THE UNIVERSITY OF ZAMBIA

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TYPHOID FEVER OUTBREAK TRENDS FROM 2009 TO 2013, ASSESSMENT OF KNOWLEDGE AND PRACTICES AMONG HEALTH WORKERS AND RESIDENTS OF LUANSHYA DISTRICT, ZAMBIA

BY

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A dissertation submitted to the University of Zambia in partial fulfilment of the award of the degrees of Master of Public Health in Environmental Health

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CERTIFICATE OF APPROVAL

The University of Zambia approves this dissertation of **Priscilla Mweetwa** in partial fulfilment of the requirement for the award of the master of public health degree by the University of Zambia.

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ABSTRACT

Background: Typhoid fever remains one of the causes of morbidity and mortality worldwide. Developing countries are the most affected, due to poor water supply and sanitation delivery services provision. In Zambia, the resurgence of typhoid started in 2008, since then the infection has been in existence and has affected different parts of the country. This study was therefore conducted to determine typhoid fever outbreak trends from 2009 to 2013 and to assess knowledge and practices among health workers and residents in Luanshya district, Zambia.

Methods: Mixed methods were applied, firstly, was the descriptive epidemiology of typhoid fever cases, which occurred in the period of 2009 to 2013. Thereafter, concurrent cross sectional surveys to assess knowledge and practices among health workers and residents of Luanshya district (OPD clients and marketeers). Finally, checklists were used to collect data on epidemic preparedness in participating health centres. Secondary data on Typhoid fever cases was collected using a pre-designed form (2009 to 2013 cases), while interview schedules where used to collect data from health workers, OPD clients, marketeers and epidemic preparedness assessment. Data was entered and validated in Epi data v 3.1 then exported to Stata version 11.0 for analysis.

Findings: Analysis results showed that, most typhoid fever cases were those aged 6 to 19 years besides which female to male ratio of cases was 2:1. Most cases occurred during rainy season (November to March) among which most cases where from the densely populated areas. The study also reveals that 98% of health workers were aware of typhoid fever but lacked updated information on its detection and management. Both, outpatient department clients and

marketeers had heard of typhoid, however they were not knowledgeable on its signs, symptoms and transmission. Results show that OPD client respondents who used water-borne toilets were 3.2 times more likely to know about typhoid fever, (OR 3.22, 95% CI 1.42-7.33) than those that used pit latrines. Marketeers aged 31-35 years old were 4 times more likely to know about typhoid fever (Odds Ratio 3.7, 95% CI 1.2-11.4: p = < 0.024). In addition, marketeers aged 41-67 years old were 4 times more likely to know about typhoid fever (Odds Ratio 4.5, 95% CI 1.3-16.0: p = < 0.021).

Conclusion: This study has given a needed understanding on the distribution of typhoid fever over time in Luanshya district. Community engagement could help strengthen the interventions given the existing of transmission knowledge in the communities interviewed. Further, the study informs policy makers on areas of focus in disease prevention and control, it also opens up questions that need to be answered by doing additional research and with superior study designs

DEDICATION

This research work is dedicated to my family.

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ABBREVIATIONS AND ACRONYMS

CSO:	Central Statistical Office
ERES:	Excellence in Research Ethics and Science
GRZ:	Government of the Republic of Zambia
IRB:	Institutional Review Board
LDHO:	Luanshya District Health Office
LMC:	Luanshya Municipal Council
MDGS:	Millennium Development Goals
MOH:	Ministry of Health
NHSP:	National Health Strategic Plan
OPD:	Out Patient Department
TVTC:	Teachers Vocational and Technical College
UNEP:	United Nations Environment Programme
WHO:	World Health Organization

OPERATIONAL DEFINITIONS

Hygiene: Conditions or practices conducive to maintaining health and preventing disease, especially, through cleanliness.

Incidence rate: Means number of new cases of typhoid fever divided by the number of people at risk in the same period.

Incidence: In typhoid fever means the annual diagnosis rate, or the number of new cases of Typhoid fever diagnosed each year (i.e. getting Typhoid fever).

Mortality rate: Means number of people dying from typhoid divided by number of people suffering from typhoid fever in the same period.

Prevalence: In Typhoid fever, usually means the estimated population of people with Typhoid fever at any given time.

Sanitation: Refers to the provision of facilities and services for the safe disposal of human urine and faeces. It also implies to the maintenance of hygienic through services such as garbage collection and wastewater disposal conditions (WHO 2009).

Waterborne infectious: Refer to diseases caused by pathogenic bacteria such as salmonella (typhoid, paratyphoid) *vibrio cholerae* (cholera) among others.

CHAPTER ONE: INTRODUCTION

1.1 Background

Typhoid Fever infection is one of the causes of morbidity and mortality worldwide (Nagashetty, 2010). It is an illness caused by a bacterium of the genus salmonella, which usually causes about 22 million infections and 200,000 deaths annually in a global perspective (Crump, *et al*., 2004; CDC, 2014). However, febrile infections (such as malaria) and lack of equipped laboratory facilities pose a challenge in estimation of the real burden of typhoid fever. In humans, Salmonella is categorized in two types, namely; *Salmonella Enterica* which is caused by low virulence serotypes which causes food poisoning and the high virulence serotypes known as *Salmonella Typhi* (*S. typhi*) which causes Typhoid, it also includes a group of serovars called *Paratyphi A*, *B* and *C* which cause *Paratyphoid* (Kanungo, *et al*., 2008).

Salmonella typhi is a gram-negative aerobic non-sporing rod like organism, which can survive for 7 days in water, 14 days in sewage and for a month in ice cream. Its incubation period is dependent on the amount of bacteria ingested, though it is generally from 8 to 14 days, but could go up to 60 days (Adetokumbo, 2003). The pathogen, whose mode of transmission is from person to person only lives in humans. Males, females and all age groups are susceptible to typhoid, further persons with typhoid fever carry the bacteria in their blood stream and intestinal tract (CDC, 2013).

1.2 Clinical Presentation of Typhoid Fever

The signs and symptoms can be mild to severe and eventually result into complications if not treated.

Mild: Headache, malaise, fever rise, constipation, diarrhoea, jaundice, mild abdominal distension, spleen and liver enlargement.

Severe: Continuous high fever, roswaller spots, weight loss, delirious confusion state, pronounced abdominal distension and diarrhoea.

Complications:

I. **Respiratory system;** Pneumonia, hemorrhagic pleural effusion
II. **Central nervous system:** Meningitis, febrile convulsions in children
III. **Genitourinary tract;** Genitourinary tract infection
IV. **Haematopoetic;** Aneamia, haemolysis
V. **Gastro- intestinal;** Intestinal heamorrhage, perforation and peritonitis

Studies have shown that at least 10% to 20% of patients treated of typhoid fever with antibiotics suffer relapse after initial treatment. Relapse mainly occurs after treatment with fluroquinolones (1.5% of those treated) but low with chloramphenicol and ampicillin. On the other hand, 3% of patients treated potentially become carriers, who continue carrying the bacteria and shed it in their faeces for months (Mandal, *et al.*, 2006).

The high incidence of Typhoid Fever occurs mainly when there is faecal contamination in the water consumed by a large population. Typhoid fever has a worldwide distribution and is endemic in communities with lack or inadequate provision of safe water supply, lack of awareness of the disease and poor hygiene practices. According to WHO, around 1.1 billion people (globally) do not have access to improved water supply sources. Approximately 2.4 billion people do not have access to improved sanitation facilities, the population most affected are those living in developing countries that live under extreme conditions of poverty, mainly in peri-urban areas or rural inhabitants (WHO, 2008). Comparably, developing countries such as those in Asia, Latin America and Africa bear a disproportionate burden of diarrhoeal diseases such as cholera, dysentery and typhoid (Park, 2009).

1.3 Historical Perspective of Typhoid Fever

The first carrier known carrier of Typhoid Fever in the USA was Mary Mallon, who was a cook in New York and had caused several epidemics, until the time she was quarantined and later died (Anthony 2001)**.** Typhoid Fever has a worldwide distribution, but endemic in localities where standards of sanitation and personal hygiene are low.

1.4 Global Status

Globally, by the year 2000 it was suggested that an approximation of 21.5 million infections and 200,000 deaths were reported each year as a result of typhoid fever. Typhoid is predominantly in school age children, it is therefore is a public health problem globally (Mweu, *et al.*, 2008).

In populations without access to safe water and basic sanitation, typhoid vaccination can help reduce inequity by delivering a safe, effective and cost-effective way to control typhoid and can ultimately complement safe water and sanitation intervention (CDC, 2014). Typhoid Fever has in Southern, Central and Southeast Asia had an outstanding number of cases (>100 per 100,000) while the fatality rate has been attributed to cultural, social and environmental factors. The occurrence of typhoid fever is associated with poor quality of life, inadequate provision of safe drinking water and sanitation as major causes (Nagashetty, 2010).

