district is not known. This study wa therefore conducted to establish major factors which contribute towards cholera epidemics i the district.

1.3 Rationale of the Study

Cholera is among major public health problems in Tanzania. The information that wa generated from this study contributes towards background information required fo developing effective interventions against cholera in the district. Findings of this study wil also contribute towards knowledge on why cholera persistently occurs in rural district i Tanzania.

1.4 Research question

This study was guided by the following questions

1. What do the household members in Kilosa district know about cholera transmission prevention, and its control?
2. What is the proportion of latrine coverage in a study area?
3. What sources of water for different domestic activities are available?
4. What methods of domestic waste disposal are used at household level in this district?

1.5 Study Objectives

The main objective of this study was to assess behavioral factors associated with cholera outbreaks in Kilosa District. Specifically the study intended to:

1. Determine knowledge of household heads on transmission, prevention and control of cholera.
2. Assess the proportion of households with latrines and their hygienic status.
3. Determine the sources of water for different activities in the households
4. Explore different methods of domestic waste disposal within the households

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

Cholera is an acute intestinal disease characterized by sudden onset of watery stool, vomiting, rapid dehydration and circulatory collapse (Kosek et al.,2003). Among people developing symptoms, 80% of episodes are of mild to moderate severity and the remaining twenty percent of cases develop a severe form and may progress to death (WHO,2009). The disease is caused by a bacteria called vibrio cholerae existing in two strains namely vibrio cholerae classical and vibrio cholerae El tor (Ramamurthy, et al.,1993).

Cholera is a severe diarrhoeal disease and water- borne in nature. It is transmitted via the feaco-oral route and commonly associated with poor sanitation (Steffen, 2003., Trauxe, et, al, 1992). Poor environmental hygiene and sanitation and limited access to clean and safe water are among the causes of cholera outbreak (Zuckerman et. al., 2007). A study in Lusaka City showed that lack of latrines and drainage system were associated with high cholera outbreaks (Satoshi et al.2004). The disease was a result of inadequacy of sanitation services (WHO, 2008).

2.2 Pandemics and causative agents

Since 1817, there have been seven outbreaks of cholera. The first six pandemics occurred between 1817 to1923 and were caused by V. cholerae the classical biotype (Kosek et al., 2003). It was during this period, Snow (1855) demonstrated the association between the spread of cholera and the use of water from contaminated sources in central London. The seventh pandemics occurred in Indonesia in 1961 and affected more countries than the previous six pandemics (WHO, 2008). It was caused by V.cholerae El tor. The causative agent for the October 1992 cholera epidemic in Mandras India was V. cholerae serogroup

0139. This strain is now responsible for secondary epidemics occurring throughout Bangladesh and India in overcrowded communities (Albert, 1994)

2.3 Factors associated with cholera outbreaks

Several factors contribute towards cholera epidemics. These include food handling and basic hygiene. Systematic hand-washing with soap after defecation and before handling food or eating, as well as clean preparation and conservation of food is associated with this health problem (WHO, 1992).

A study done in West Africa indicated that persons who washed hands before eating and after toilet use were at lower risk of cholera infection (Curtis et al. 2003; WHO, 1992). This was supported with epidemiological evidence which suggested that people who wash hands with soap before eating and after toilet were at lower risk of cholera illness (Hutin, 2003).

Eating food leftovers, eating food without washing hands and not washing hand after toilet use were found to be associated with cholera outbreaks (Shahrokh et, al., 2006; Louis et al.; 1990). Drinking beverages including water from street vendors was associated with high risk of cholera transmission (Tux, et al., 1995; Weber et al., 1994). Poor hygiene in the preparation of food and handling habits such as eating cold food (Luois et, al. 1990 & Benjamin, et al., 2005) have been reported to be associated with cholera outbreaks.

A study conducted in Rufiji district showed that the main mode of cholera transmission is contaminated water and food (Mhalu 1991, Mandala and Mhalu 1981). In Lugoba village Bagamoyo district Mhalu et al (1984) reported that contaminated wells were associated with cholera outbreak. Similar result were found in a study from Kenya which also showed that drinking contaminatedwater from lake Victoria, sharing food with a person with watery diarrhea, and attending funeral feasts were the main risk factors for the disease (Roger et al., 1999). A study conducted in Ifakara during a cholera outbreak revealed that drinking water

from rivers and eating dried fish were both associated with increased risk for cholera outbreaks (Acosta, et al., 1997)

On a global scale, cholera epidemics can be related to climate and climatic events (Colwel, 1996). Seasonal variations of water temperature have been also associated with cholera outbreaks. In Peru and Bangladesh, cholera is preceded by a period of warm water (Franco, 1997).

In Gulf of Guinea, cholera epidemics in human population are often influenced by climate variability (de Magny, 2007). In some parts of Africa outbreaks occurs during the dry period or after heavy rainfalls (Morilla, 1998 & Lawoyin, 1999). Heavy rainfall is often an important factor in the contamination of surface water with sewage or slurry and thus leads to cholera outbreak (El Nino and human health, 2000).

Drought and floods are likely to influence cholera in complex manner. In Dhaka, Bangladesh it was observed that during flood period the number of cholera diarrhoea cases was increased almost six times higher than expected (Hashizume, 1998). Flooding may also disrupt water distribution services and aggravate hygiene conditions therefore predisposing to unsafe water and later to cholera infection (Lawoyin, 1999). Drought can spark disease outbreak as people are force to rely on contaminated water sources and have less water for hygiene.

In Tanzania, cholera has a seasonal pattern of occurrence with peak of the disease coinciding with the two rain seasons of October to November and March to May (Webber & Mwakalukwa, 1983).

Excreta disposal is an important factor in determining risk of cholera in the household or community. When human excreta are not properly disposed will lead to contamination of environment and water sources. WHO (1988) underlined the importance of open field

defecation as a major means of contaminating the environments and unprotected water sources leading to cholera outbreaks. Hygiene practices such as latrine use and hand washing are also mentioned as risk factors for cholera outbreaks (Nagelkerke, 1990).
Poor accessibility and unavailability of sanitation facilities are among the determinants of cholera outbreak. Places where there are poor toilet facilities (Angtini, 2005) as well as lack of access to sewage system (NaTHNac, 2004) make waste disposal rather difficult and generally uncontrollable, thus escalating the rate of cholera outbreak (Kahwa, 2002).

Decomposing domestic waste provide conducive environment for vector breeding necessary for cholera transmission. Although cholera has been known to be a feacal- oral disease, housefly can also transmit the disease. A study done in Delhi, India isolated and identified v. cholerae from housefly, Musca domestica from a low socio economic area where cholera was encountered (Foterdar, 2001).

In Central Africa low level of knowledge of cholera transmission in a community was reported to be associated with cholera outbreak (Nsungu, 1996). A study from Tunduru revealed that poor knowledge among household members and poor sanitation contributed to recurrent cholera outbreaks (Mrope et al 2006).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Area

This study was conducted in Kilosa District, Morogoro Region. Kilosa district was selected due to frequent occurrence of cholera in the district. The district is situated 300km west of Dar es Salaam between latitude 5.55'S and 7.53'S and longitude 36.31' E and 37.30' E. The total surface area of Kilosa District is 14,245 square kilometers. The population in 2008 was estimated to be 574,637 with a growth rate of 2.6% per annum. Fifty nine percent of this population has access to clean drinking water. Sixty percent of households have latrines and coverage for refuse bins or pits was reported to be 60% in the district (CCHP- Kilosa, 2008). Kilosa district has nine administrative divisions, thirty seven wards and 167 registered villages. There are 18 boreholes, 507 shallow wells, 4 gravity schemes and 21 swamps within the district.

The district health system comprises of 73 primary health care facilities. They include three hospitals, seven health centers, sixty three dispensaries and one hundred and seven drug outlet shops. Most of people in Kilosa are peasants and livestock keepers.

3.2 Study population

The study population consisted of heads of households in Kilosa District.

3.3 Study design

A cross sectional-descriptive study that includes both qualitative and quantitative methods was used to explore factors associated with cholera outbreaks.

3.4 Sample size estimation

Sample size estimation in this study was calculated by using a single proportion formula (Wayne, 1987).

$$n = \frac{N \; z^2 \; p \; (1-p)}{d^2 \; (N-1) + z^2 \, p \, (1-p)}$$

Where

N: total population of Kilosa district is 574,637.

z: z value (corresponding to the 95% confidence level)= 1.96

d: margin of error = 5%

p = proportion of household with latrine in acceptable hygienic condition is 60% [DHO, 2008]

The number substitution in the formula

$$n = \frac{574{,}637 * 1.96^2 * 60 * (40)}{5^2 * (574{,}636) + 1.96^2 * 60 \, (40)}$$

n = 368 (minimum sample size). This was rounded to 400 so as to accommodate the unforeseen problems such as non response to questions.

3.5 Sampling procedures

A multistage sampling method was employed to select study participants. Sampling frame of all 37 wards in Kilosa district was made and one ward was randomly selected. From the selected ward a sampling frame consisting of all villages was constructed and three out of six villages were randomly selected. The names of all villages were written separately on pieces of papers and mixed together in the container. Then one paper was picked at time and returned back until list of three villages was attained. From the villages a sampling frame

consisting of households was made and 400 households were randomly selected for this study.

3.6 Data collection instruments

Structured interviews were used to collect information from the respondents. The interview guide consisted of five sections. These were demographic characteristic of the respondents; knowledge of cholera transmission, prevention and control; availability of latrines and their hygienic status, sources of water for different uses at household level as well as methods of waste disposal within the households. Observational guide (checklist) was used to check the physical existence of latrines, garbage pits and their cleanliness. They were seven observations in a checklist.