Asia has had 274 cases per 100,000 persons and recorded the highest incidence of typhoid fever cases worldwide, especially in Southeast Asian Countries and on the Indian Subcontinent. Studies in Asian countries site annual incidence rates of the blood culture confirmed typhoid cases to 180-494/100,000 of those between the ages of 5-15 years, rates of more than 100/100,000 are considered high. In the urban slum of Dhaka, the incidence of typhoid fever was 390/100,000 of the population (Vollaard, *et al*, 2004).

1. 5 Regional Status

In sub-Saharan Africa 50 cases per 100,000 of persons with typhoid fever are recorded annually (Kosek, *et al*., 2000). In Africa 400,000 cases occur annually with an incidence of 50 per 100,000 persons per year, on the other hand there has not been sufficient data published from Sub–Sahara Africa to substantiate the burden of typhoid. Countries such as Nigeria, Ethiopia, South Africa, Zimbabwe, Democratic Republic of Congo, Kenya and Tanzania among others have had reports of typhoid fever (Kariuki, 2008).

1.6 Zambian Status

According to Ministry of health (2012), the recent on going typhoid fever outbreaks in Zambia started in 2008, consequently different parts of the country have had reports of the infection. In 2009, 1,096 cases were reported countrywide, while in 2010, 1,014 cases were recorded countrywide, with Copperbelt Province being the most affected with 450 cases of which the case fatality rate was 4%.

During the period of 2011, 2,758 cases were recorded national wide. In copperbelt, one of the reasons of the outbreak was the accident in Mufulira district where the sewer pipe broke and contaminated water this was a massive outbreak. In 2012, the nation (Zambia) had 3,565 cases, with copperbelt having reported most cases with a total of 634 cases (MoH, 2013). By March 2014, fifty confirmed cases were reported by Solwezi District Health Office (MoH, 2014), it is clear from the above information that typhoid fever has existed in Zambia since its resurgence in 2008 has affected different parts of the country.

According to ministry of health typhoid outbreaks were first recorded in Kitwe, Chingola and Luanshya districts in copperbelt province and later Lusaka district in Lusaka province. In 2011, the outbreaks spread to Northern and western provinces. These outbreaks occurred against the backdrop of a challenged sewage reticulation system, limited access to safe water mainly affecting densely populated areas (MoH, 2011).

1.7 Typhoid Fever and its Associated Factors

1.7.1 Typhoid and Food Handling

It is clear from the history of Mary Mallon, that food handlers (with infectious diseases) pose a great threat to the public, especially those that handle food consumed by a number of people (large population). Hence the need for the Public Health Department in Ministry of Health, Community Development and the Local Authority to ensure that food handlers such as those in restaurants, bakeries, supermarkets, boarding schools undergo medical examination at least every six months as stipulated by the Zambian law "Food and Drugs Act, 1995 (GRZ). Inability to implement such a law, was attributed to be one of the contributing factors to typhoid fever occurrence in a study conducted in Chawama Township of Lusaka District (Chishimba, 2012)

1.7.2 Seasonal Related Factors

Some studies have associated temperature and rainfall to having an influence on the disease pattern of infections such as typhoid and other diarrheal diseases. They state that seasonal trends have been determined for diseases, which were at their peak in summer when temperatures are high and during rain seasons when contamination of water is possibly high (Radja, 2002). In areas were water is sourced from shallow wells, there is a higher risk of water contamination with human excreta, thereby outbreaks of typhoid and other diarrhoeal diseases is inevitable (Caroline, 2001). On the contrary, other scholars argue by stating that as long as the pathogen is in existence the outbreaks of typhoid fever and other diarrhoea infections would be present regardless of the seasonal variations (Beyene, 2008).

1.7.3 Water and Sanitation

Other Studies have shown that typhoid will continue to exist if long lasting measures are not put in place, such as safe water provision, improved food hygienic practices, safe waste disposal, massive vaccinations, proper assessment of population based surveys and accurate microbiological diagnosis of typhoid (Beyene, *et al*, 2008 and Sur, *et al*, 2006).

Similar studies done in a wide range of settings established that a strong consistency in the effectiveness of interventions, such as improvement of water supply, sanitation and hygiene practices, the combination of these factors were found to reduce infectious diseases. On the other hand, it is impossible to determine the improvement of water supply without having improved its quality or quantity, introduction of new water sources, piped water supply and household connection installed, including water borne sanitary facilities respectively (Eisenberg, *et al*, 2007). Drinking safe and healthy water is a human right, yet unsafe drinking water and inadequate sanitary conditions increase the risk of various public health hazards such as typhoid fever (Pruss, *et al*, 2008).

The millennium development goal 7 (c) targets the reduction by half the proportion of the population without access to safe drinking water and basic sanitation by 2015. On the contrary, in Sub-Saharan Africa, over 40 % of people are without improved water supply, besides 11% of the global population, 783 million people remain without improved drinking water sources.

1.7.4 Community Sensitization

Given community sensitization, water supply and sanitation interventions spearheaded, there could be 30% to 50% reduction in typhoid, general diarrhoea, bloody diarrhoea, non-bloody diarrhoea infections among others (World Bank 2008). Further, studies have highlighted the importance of educational campaigns for the reduction and control of typhoid (Uneke, 2008).

A study conducted in rural Egypt, showed that promotion of hand washing campaign alone had a great impact in the control of typhoid fever. But this is not usually done for example, there was a discordant of information between the health workers and the community members focus group discussants, in that while the health workers group discussants claimed to routinely conduct educational campaigns through targeted home or ward visits. The community group discussants unanimously indicated inexistent of such campaigns, such instances hinder the fight against diseases or any health related event (Bahl, 2004).

1.7. 5 Diagnostic Challenges

Typhoid fever is often missed during clinical diagnosis, because of the febrile conditions such as malaria and viral hepatitis tend to have similar clinical presentations as that of typhoid (Ohanu, 2003). Laboratory services are vital in ensuring that patients are rightly diagnosed and given the right medication for a given medical condition. However, due to insufficient laboratory infrastructure, trained staff, lack of equipment and diagnostic reagents is a challenge for most developing countries, Zambia inclusive (Lin, 2000). Most laboratories use the Widal test to isolate typhoid fever as opposed to other reagents (e.g. culture) which are expensive but more effective.

1.7.6 Dynamic approach

There are arguments stating that use of Multidisplinary approaches would help reduce incidence of infectious diseases (such as typhoid fever) incidence. Such approaches are sustainable measures that incorporate distal processes into analysis and designs of intervention (including political will, economic, social and ecological processes) are important in disease control (Eisenberg, *et al*, 2007 and UNEP, 2007). In as much as there may be need for Multidisplinary approach towards curbing communicable diseases, failure to prioritize programs in preventive medicine poses a great challenge in prevention and control of infectious diseases such as typhoid and other communicable diseases. It is observed that there is much attention on HIV/ AIDS and cancer programs while communicable diseases such as typhoid, diarrhoea and dysentery continue to exist.

According to the National Health Strategic Plan (2011), there is need for significant improvement of public health surveillance in order to reduce morbidity and mortality associated with epidemics. Its main objective is to promote, improve hygiene, by ensuring universal access to safe water and adequate food safety with acceptable sanitation, thereby expecting reduction of incidences of water and food borne diseases throughout Zambia.

1.8 Legal Frameworks

In Zambia, there are pieces of legislation that govern the prevention and suppression of infectious diseases.

The Water Supply and Sanitation Act No. 28 of 1997 provides guidance on how Local Authorities should provide urban water supply in an appropriate manner.

The Food and Drugs Act Cap 303 section 7 prohibits any person to sale and prepare food under insanitary conditions.

The Public Health Act Cap 295 sections 28 under Prevention and Suppression of Diseases gives power to the minister responsible for health responsibility to make regulations regarding infectious diseases and to act appropriately to prevent further spread.

The Water Act Cap 198 provides for guidance in the development and management of surface and ground water resources throughout the country. If all these pieces of legislation are implemented and monitored efficiently, infectious disease such as typhoid fever, cholera, dysentery and many other diarrheal infections would not exist or if so then they would be very few and not so often.

CHAPTER TWO: RESEARCH FOCUS

2. 1 Statement of the Problem

Globally, an estimation of 16 – 33 million of typhoid fever infections and 216,000 deaths occur annually, WHO identifies typhoid as an important public health problem (WHO, 2008). According to Ministry of Health in Zambia, typhoid fever outbreaks started in 2008, since then, cases of typhoid have been reported in various parts of the country. Luanshya district has not been spared from these outbreaks, morbidity and mortality as a result of typhoid fever have been reported in the district since the year 2008 (MOH, 2011). Despite preventive and control interventions by relevant authorities such as Luanshya District Medical Office, Luanshya Municipal Council, Kafubu Water and Sewerage Company and other stakeholders, the disease continues to occur. There has not been a documented study on typhoid fever trends from 2009 to 2013, including assessment of knowledge and practices among health workers and residents in Luanshya District from the time outbreaks started.