3.7 Pre-testing of research instruments

Pre testing of data collection instruments was done in order to test the clarity of questions. This exercise was carried out in an area not selected for the study. After this exercise, corrections were made.

3.8 Measuring knowledge of cholera

Knowledge of cholera in the study area was measured using 20 questions on transmission, signs and symptoms as well as the control of the disease. A Knowledge scale was used for measuring knowledge. Each item was scored correct or wrong and correct response was awarded one point while a wrong answer scored a zero. The total score for each study participant was obtained by adding the number of points obtained. Then total scores were arranged in ascending order. A cut off point for low, medium and high knowledge was obtained as follows:

> Low level of knowledge.....0-7points

>medium level of knowledge.....8-14points

> High level of knowledge.....15-20 points.

3.9 Measuring compound cleanness:

Observation for cleanness of household compound was conducted during a house visit. The observation focused on general compound cleanness of the household. Five variables were used to assess the cleanness of house compound namely presence of unwashed utensils, houseflies, animal feaces, stagnant washing water and garbage. Each variable was assigned a point then scores were added. The expected lowest score is one and maximum score was five.

A frequency distribution was obtained indicating the lowest and highest point. A house scored one point was regarded to have a very clean compound, 2-3 points regarded to have a clean compound, and 4-5 points regarded to have a dirty compound.

3.10 Identification and training of research assistants

Two research assistants were recruited three days before the work of data collection commenced. Selection of research assistants based on previous experience in research work in communities. All two research assistants were government employees who were on leave. The training focused on the general overview of the study, interviewing skills and procedures and finally, familiarization with the study instruments. The training also emphasized how to obtain consent, privacy and ethics.

3.11 Data management, entry and analysis

All structured interviews and checklists were numbered before data collection to facilitate reference. Data were collected every day and rechecked by the investigator. Template for entering data was created and data were entered into Epi Info Computer program version 6. Data entry, cleaning, validation and analysis were done by using Epi Info Computer program version 6. Statistical associations were done using the same program.

3.12 Ethical consideration

Ethical clearance was obtained from the Research and Publication Committee of Muhimbili University of Health and Allied Sciences (MUHAS). Research permission was obtained from the authorities of the Morogoro region and Kilosa District council through Administrative secretaries. Division officer of Kimamba where Ludewa ward is located and ward executive officer of Ludewa ward were briefed on the purpose of the study before meeting with participants. Informed consent were sought and obtained from the respective participants before they participated in the study. Participants were informed about the objective of the study and their participation was voluntary. Also, the participants were assured of confidentiality and anonymity as the information provided whether orally or in writing were strictly to be used for research purposes only and outcomes would lead to improve cholera interventions and wellbeing of the participants.

CHAPTER FOUR

4.0 RESULTS

4.1 Demographic Characteristics of head of households

The study sample consisted of 400 heads of households of whom 42% were men and the rest were females. Their age ranged from 19 to 87 years with a standard deviation of ±16.4 years. Most respondents were married. The proportion of married male respondents was higher (89.3%) than that of females (54.3%). However the proportion of single female heads of household in the study sample was more than three times that of males. Almost 45% of female heads of households did not have formal education compared to 30% of the males. Most respondents (88%) were peasants and very few were in formal employment. Variations in selected demographic characteristics by sex are as summarized in table 2.

Table 2:Variation of selected demographic characteristics of the study sample by sex.

characteristic	Male		Female		Total	
Age group	Number	(%)	Number	(%)	Number	(%)
Less than 24	7	(4.2)	25	(10.8)	32	(8.0)
25-34	27	(16.1)	69	(29.7)	96	(24.0)
35-44	46	(27.4)	56	(24.1)	102	(25.5)
45 and above	88	(52.4)	82	(35.3)	170	(42.5)
*Marital status***						
Married	150	(89.3)	126	(54.3)	276	(69.0)
Single	12	(7.1)	51	(22.0)	63	(15.8)
Others	6	(3.6)	55	(23.7)	61	(15.3)
Occupation **						
Peasant	160	(95.2)	192	(82.8)	352	(88.0)
Petty business	6	(3.6)	31	(13.4)	37	(9.3)
Others	2	(1.2)	9	(3.9)	11	(2.8)
Number of occupants						
1-3	53	(31.5)	74	(31.9)	127	(31.8)
4-6	76	(45.2)	116	(50.0)	192	(48.0)
>7	39	(23.2)	42	(18.1)	81	(20.3)
*Level of education**						
No formal education.	51	(30.4)	104	(44.8)	155	(38.8)
Primary education	107	(63.7)	111	(47.8)	218	(54.5)
Secondary and above	10	(6.0)	17	(7.3)	27	(6.8)

* Significant at $p \leq 0.05$

** Significant at $p \leq 0.001$

4.2 Knowledge of cholera in Kilosa District

Awareness of cholera in the study area was measured using 20 basic questions on transmission, signs and symptoms as well as the control of the disease. It was anticipated that most study participant would score at least 90% on the test which was given. However 13.2% of participants scored 50% or less and less than 40% of them scored 85% and above. This generally shows the level of awareness on cholera was not as good as expected. Generally female heads of household were better informed about the disease than males. The proportion of men with low test result was almost two times that of women and the variations in scores

obtained by sex were statistically significant (chi square =8.8, p=0.0122). The observed level of knowledge on cholera was independent of age. All respondents with secondary education scored more than 50% while nearly 19% of those without formal education scored less than 50% (Chi-square=11.2, P=0.0243) Variations in demographic characteristics by knowledge of cholera were as summarized in table 3

Table 3: Variation of level of knowledge by demographic characteristics

	Levels of knowledge						
characteristics	Low		Medium		High		Total
Sex *	No	(%)	No	%	No	%	No
Male	27	(18.9)	69	(48.3)	47	(32.9)	143
Female	17	(8.9)	89	(46.8)	84	(44.2)	190
Age							
≤24 yrs	3	(12.5)	10	(41.7)	11	(45.8)	24
25-34	8	(10.4)	33	(42.9)	36	(46.8)	77
35-44	6	(6.5)	53	(57.6)	33	(35.9)	92
45 and above	27	(19.3)	62	(44.3)	51	(36.4)	140
*Education level**							
No formal education	23	(18.7)	63	(51.2)	37	(30.1)	123
Attended school	21	(10.0)	95	(45.2)	94	(44.7)	210
Occupation							
Peasant	39	(13.2)	143	(48.3)	114	(38.5)	296
Petty business	3	(10.0)	13	(43.3)	14	(46.7)	30
Others	2	(28.6)	2	(28.6)	3	(42.9)	7

* Significant with P≤0.05

4.3 Availability of Latrines and hygienic practices in the households

Most respondents (88.3%) had latrines. The rest were either sharing with their neighbors or attended calls of nature into the bush. Households with female heads were more likely (90.5%) to have latrines than those whose heads were males (85.1%). Heads of household who attended school were more likely to own latrine (88.9%) compared to those without a formal education (87.1%). The distribution of latrine by sex and education level in the study area was as summarized in table 4

Table 4: Distribution of latrines by sex and education level in a study area

	Having latrines		No latrines		Total
Characteristics	No	(%)	No	(%)	
Sex					
Male	143	(85.1%)	25	(14.9%)	168
Female	210	(90.5%)	22	(9.5%)	232
Education level					
Never attended school	135	(87.1)	20	(12.9%)	155
Attended Primary education and above	218	(88.9%)	27	(11.1%)	245
Total	**353**	**(88.3%)**	**47**	**(11.8%)**	**400**

4.3.1 Hand washing practices after latrine use:

Only sixty percent of the respondents washed their hands after latrine use. Hand washing behavior after latrine use increased with increasing age varying from 8% among respondents less than 24years to 37% of older age heads of households. Female heads of households were

more likely (67.6%) to wash their hands after toilet use as compared to males (40.6%) and these difference was statistically significant (Chi-square=25.37, P=0.0000). Behavior of hand washing after latrine use among heads of households increased with increasing level of knowledge score cholera varying from 18.2% of heads of household who had low knowledge to 66.7% of the heads of household who had high knowledge. (Chi-square=36.3, P=0.0000). However, hand washing behavior was independent of the level of education.

4.3.2 Hygienic status of latrines

Hygienic status of the latrine was measured by presence and or absence of houseflies, maggots and feaces on the latrine floor, feaces overflow of latrine and presence of strong odor or stains of urine. Out of 316 latrines visited 36.5% were found with feaces on the floor and surrounding the latrine hole. Presence of feaces on the floor in the latrines decreases with increasing level of education varying from 41.7% of heads of households who had no formal education to 31.3% of those who had secondary school education and above. Latrines in households whose heads are women were less likely (38.1%) to be found with feaces than the households headed by men(42.5%). Latrines in households whose heads are women were more likely (38.1%) to be found with flies than the households headed by men(33.9%) (Chi-square=0.59, P=0.44).

Presence of urine on the floor of latrines whose head were female was lower (28.0%) compared to that of males (37.8%) and staining of urine on the latrine floor decreased as increasing level of knowledge of cholera varying from (40.5%) of low level of knowledge to (29.5%) of that of high level of knowledge (Chi-square=1.56, P=0.457).