2.2 Justification of the Study

It is hoped that undertaking such a study would give an understanding of the distribution of typhoid fever over time and associated knowledge and practices among health workers and community members in Luanshya district. Further such a study generates new knowledge to inform policy makers, as well as reshaping disease prevention and control strategies. Findings of this study will be made available to the University of Zambia, as well as to stakeholders such as Luanshya Municipal Council, Luanshya District Health Office and the Water Utility Company.

Being largely a descriptive study, reflections arising out would provide candidates for new research questions needing to utilise stronger epidemiological study designs.

2. 3 Research Question

What have been the trends of typhoid fever outbreaks (2009 to 2013), knowledge and practices among health workers and residents of Luanshya District?

2.4 General objective

The general objective of the study was to describe typhoid fever outbreaks (2009 to 2013) in Luanshya District.

2.5 Specific Objectives

The specific objectives where as follows;

a) To assess knowledge on typhoid fever and practices among health workers in Luanshya District.
b) To assess knowledge on typhoid fever and practices among out patient department visitors at health facilities.
c) To assess knowledge on typhoid fever and practices among marketeers from selected markets.
d) To determine epidemic preparedness of selected health facilities in Luanshya District.

2.6 Conceptual Framework

Factors that contribute to the out breaks of typhoid fever may differ from place to place. Below is a designed conceptual framework to signify some factors that could necessitate the infection. Firstly, are the socio-economic factors which may include urbanization, population growth in a given locality including levels of education, such are said to be among contributing factors to disease occurrence in a given community. The above factors may result in illegal infrastructure development, illegal connection of the water reticulation system and sewer system thereby resulting into contamination of water supplied to a large number of people and poor hygiene standards, which ultimately pose a danger to possible outbreaks of infectious diseases such as typhoid, dysentery and cholera among others (Pruss, 2008).

The service delivery related factors include, poor funding towards the programs such as training of health workers (refresher courses), insufficient number of health workers in health facilities. Lack of diagnostic equipment and reagents to isolate the diseases such as typhoid fever and other febrile infections can lead to the spread of infections and under estimation of the disease burden. Abuse of antibiotics may eventually result in drug resistance, which would contribute to having typhoid fever carriers who may spread the infection (Lin, 2000).

On the other hand, lack of information or sensitisation of the public on the preventive measures, signs and symptoms of the infection is critical to disease prevention and control. Temperature and rainfall considered important factors in disease existence (Radja, 2002).

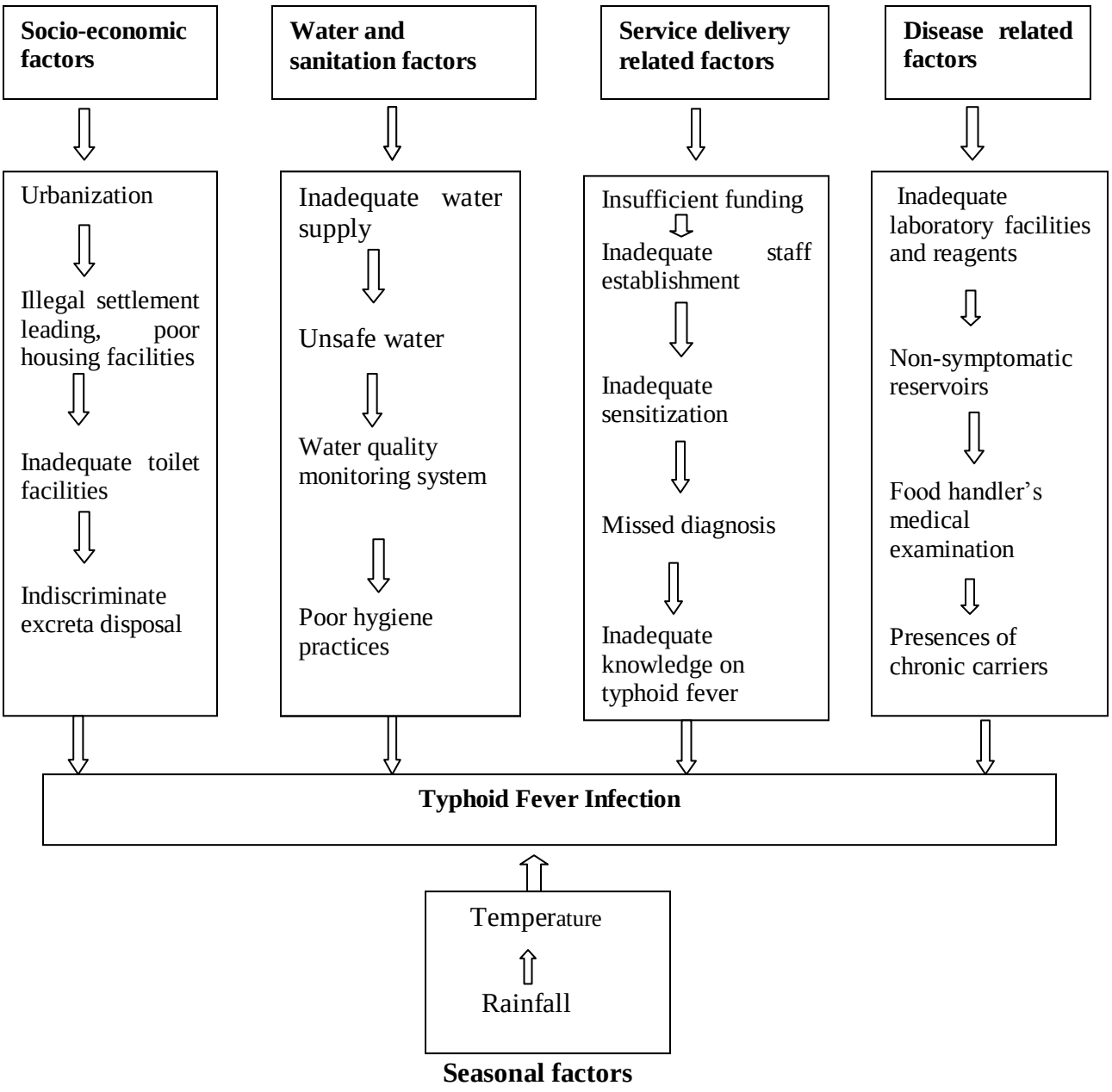


Figure 2.1: Conceptual Framework

CHAPTER THREE: RESEARCH METHODOLOGY

3. 1 Study Setting

This study was conducted in Luanshya District of the Copperbelt Province. Luanshya is a District located 360 kilometres from the National capital (Lusaka city) and 35 kilometres from Ndola the copperbelt provincial capital. It borders with Ndola District in the North East, Kitwe District in the North West and Masaiti District in the South West. The district covers an area of 935 kilometres comprising of 90% urbanized a 10% rural (LDHO, 2011). The total District population is 156,059 (77,368 male and 78,691 female), with 29,043 households (CSO 2010). The number of households with access to safe water supply is 14,190 and 14,853 sanitary facilities. The main activities in the district are mining, civil service, private sector and farming. The District has twenty-two (22) existing health facilities of which, 13 are government owned health centres, six (6) are privately owned health centres, two (2) are government hospitals and one (1) is a private hospital (mine hospital). There are also ten (10) markets in the district.

3. 2 Study Population

For the purpose of this study, the study population included typhoid fever cases recorded from January 2009 to July 2013 at three referral hospitals (Roan, Thompson and Luanshya hospitals) compiled by Luanshya District Health Office. Data collected was analysed to show the disease case distribution (trends). Out of the 22 health facilities, 15 where randomly selected to participate in the study, having 22 functional health facilities in the district, 15 is over half the number health centres and is seemingly representative. Furthermore, from the 10 markets in the district, 5 took part in the study.