Latrine overflow of feaces were more likely to be observed in male headed household (33.9%) than that of females (20.6%). Latrine overflow with feaces was independent of the age and level of knowledge of cholera. Variations in latrine cleanness by education level were as summarized in table 5

Table 5: Variation of latrine hygiene status by level of education

	Never attended school		Primary education		Others (post primary education)		Total
Variable	No	(%)	No	(%)	No	(%)	No
presence of flies	50	(39.4)	58	(33.5)	7	(43.8)	115
Presence of feaces	53	(41.7)	68	(39.3)	5	(31.5)	126
Presence of Maggot	33	(26.0)	49	(28.3)	2	(12.5)	84
Toilet Overflow	33	(26.0)	46	(26.6)	3	(18.8)	82
Presence of Strong odor	38	(29.9)	66	(38.2)	7	(43.8)	111
Presence of urine	43	(33.9)	50	(28.9)	8	(50.0)	101

4.4 Water sources in a study area

An assessment was made on the sources of water for different purposes in the households. Availability of water for drinking, laundry, and washing utensils was mainly from taps in the village. About 10% of head of households collected drinking water from rivers. Others (Rain water and water from traditional wells and bore holes) were not commonly used in the households. Sources of water for different household activities are summarized in figure 2.

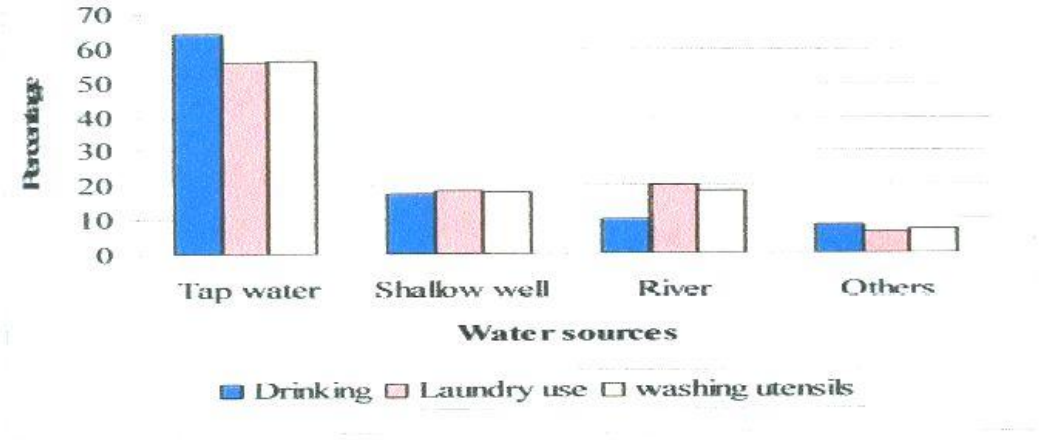


Figure 2: Sources of water for various activities in Kilosa District

Figure 2 shows distribution of water sources in a study area for various domestic activities. Majority of households were getting their drinking water from taps. Other sources include shallow wells, rivers and dams.

4.4.1 Sources of drinking water.

Almost two-thirds of households (64.3%) had access to tap water for drinking, 17.5% were taking drinking water from shallow wells, 10.0% were using river for drinking water and about 8.2% were drinking from dams, deep wells, traditional wells and rain water. Women were more likely (69.4%) than men (57.1%) to obtain drinking water from pipes in the village. Women were also more likely (18.5%) than men (16.1%) to drink water from shallow wells. However, the proportion of male heads of household who were drinking water from rivers was more than six times that of females and these variations were statistically significant (Chi-square=33.7,P-value=0.0000). Various methods were reported to be used to make water safe for drinking. Treatment by boiling (14.3%) and use of water guard (5.0%). When asked the reasons for not boiling or using water guard, 70.3% said water from tapes and

deep well was safe, 30.8% said boiled water was tasteless, 16.7% said they could not afford the cost of fuel for boiling water and 41.3% had no reasons. Safe water for drinking in this study area was guaranteed to less than 20% of the population. Variations in selected demographic characteristics by sources of water for drinking were as summarized in table 6

Table 6: Variations in selected demographic characteristics by sources of water for drinking.

	WATER SOURCES							
	Tap water		Shallow wells		River		Others	
Characteristics	No	%)	No	(%)	No	(%)	No	(%)
Age group								
≤24 yrs	22	(68.8)	6	(18.8)	1	(3.1)	3	(9.4)
25-34	64	(66.7)	16	(16.7)	11	(11.5)	5	(5.2)
35-44	68	(66.7)	18	(17.6)	10	(9.8)	5	(5.9)
≥45 yrs	103	(60.6)	30	(17.6)	18	(10.6)	19	(11.2)
Sex**								
Male	96	(57.1)	27	(16.1)	33	(19.6)	12	(7.2)
Female	161	(69.4)	43	(18.5)	7	(3.0)	21	(9.1)
Education level								
No formal education	102	(65.8)	25	(16.1)	13	(8.4)	15	(9.7)
Primary education	139	(63.8)	35	(16.1)	26	(11.9)	18	(8.3)
Others(post prima)	16	(59.3)	10	(37.0)	1	(3.7)	0	(0.0)

** Significant with P-value<0.001

4.4.2Water sources for laundry use

More than half (56%) of respondents were using tap water for washing clothes.