3. 3 Variables

The variables used in the study were as indicated in the table

Table 3.1: Description of Dependent and Independent variables used in this study

VARIABLES	INDICATORS	SCALE OF MEASUREMENT	TYPE OF VARIABLES
A. Dependent variable			
Typhoid knowledge			
B. **Independent Variables**			
B.1Demographic Factors B1.1 Age	B1.1 # of age intervals affected with typhoid fever. and above .	B1.1 1 = 1- 5 2 = 10 -20 3 = 21 – 30 (above)	B1.1 Categorical
B1.2 Sex	B1.2.1 # of either male /female knowledgeable on typhoid fever.	B1.2 Male , Female	B1.2 Categorical
B1.3 Marital status	B 1.3 # of respondents with their marital status	B1.3 Married, single, divorced	B 1.3 categorical
B 1.4 Occupation	B1.4 # respondents and their occupational status	B1.4 Employed, unemployed, farmer, marketeer	B1.4 categorical
B1.6 Educational Levels	B 1.6 # respondents with their educational level	B1.6 Non, Primary Secondary, tertiary.	B1.6 categorical
B.2 Knowledge levels on typhoid fever	B2.1 # respondents ever	B2.1 yes, No	B2.1 Categorical

B 2.1 ever heard of typhoid	heard of typhoid		
B 2.2 signs and symptoms	B2.2 # responses on typhoid fever	B2.2 FCMH, DAVC Others	B2.2 categorical
B2.3 transmission route	B.2.3# Reponses on transmission	B2.3 feacal oral, air, sex	B 2.3 categorical
B2.4 prevention	B2.4 # respondents responses on prevention o typhoid	B2.4 --------- ---------	B 2.4 categorical
B2.5 Hand wash	B2.5 # respondents to hand wash	B 2.5 yes No	B2.5 categorical
B.3 Management and control of typhoid fever			
B.3.1Laboratory facilities	B.3.1 # health facilities with laboratory facilities	B.3.1 1 = present 2 = absent	B.3.1categorical
B.3.2 Reagents	B.3.2 # of health facilities with reagents	B.3.2 1 = present 2 = absent	B.3.2 categorical
B.3.3Health education schedule	B.3.3 #of health facilities with health education schedules	B.3.3 1 = present 2 = absent	B.3.3 categorical
B.3.4 Food and water quality monitoring schedule	B.3.4 # of health facilities with food and water quality monitoring schedules	B.3.4 1 = present 2 = absent	B.3.4 categorical

*FCMH (fever, constipation, malaise, headache), *DAVC (diarrhoea, abdominal pains, vomiting, chills).

3. 4 Study Design

In this study, mixed methods were applied; firstly was the descriptive epidemiology of typhoid fever cases that occurred from 2009 to 2013. Then concurrent cross sectional surveys were conducted to assess knowledge and practices among health workers, OPD clients and marketeers, including Checklists on the epidemic preparedness activities of the participating health facilities.

Inclusion criteria

- The confirmed typhoid fever cases which occurred in the period of January 2009 to July 2013 with complete information of variables of interest.
- Only health workers from selected health facilities participated in the study.
- The out patient department (OPD) clients from selected health facilities who gave consent of their participation in the study.
- Marketeers from selected markets who gave consent to their participation in the study.
- All participants were 18 years old and above.

Exclusion criteria

- Cases of typhoid fever that had incomplete information, but occurred from January 2009 to July 2013.
- The health workers from health facilities that were not selected in the study.
- Clients who were not from the out patient department (OPD).
- Marketeers who did not consent to their participation in the study.
- Those under the age of 18 years did not qualify to take part in the study.

3. 5 Sample Selection

3.5.1 Typhoid Outbreaks Cases (2009 to 2013)

A total sampling method was used, as well as a census of all the typhoid fever confirmed cases with variables of interest recorded from January 2009 to July 2013. Therefore, 346 cases were observed from January 2009 to July 2013 among which 332 were alive while 14 died.

3.5.2 Sample Selection of Health Workers, OPD Clients and Marketeers

(i) Selection Of Health Facilities / Health Workers

A simple random sampling (SRS) method was employed, were names of health facilities (22 health facilities) were written on pieces of paper then placed in a bag which was shaken before and after each draw till the 15^{th} draw. (Baluba, Kawama, Mpatamatu, TVTC, Section 9, Section 5, Independence 72, Chilabula, Malaika, Mikomfwa urban, Miikomfwa health, Fisenge, Section 23 and Chibolya, Alexandras, Franco, Kafubu block, Zamefa Health Centres, including Roan general hospital, Thompson and Luanshya hospitals).

At least two (2) health workers from 15 health facilities (but only one health facility had four respondents because it had more health workers at the station hence 32 health workers were interviewed) were randomly selected to take part in the study. Further, checklists were used in collection of data on epidemic preparedness at the same 15 health facilities. Furthermore, a simple random sampling method in selecting the five health facilities from the already selected 15 health centres was applied. Names of 15 health facilities were written on pieces of paper, placed in the bag and then shaken before and after each draw until the fifth (5^{th}) draw.

From the selected five health facilities, at least 24 OPD clients at each health facility participated in the study. The selection of participants was systematically done (systematic random selection) were every 3rd client at the OPD were selected in the study.

(ii) Selection of markets and marketers

A simple random selection of 5 markets out of 10 major markets was performed (Namely; Zani Muone, Roan, Mpatamatu, Baluba, Kalala, Main, Buseko, TVTC, Kambilombilo and Kawama markets). Similarly, names of markets were written on the pieces of paper then placed in the bag from which 5 draws of names of markets was conducted, however before and after each draw the bag was shaken. The participants recruited were systematically selected were every third 3rd marketeer was recruited to participate in the study. A total selected sample of 244 among which were 120 OPD clients and 124 marketeers participated in the study, though the point of saturation determined the selected sample size (which implies the moment respondents begin to give similar answers).

To reduce on selection bias

- The confirmed typhoid fever cases with variables such as age, sex, date residence and results alive or died were recruited.
- For health centres and markets, participating facilities were randomly selected, in that names of health facilities and markets were written on small pieces of paper then placed in a bag which was shaken before and after each drawn until the required number was attained, that is 15 health facilities and five markets thereby giving them all equal chances of participation.

- Among the respondents from OPD (five health centres) and five markets were systematically selected and every third third person participated in the study.

3. 6 Data Collection

Laboratory results together with demographic data was obtained from the patients records (the line list) using a predesigned data collection form. The patient's identifiers were removed while a unique number was allocated to each case and only eligible patients' data with variables of interest such as sex, age, time, year and location recorded from January 2009 to July 2013 were included in the study. To avoid ambiguous answers, structured interview schedules had clear and simple questions used in collecting data from the health workers, OPD clients and marketeers. Checklists were designed to collect data from selected health facilities on there epidemic preparedness activities. Research Assistants were trained on the approach to take part in collecting data from respondents. During data collection, the principal researcher checked for completeness and consistency of information on interview schedules before been stored and locked in a safe cupboard.

3. 7 Data entry and Analysis

Five databases were created with regard to the data collected in this study. Firstly, data was collected from typhoid fever records using a predesigned data collection form. Data was then entered and validated using Epi Data after which it was exported to STATA version 11.0 for analysis. Microsoft excel 2007 was used in creating a typhoid fever epidemic curve. Thereafter databases on health workers, out patient clients and marketeer's interview schedule responses were created in Epi Data version 3.1, and then exported to STATA version 11.0 for analysis.

Further, box plots, graphs and tables on typhoid cases were created, while descriptive graphs, means and proportions were obtained in coming up with knowledge and practices estimates. The method of implementing logistic regression analysis for the effect of individual's covariates on having heard of typhoid fever (among OPD clients and marketeers) was conducted. In our bivariate analysis we determined the effect of individual covariates on the likelihood of having heard of typhoid fever, clinical signs and transmission, of which were odds ratio ratios and p-values (at 5%) were obtained. Data collected with the use of checklists was entered and analysed in Microsoft excel 2007, as a result a health centre assessment tool was designed which included all the results from the checklists.

3. 8 Ethical Considerations

Approval to conduct the study was obtained from Excellence in Research Ethics and Science Converge Institutional Review Board (ERES, IRB). In order to ensure overall ethical compliance of the study, permission to conduct the study was sought from Ministry of Community Development Mother and Child Health, Copperbelt Provincial Medical Office, Luanshya District Community Development Health Office and Luanshya Town Clerk respectively. The study did not pose any injury on the participants, yet confidentiality was upheld by use of codes as well as numbers during data collection and data entry. Permission to use records on typhoid fever from 2009 to 2013 was sought from Luanshya District Medical Office. An information sheet and a consent form were read out and explained to the participants and only those who either consented orally or by signing, took part in the study.

3. 9 Pre-testing

Prior to the study, research assistants were trained in a three-day session to orient them on the terms and procedures to be followed during data collection. Data collection tools were pretested in a non-study site to establish validity of the tools used. Pretesting was an important activity in ensuring that consistence of questions, quality data was generated, eventually data collection tools were understood. The locations were pretesting was done had similar characteristics to those in the study site.

CHAPTER FOUR: RESULTS

This study took a dynamic approach in answering the research question. The results section has five parts which are in line with research objectives, firstly is the typhoid fever outbreak (cases) analysis results, secondly are the health workers' knowledge and practices assessment results, thirdly are the out patient department clients' (OPD) knowledge and practices assessment results. Fourth are the assessment results of marketeers on knowledge and practices, lastly are the health facilities' epidemic preparedness assessment results.

4.1 TYPHOID FEVER OUTBREAKS (JANUARY 2009 – JULY 2013)

Figure 4.1 shows laboratory confirmed typhoid fever case results, we note that most cases and deaths occurred during rainy season (November to March) and the months when temperatures are perceived to be high (September to November). It is observed that typhoid fever cases were recorded between January to April 2009 thereafter no case was recorded till December of the same year (2009) when there was a sharp rise in cases. Since December 2009, it is observed that there were a continuous but fluctuating number of cases, with a decrease over time until 2013 (Figure 4.1 and Table 4.1).

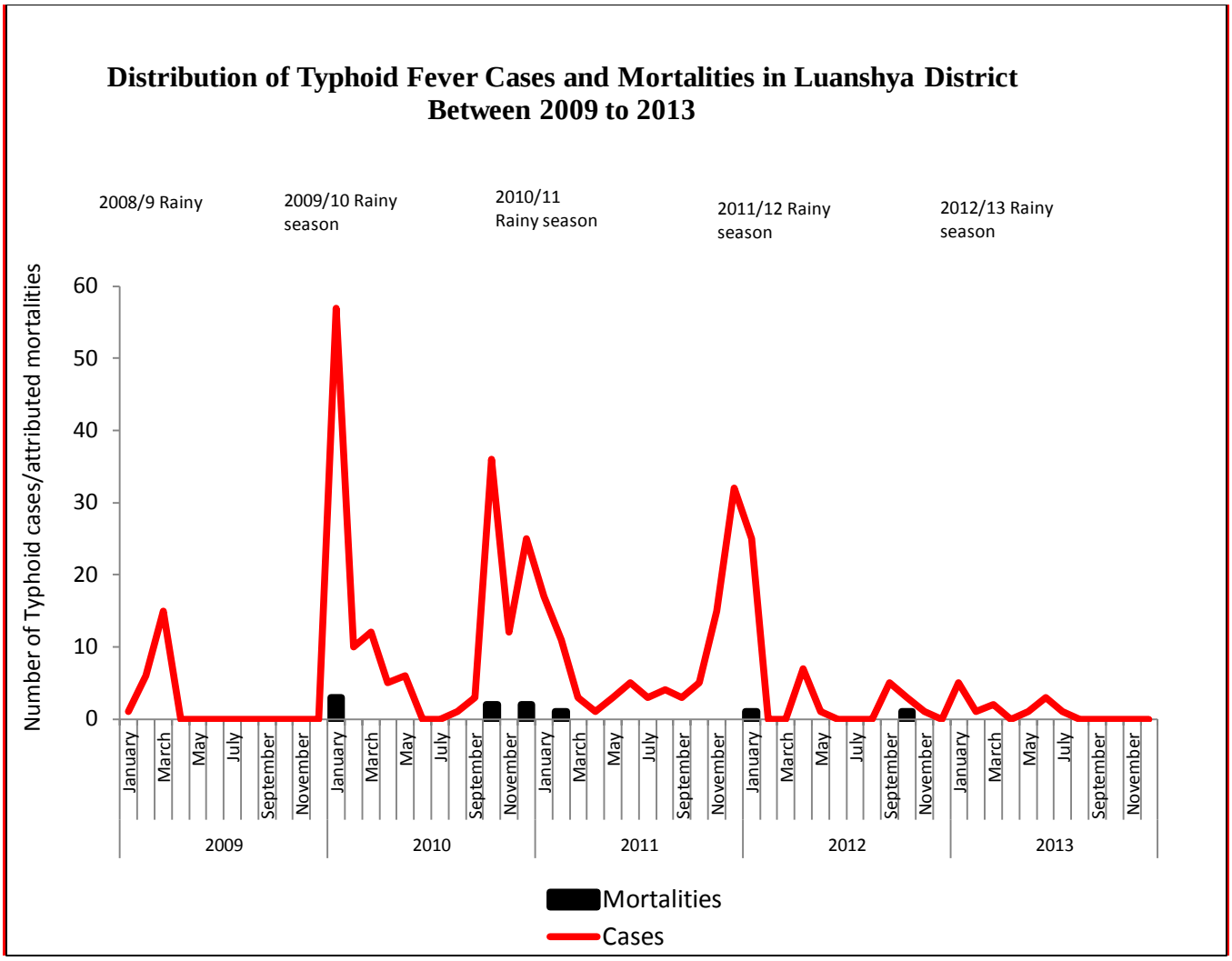


Figure 4.1.: Typhoid Fever Epidemic Curve (2009 to 2013).

Table: 4.1.: Typhoid Fever Cases over time in Luanshya District (2009 to 2013)

Year	Confirmed Cases	Alive	Died
2009	22	19	3
2010	167	166	1
2011	102	98	4
2012	42	39	3
2013	13	10	3
Total	**346**	**332**	**14**

4.1.1 Typhoid Cases, Mean Age across Gender.

From figure 4.1.2, the mean age of typhoid fever patients in Luanshya district (2009 to 2013) indicates that, for females it was 23 years, on the other hand 18 years of age for males.

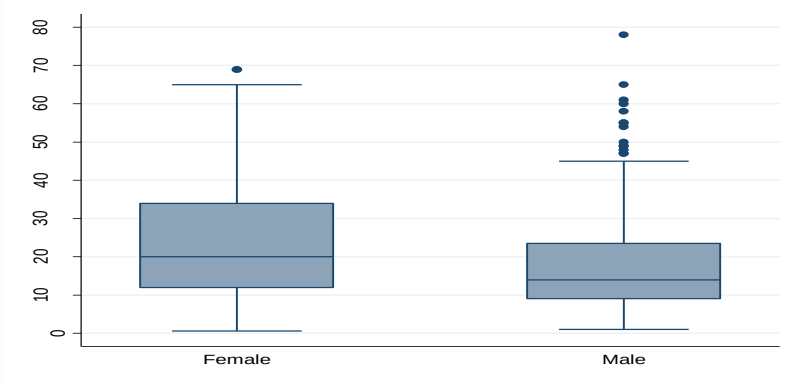


Figure 4.2 Typhoid Cases mean age across gender.

4.1.2 Age Distribution of Typhoid Fever Cases

The distribution of cases by age shows that typhoid fever patients aged 5 to 19 years were the most affected besides the median age of the cases was 19 years.

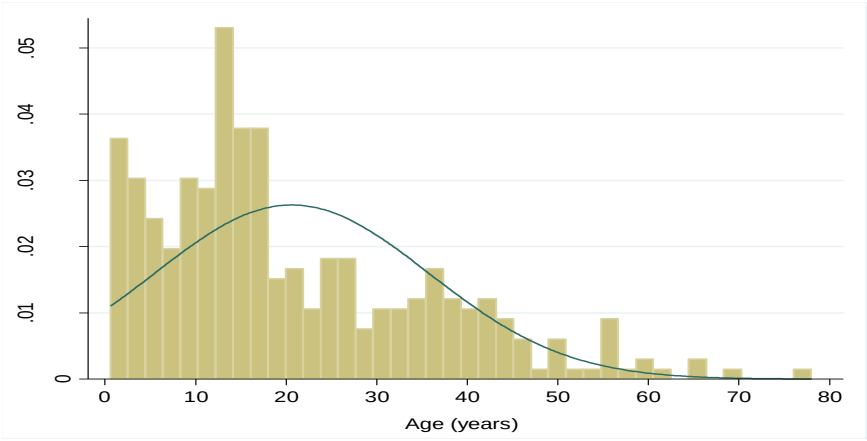


Figure 4.3: Age Distribution of Typhoid Fever Cases.

4.1.3 Case Fatality across Gender

Figure 4.4 shows that in the period of 2009 to 2013 (from the cases recorded) the case fatality rate of children aged five years and below was as follows: 5% for females and 3% for males. Those aged 13 to 19 years, the case fatality rate was below 5% for both females and males, and whereas the 20 to 25 years olds indicated that females had 6 % compared to, 8% of males of there case fatality rates. Only females aged between the ages 26 to 30 died because of typhoid fever whose case fatality rate was more than 5%. Typhoid fever patients aged 56 to 80 years indicate that females had a higher case fatality (25%) than males (20%).