About 20% of respondents used river water for washing, (18.3%) from shallow wells and the remaining (6.3%) were using water from dams, swamps, traditional wells and rain water. Women were again more likely (59.1%) than men (51.8%) to obtain water for laundry use from pipes in the village. These were independent of age and level of education. Women were also more likely (19.8%) than men (16.1%) to use shallow well water for washing clothes. A trend of heads of households washing from shallow wells was increased with increasing level of education. Variations of selected demographic characteristics of respondents by source of water for laundry use were as summarized in table 7.

Table 7: Variation of sources of water for laundry use by selected demographic characteristics

	Water sources							
Characteristic	Tap water		Shallow well		River		Others	
Age group	No	(%)	No	(%)	No	(%)	No	(%)
≤24 yrs	17	(53.1)	6	(18.8)	7	(21.9)	2	(6.3)
25-34	52	(54.2)	17	(17.7)	24	(25.0)	3	(3.1)
35-44	60	(58.8)	17	(16.6)	21	(20.6)	4	(4.0)
≥45	95	(55.9)	33	(19.4)	26	(15.3)	16	(9.4)
Sex								
Male	87	(51.8)	27	(16.1)	44	(26.2)	10	(6.0)
Female	137	(59.1)	46	(19.8)	34	(14.7)	15	(6.5)
Education level								
No formal education.	85	(54.6)	26	(16.8)	34	(21.9)	10	(6.4)
Primary education	124	(56.9)	39	(17.9)	40	(18.3)	15	(6.9)
Others(post primary)	15	(55.6)	8	(29.6)	4	(14.8)	0	(0.0)

4.4.3 Water sources for washing utensils.

Tap water was used by 56.5 % of the respondents for washing utensils, (18.5%) used river water, (18.0%) from shallow wells and the rest obtained water from swamps, open drains, dams and traditional wells. Women were more likely (60.8%) than men (50.6%) to use tap water for washing utensils in the study villages. Women were more likely (19.5%) than men (15.5%) to wash utensils using water from shallow wells. Men mainly used river water for this purpose. The proportion of male heads of household who were washing utensils using river water was more than twice that of females and these variations were statistically significant (Chi square=11.63, P=0.018). The source of water for washing utensils in the households were independent of age (Chi-square=18.8, P=0.092) and level of education of the heads of households (Chi-square=5.42, P=0.712).

4.5 Disposal of solid and liquid waste

4.5.1 Disposal of solid waste

About (58%) of solid waste in the study area was disposed in garbage pits, while 26% of solid waste was thrown around the house compound. Less than a quarter were either burning or throwing the waste in bushes and farms. The solid waste was a combination of either vegetable food remnants, remains of burnt charcoal, papers, broken bottles and utensils and debris of wood, clothes and stones. About a third of married couples (29.3%) had garbage around their houses compared to those who were single (58.9%) or those who were widowed or cohabiting (42.6%) and these difference were statistically significant (Chi-square=20.6, P-value=0.0000).

Garbage around the households increased with increasing number of people in the household varying from 35.4% in households with one to three occupants to 42% in those with seven or more members. Households with four to six occupants had the lowest percentage of garbage accumulation. The presence of solid waste around households decreases with increasing level of education varying from 38.1% in households whose heads did not have any formal education to 33.3% among those with secondary education or higher.

Female headed households had a higher percentage of house with garbage (38%) compared to those whose heads were males (34%) but these differences were not statistically significant. (Chi-square=0.54, P=0.462).Variations of presence of garbage heaps in a household by selected demographic characteristics were as summarized in table 8.

Table 8: Variations of presence of garbage heaps in a household by selected demographic characteristics N=144. (Analysis was done to 144 visited households found with garbage heaps)

Characteristics	Presence of garbage heaps	
Education level	No	(%)
Never attended school	59	(38.1)
Primary education	76	(34.9)
Others (post primary)	9	(33.3)
Marital status*		
Married	81	(29.3)
Single	37	(58.9)
Others	26	(42.6)
Sex		
Male	57	(33.9)
Female	87	(37.5)
Occupation		
Peasant	131	(37.2)
Petty business	9	(24.3)
Others	4	(36.4)
Occupants in household		
1-3	45	(35.4)
4-6	65	(33.9)
≥ 7	34	(42.0)

**Significant with P-value≤0.001

4.5.2 Disposal of liquid waste

About 52.3% of dirty water from households was haphazardly thrown within the house compound and 47.7% was disposed in pit. Female headed households had high percentage of household having special pit for disposing dirty water (40.9%) compared to male headed households (36.9%) but these differences were not statistically significant (Chi-square=4.32,P=0.364). Presence of special pit used for disposing waste water in a household increased with education level varying from (34.8%) in households whose heads did not have any formal education to (48.1%) among those with secondary education or higher and these differences were statistically significant (Ch-square=21.37, P=0.0062). the observed methods of liquid waste disposal was independent of age and marital status. Variations of selected demographic characteristics by methods of disposing waste water in a household are summarized in table 9.

Table 9: Variations of water disposal methods by selected demographic characteristics

Characteristics	Waste water disposal methods: Special pit No	(%)	House compound No	(%)	Total
Sex*					
Males	62	(36.9)	106	(63.1)	168
Females	95	(40.9)	137	(59.1)	232
Level of education*					
Never gone to school	54	(34.8)	101	(65.2)	165
Primary education	90	(41.3)	128	(68.7)	218
Others (post primary)	13	(48.1)	14	(37.3)	27
Age group					
≤24yrs	11	(34.4)	21	(65.7)	32
25-34	37	(38.5)	59	(51.5)	96
35-44	52	(51.0)	50	(69.0)	102
≥45yrs	57	(33.5)	113	(66.5)	170
Marital status					
Married	109	(39.5)	167	(60.5)	276
Single	25	(39.7)	38	(60.4)	63
Others	23	(37.7)	38	(63.3)	61

*Significant with p-value≤0.05

4.5.3 General compound cleanness

Compound cleanness in the study area was generally good. More than half (53%) of respondents were occupying houses with clean compound, (19%) were occupying houses with very clean compound and the rest were assessed to be in dirty compounds.

The proportion of very dirty compounds was higher (83.9%) in heads of household with no formal education as compared to (81.4%) among those with secondary education or higher. Female headed households had a higher percentage of very dirty houses (81.1%) compared to those whose heads were male (80.4%) but these differences were not statistically significant. (Chi-square=1.96, P=0.580) and was independent with the age and marital status. Variations of selected demographic characteristics by compound cleanness are summarized in table 10.

Table 10: Variations of selected demographic characteristics by compound cleanness

	Compound cleanness				
Characteristics	Clean No	(%)	Dirty No	%	Total No
Sex					
Male	33	(19.6)	135	(80.4)	168
Female	43	(18.5)	189	(81.5)	232
Level of education*					
Never to school	25	(16.6)	130	(83.9)	155
Primary education	46	(21.1)	172	(78.9)	218
Post primary	5	(18.5)	22	(81.4)	27
Age group					
<24yrs	6	(18.8)	26	(81.2)	32
25-34	23	(24.0)	73	(76.0)	96
35-44	17	(16.7)	85	(83.3)	102
>45	30	(17.6)	140	(82.3)	170
Marital status					
Married	55	(19.9)	221	(80.1)	276
Single	12	(19.0)	51	(81.0)	63
Others	9	(14.8)	52	(85.2)	61

* Significant with p-value≤0.05

Table 10 shows how selected demographic characteristics of 400 heads of household in study area vary with cleanness of house compound where there is a correlation between level of education and compound cleanness.

In summary, Results of the study revealed that only 39.6% of respondents were knowledgeable of causes, mode of transmission and prevention of cholera. Females were better informed about the disease (44.2%) than males (32.9%). Regarding clean and safe water provision, the study revealed that the main sources of water for domestic use in the study area were tap water, shallow wells and rivers. Furthermore, only two-third of respondents had access to tap water for drinking, 56.6% of respondents use tap water for washing domestic utensils and 56% of respondents use tap water for washing their clothes. Level of education of respondents influenced knowledge of cholera. Results also revealed that majority 88.3% of respondents had latrines but only three out of five respondents washed their hands after latrine use.

For waste management, the study revealed that 58% of solid waste was disposed in garbage pits and 52.3% of domestic liquid waste was thrown within the house compound. Garbage accumulation around the compound varied with marital status and level of education of the respondents. Garbage accumulation habit is (29.3%) low in married couples compared to those who were single (58.9%).

However, the habit of using special pit for disposing waste water varied with the education level of the respondents.

CHAPTER FIVE

5.0 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

The study was conducted to determine behavioral factors associated with cholera outbreaks in Kilosa district. The results revealed that several factors were associated with cholera outbreak among resident of kilosa district. It was found that 39.2% of 400 heads of households were aware of the causes, mode of transmission as well as preventive measures. A similar result has been reported in other places in Tanzania. Mrope, (2006) reported low level of knowledge of cholera disease among residents in Tunduru district to be 4.0%. This is contrasting with the results of a study conducted in Ilala Municipal where revealed that 99.9% of respondents were aware and knowledgeable on cholera disease (Bangoka, 2006). This could be attributed to the fact that the respective council health management teams had low level of knowledge on advocacy and treatment thus they focused more on treatment rather than preventive measures.