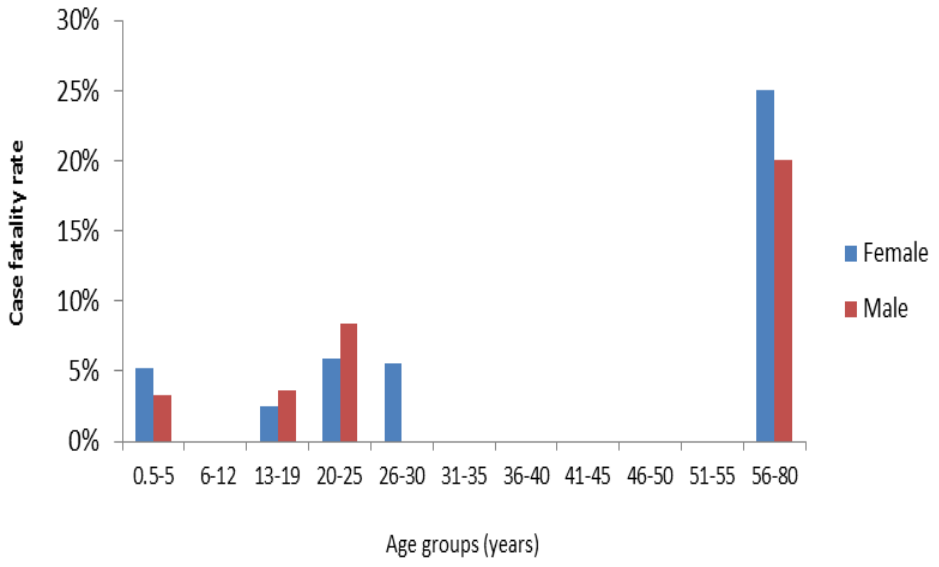


Figure 4.4: Case Fatality across Gender

4.1.4 Map of Luanshya Showing Typhoid Fever Affected Areas

Figure 4.5 below depicts areas affected and the level of effect by typhoid fever outbreaks (2009 to 2013) in Luanshya District, the areas are identified in red colour.

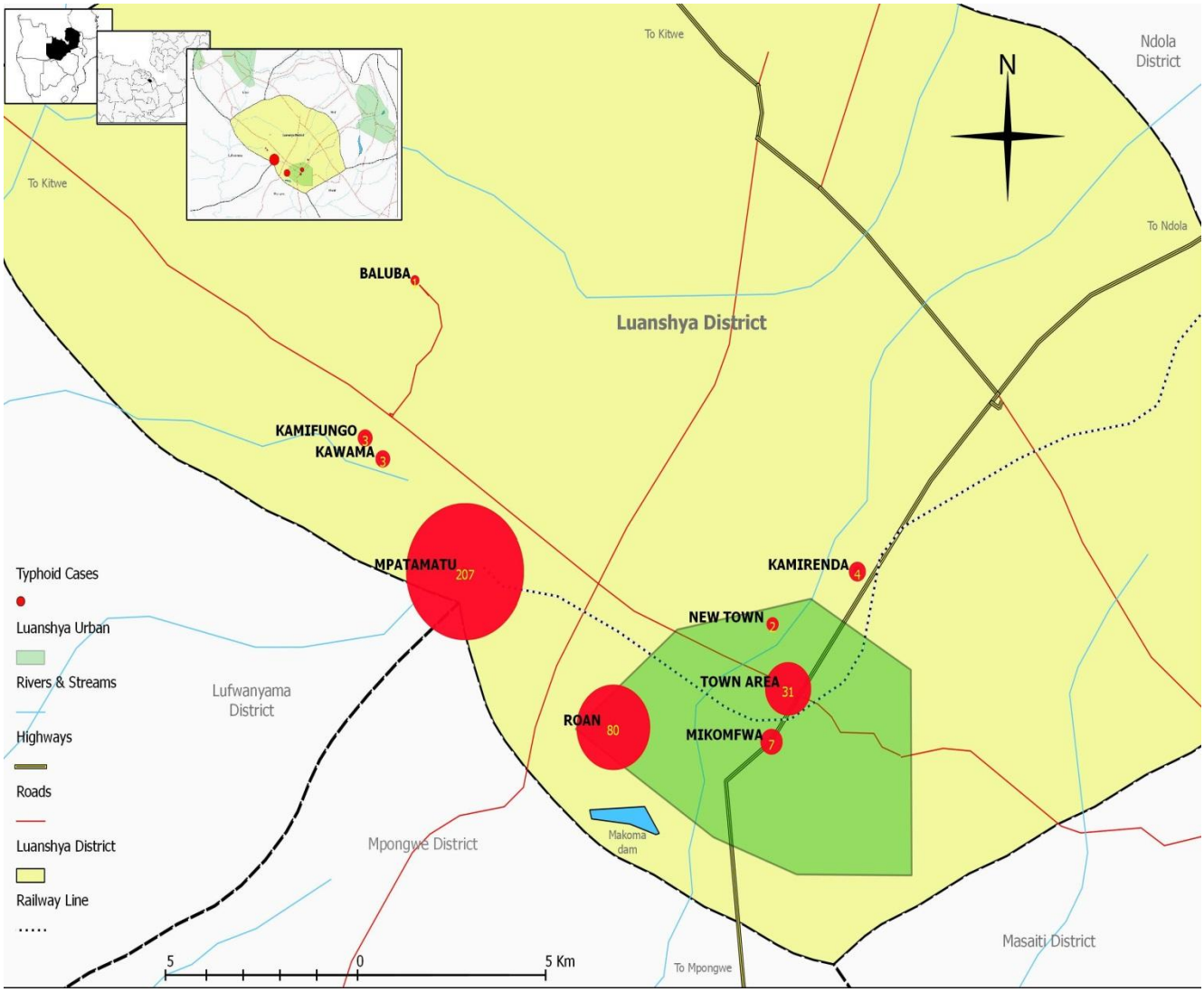


Figure 4.5: Map of Luanshya Showing Typhoid Fever Affected Areas

4. 2 HEALTH WORKERS RESULTS

In this study, health workers were the trained health professionals such as the Medical Doctor, Nurse, Clinical Officer, Environmental Health Personnel and Laboratory Technician. Table 4.2 shows the number of participants from various fields who participated in the study

Table 4.2.: Number of Health Workers interviewed from Study Sites

Profession	Study population (n=32)
Environmental health tech	3
Lab technologist	2
Clinical officer	2
Nurse	25

4.2.1 Health Workers Knowledge on Typhoid Fever and Practices

The study reveals that a high number of health workers interviewed in the study had heard of typhoid fever (97%), as opposed to the 3% who had never heard or learnt of it before. Among the respondents, 88% learnt of typhoid during their professional training whereas 9% learnt of if during the period of outbreaks. Out of 31 respondents, only 22% have attended a refresher-training course, while 78% had not attended any training since typhoid fever outbreaks started in Luanshya District. From the 25 respondents, 32% has at least handled a typhoid fever case before, while 68% did not. Out of 31 interviewed health workers, 3% did not know the transmission of typhoid fever, 3% referred typhoid to be an airborne disease, nevertheless 94% of participants stated that typhoid is a feacal-oral route infection.

On signs and symptoms of typhoid fever, 58% of respondents cited FCCMH (fever, chills, constipation, malaise and headache), 35% stated DAV (diarrhoea, abdominal pains and vomiting) and 7 % singled chest spots. Among Health workers (31 respondents) interviewed on health education, 76% stated that it is only conducted during outbreaks, while 16% quarterly carry out health talks and 8% conducted health education on a weekly basis.

Table 4.3: Health Workers Knowledge on Typhoid and Practices

Characteristics	**Study population (n=32)**	
	Frequency	**Proportions %**
HEALTH WORKERS KNOWLEDGE ON TYPHOID		
Health workers who have learnt of typhoid (n=32)		
No	1	3.12
Yes	31	96.9
Source of information on typhoid (n=31)		
College/training institute	27	87.5
Colleagues	1	3.13
Health centre	3	9.38
Ever attained refresher course on typhoid fever (n=31)		
No	24	78.1
Yes	7	21.9
Ever handled a typhoid fever case (n=25)		
Yes	8	32
No	17	68
Transmission route of typhoid fever (n=31)		
Do not know	1	3.13
Faecal oral	26	93.75
Airborne	1	3.12
Signs and symptoms of typhoid (n=31)		
FCCMH	18	58.07
DAV	10	35.01
Chest spots	3	9.68
How often is health education conducted (n=31)		
During any outbreak	23	77.16
Quarterly	5	15.63
Weekly	3	8.25

*Fever, Chills, Constipation, Malaise, Headache (FCCMH), *Diarrhea, Abdominal Pains, Vomit (DAV)

4.2.2: Health Workers' Opinion on Typhoid Fever Detection Methods

Figure 4.6 gives a picture of the (31) interviewed health worker's opinion on typhoid fever infection detection, 6% of the respondents did not know any method, whilst 10% of the respondents cited laboratory investigation. At the same time, 19% mentioned clinical diagnosis, and 65% pointed out a combination of clinical and laboratory diagnosis as ways of detecting typhoid fever**.**