Availability and use of latrines is associated with cholera outbreaks. This study revealed that the majority of households (88%) in Kilosa district have latrines. This is similar to a study conducted in Ilala Municipal which revealed that 97.1% of household had latrines (Bangoka, 2006). Another study from Tunduru revealed that the majority (81%) of household had latrine. The findings were contrary to the findings of the study done in Ifakara where only 43.4% reported to have latrine at home (Acosta, 2001).

Hand washing after latrine use is strongly recommended as a preventive measure against cholera outbreak. The study revealed that 60% of heads of households reported to wash their hands after latrine use. In Calcutta, India, 63% of household members were reported to always wash their hands after latrine use (Dipika, 2006). These findings imply that washing hands after latrine use is a good preventive measure against cholera.

Regarding water sources for different domestic uses, the study found that the main sources were tap water, shallow wells and rivers. The majority of respondents (69.5%) were obtaining water for drinking from taps. The shallow well and river source was certainly not safe for drinking. The use of these sources for domestic purposes is mainly associated with the unreliable supply of tap water. Under such a situation, drinking untreated water from the shallow wells and rivers exposed people to risks of getting cholera. The study revealed that 14.3% of the heads of households drink boiled water. This is in contrast with what was observed by Yanda et al (2005) in Chato village in Kagera region who revealed that about 56.7% of the population drank boiled water. On the question of why they do not drink boiled water, many respondents in Kilosa, (70.3%), said that tap water is clean and safe and thus it did not need to be boiled.

Reller, (2001) emphasized the importance of drinking boiled water in Madagascar as a public health measure in control of the cholera disease. Findings from this study revealed that male headed households were more prone to cholera infections because the rate of their unsafe water drinking is six times higher than that of their female counter parts. This can be explained by the fact that a large number of males spend most of their time out in the fields where they consume water from rivers and wells.

About 56% of household in this community were using tap water for washing clothes in the house. A study conducted in Ifakara showed washing clothes in a contaminated river was found to be associated for the spread of cholera (Acosta, 1997).

This study revealed that, more than a half of the respondents (56.5%) washed utensils using tap water. The rest washed utensils with water from either rivers (18.5%), or shallow wells (18.0%) or from swamps (7%). Using safe water for washing utensils is a good practice towards effective prevention of cholera. In a study conducted by Swerdlow, (1992), it was revealed that the improper practice of keeping water in containers washed using unsafe water was highly associated with cholera outbreaks in Peru. Swedlow's study showed that 30% of

case patients drunk from household water storage containers washed using unsafe water were associated with cholera disease.

This study further revealed that (36%) of the visited households had accumulated garbage around their residential areas. This is in line with a study conducted in Tabora Municipality by Marcelli, (2001) who revealed that 59.6% of the visited households were found to have accumulated garbage around their house compounds.

Many overcrowded households have a habit of accumulating their domestic wastes around their compounds. This is a dangerous practice because decomposing domestic wastes provide favorable environment for vector breeding, a necessary agent for cholera transmission. This study revealed that garbage around the households increases as the number of people in the household increase. That is to say, the more the number of people in a household, the more the amount of garbage. For example, households with four to six occupants had the lowest percentage of garbage accumulation. Dipika, (2006) in a study done in Calcutta revealed that community members living in congested areas were the most affected by cholera disease.

Findings in this study show that 52.3% of waste water in households was disposed of haphazardly around the compound. 47.7% of liquid wastes and other forms of dirty water were put into pits. The rate of pits use for disposing waste water is parallel with the level of education. To be more precise we can say that, people with the higher level of education tend to be more informed about the accessibility of environmental sanitation information from different sources than those with low level of education.

5.2 Conclusion

Cholera is a fatal disease. It kills people of different ages fast and in big numbers. However, although cholera is life-threatening; prevention of the disease is normally straightforward if proper sanitation practices are followed.

Generally from this study it can be concluded that community of Kilosa had moderate knowledge of cholera. Majority of participants know how cholera is transmitted but do not know how can be prevented. Majority of respondents had latrines but few of them washed their hands after latrine use. Dirty compounds and low level of hygiene and environmental sanitation were also critical in the district. Lack of safe water is a problem in this community. This however, was contributed to by community disregard to boil water.

5.3 Recommendations

It is therefore recommended that awareness and advocacy campaign on cholera disease should be done to this community emphasizing on preventive and control measures so that they can be able to change their practices which exacerbate cholera outbreak such as to boil drinking water, proper use of latrines and wash hands after latrine use and before eating and compound cleaning.

Provision of cholera disease health promotion is also recommended to improve hygiene related behaviors among villagers and community at large. Health education to males on environmental sanitation will help to change their perception towards cholera disease prevention and control.

Supportive supervision is recommended to this community where villagers are provided with appropriate methods to strengthen pit latrines to avoid collapsing during rain season. There is need to provide education on cholera disease on a continuous basis rather than to wait until there is an outbreak

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