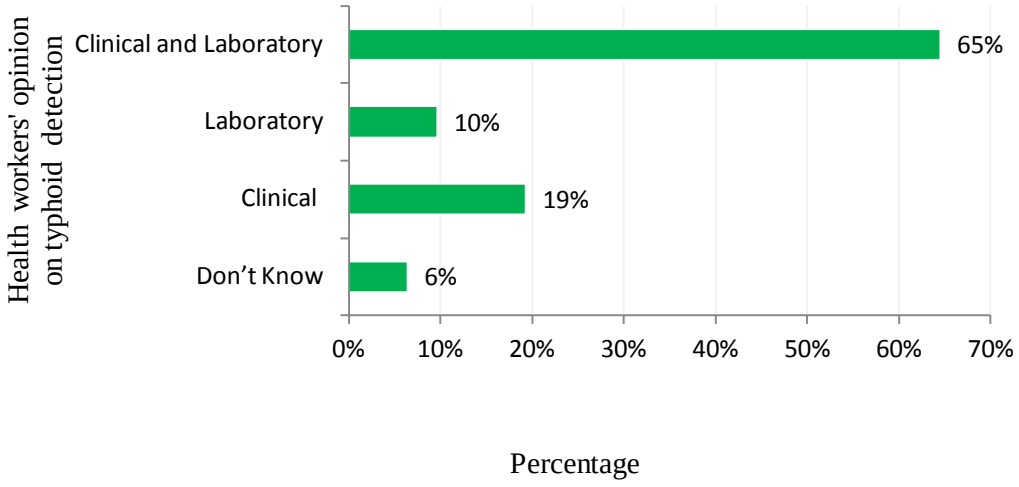


Figure 4.6: Health Workers Opinion on How to Detect Typhoid Fever

4.2.3: Health Workers' Opinion on Typhoid Fever Prevention

Among health worker respondents (n=31), 42% highlighted general hygiene as an important way of preventing typhoid, 14% cited sewer treatment, 24% indicated that chlorination and access to clean water would prevent typhoid fever. Treatment of contacts (14% of respondents) of typhoid fever cases prevents the infection and it, 7 % cited consumption of clean food, and on the other hand, 7% said isolation of patients prevent the infection spread. Only 4 % of the respondents mentioned access to a toilet as an important in typhoid prevention.

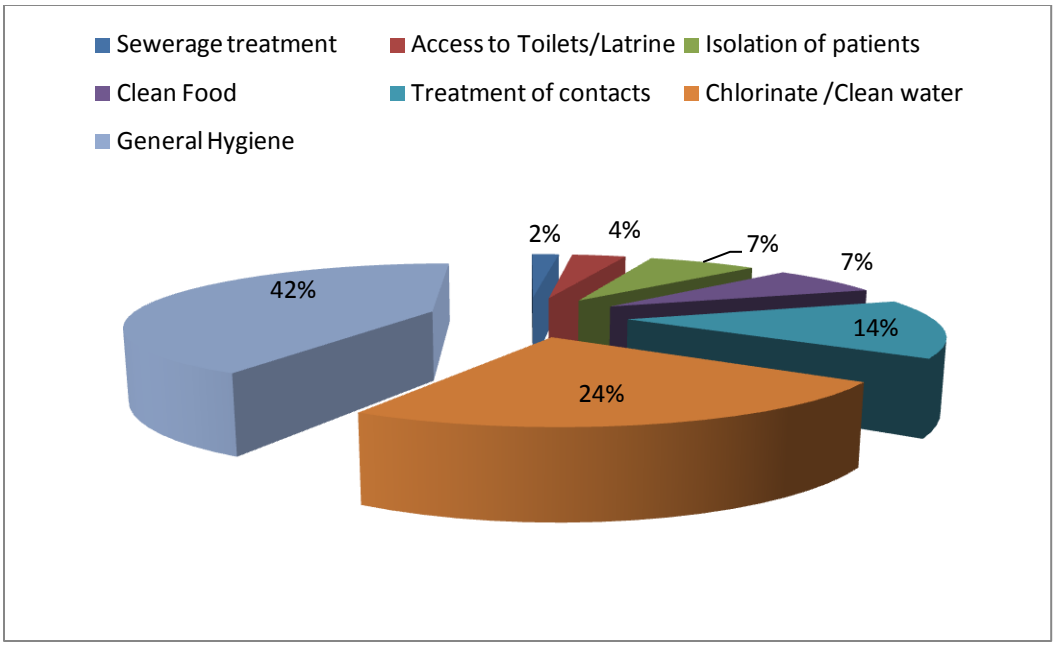


Figure 4.7: Health Workers' Opinion on How to Prevent Typhoid Fever.

4.3 OUT PATIENT DEPARTMENT (OPD) CLIENT RESULTS

Table.4.4 below shows that among (n=120) participants, 43% were aged 18 to 19 years old, while those in the age range of 31 to 40 years were the least represented (11%). Participant's response on water sources (n=80) were as follows; 53% accessed piped tap, 41% drew water from shallow wells, 5% had access to borehole water and 2% used water from the stream. From 120 respondents, 54% use water borne toilets, whilst 46% use pit latrines for excreta disposal. On personal hygiene, out of 120 respondents, 92% washed their hands after toilet use, while 8% did not. On the other hand, out of 111 respondents, 78% only used water after toilet use, whereas 22% used soap. From 95 respondents, 42% boiled their drinking water, 49% chlorinated it, but 8% did not treat their water at all. Out of 80 respondents, 51% indicated that they would report a suspected typhoid fever case to the nearest health centre, while 49% did not know what they could do given a suspected typhoid cases.

Table 4.4: Socio Demographic Factors and Practices among OPD Participants

CHARACTERISTIC	Study population n = 120	
	Frequency	**Proportions (%)**
Age distribution (n=120)		
15 – 19	51	42.9
20 – 25	38	31.9
26 – 30	17	14.3
31 – 40	13	10.9
Water Sources (n = 80)		
Piped	42	52.5
Shallow well	33	40.8
Stream	1	1.7
Borehole	4	5.0
Type of toilet facility used by OPD clients (n = 120)		
Water borne	65	54.2
Pit latrine	55	45.8
OPD clients who wash hands after toilet use (n= 120)		
Yes	110	91.7
No	10	8.3
PRACTICES AMONG OPD CLIENTS		
How hands are washed after toilet use (n=111)		
Water only	87	78.5
With soap	24	21.6
How OPD clients treat drinking water at home (n=95)		
Chlorination	47	49.5
Boiling	40	42.1
No treatment	8	8.4
Response to the suspected typhoid fever case (n = 80)		
Report to nearest health centre	41	51.3
Didn't know	39	48.8

4.3.1 Mean Age across Gender (OPD Clients)

From figure: 4.8 we note that out of 120, there were 60% of female participants with mean age of 25 years compared to 38.33 % male participants with the mean age of 29 years.

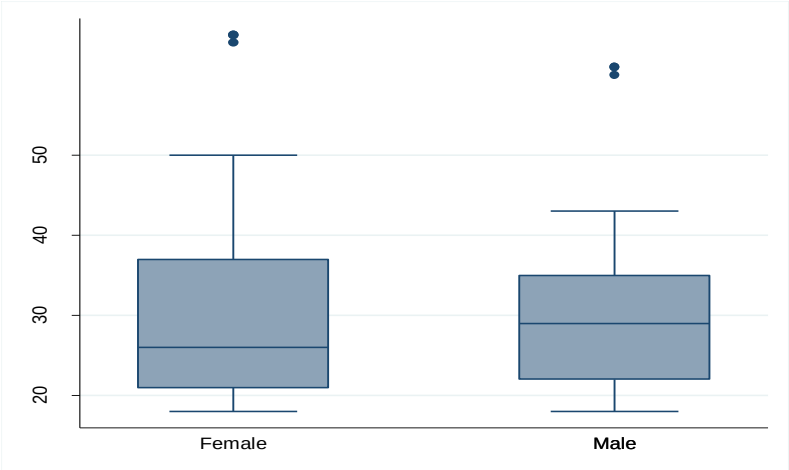


Figure 4.8: Mean age of participants across Gender

4.3.2 Suggested Clinical Presentation of Typhoid Fever (OPD Clients)

Figure 4.9 shows that out of 80 respondents, 60% did not know any clinical presentations of typhoid, followed by 25% of those who mentioned atleast four symptoms such as fever, constipation, body malaise and headache. Thereafter few respondents singled out diarrhoea (8%), vomiting (4%), bloody stool (3%) and 1% weight loss.

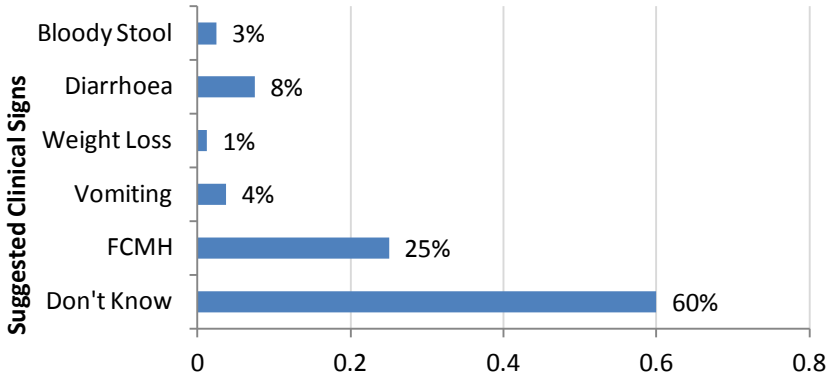


Figure 4.9: clinical presentation, OPD client's responses

4.3.3 Suggested Method of Typhoid Transmission (OPD Clients)

Figure 4.10 below shows responses of 80 participants, among which 50% did not know any mode of transmission, 42 % suggested faecal-oral route. At least 1.25% of respondents suggested skin contact, 3 % referred typhoid fever to airborne infection, while 3% said it was a sexually transmitted infection and 1.25% cited blood transfusion as a mode of transmission of typhoid fever.

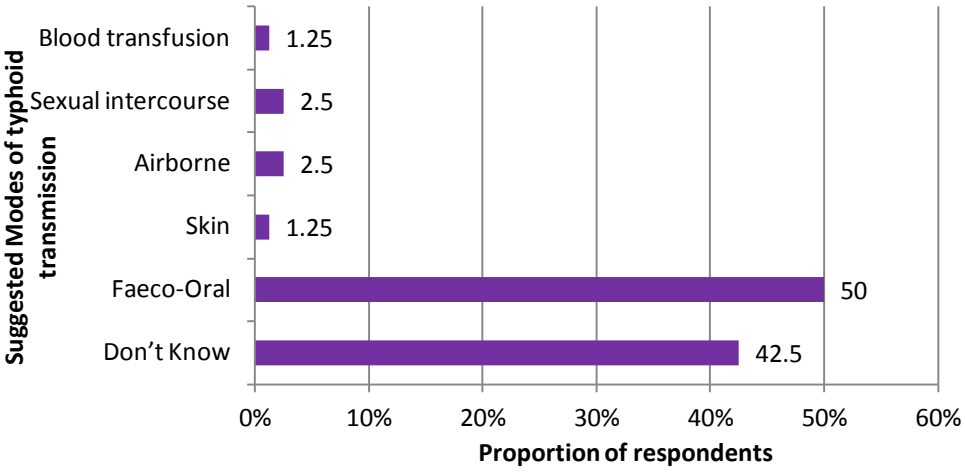


Figure 4.10: Suggested Modes of Typhoid Transmission (OPD Clients)

4.3.4 Source of Information on Typhoid Fever (OPD clients)

Figure 4.11 gives a picture of the source of information on typhoid among (n=80) participants, 25 % learnt of typhoid from communities in which they live, 20 % through watching television programs. Those that learnt of typhoid from health centre were 19% while 18% through radio programs, 8% could not recall the source, 6% through reading literature and lastly 5% was from school.

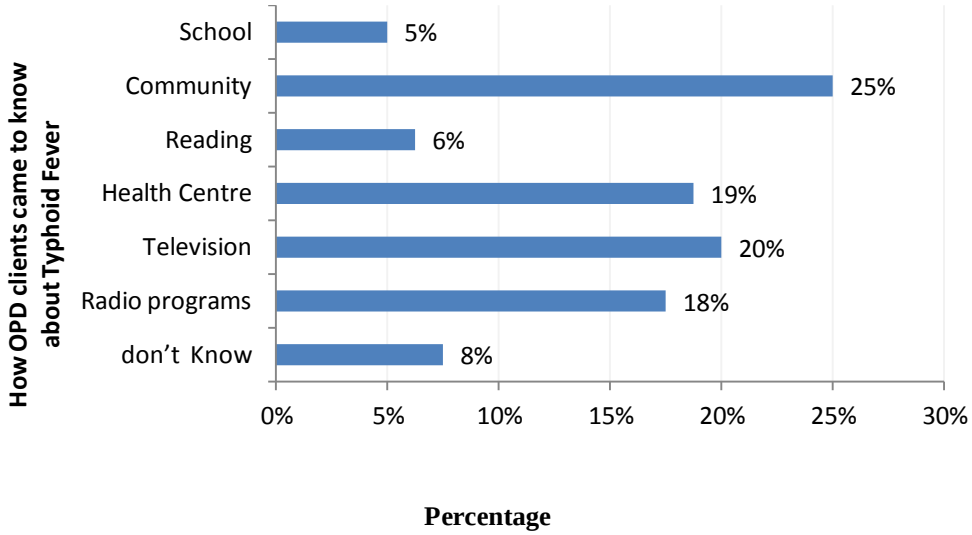


Figure 4.11: Source of Information on Typhoid Fever (OPD Clients)

4.3.5 Opinion on Typhoid Prevention (OPD Clients)

With reference to figure 4.12, out of 80 respondents, 51 % did not know any way in which typhoid fever can be prevented, whereas 38% cited boiling of drinking water. Further 6% of respondents mentioned safe excreta disposal, 4% emphasised on the treatment of the patients and

1% singled out sleeping under an insecticide treated net as a way to prevent typhoid fever.

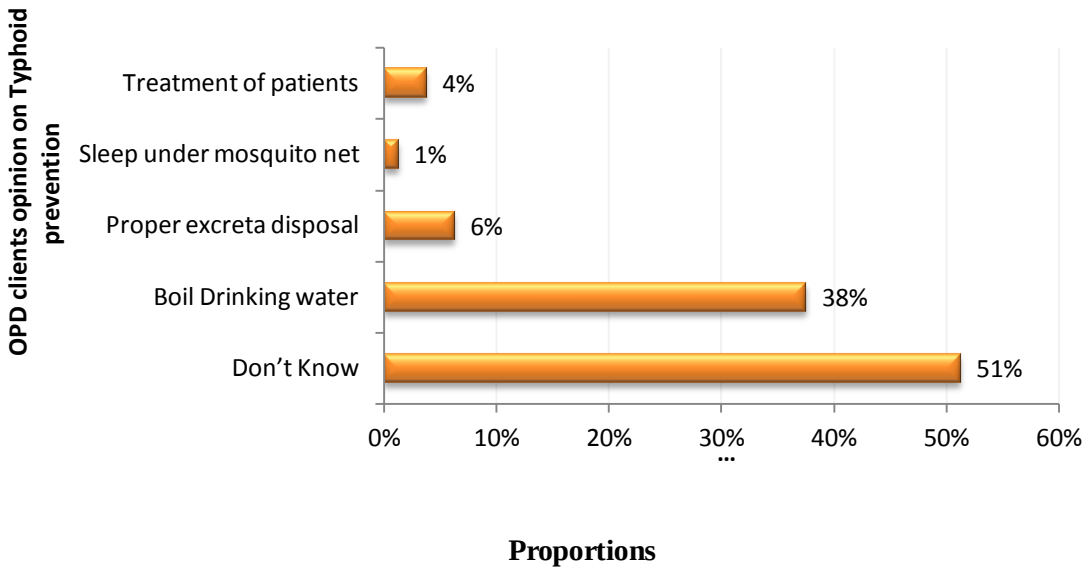


Figure 4.12: Typhoid Prevention Responses from OPD Clients

4.3.6 Factors influencing having heard of typhoid fever (OPD client)

Table 4.5 below, shows logistic regression application to investigate factors influencing having heard of typhoid fever among out patient department interviewed participants. The socio-economic status indicator of 'Type of Toilet' at households influenced the factor of having heard of typhoid fever, as it had a significant association. Compared to OPD clients that had pit latrines at their household, individuals that had water-borne toilets were 3.2 times more likely to know about typhoid fever (OR 3.22, 95% CI 1.42-7.33, P value 0.005).

Table 4.5: Bivariate Analysis of Typhoid Fever Knowledge and Demographics of OPD clients

Covariates	Bivariate Analysis			Final Model		
	Odds Ratio	**95% CI**	**p-value**	**Odds Ratio**	**95% CI**	**p-value**
Sex of OPD Clients (ref: Female)						
Male	1.60	0.71 – 3.62	0.27			
Age group (ref: Age 15-19)						
20-25 years	1.81	0.72 – 4.51	0.25			
26-30 years	1.55	0.47– 5.06	0.40			
31-40 years	1.03	0.30 – 3.61	0.96			
Marital Status (ref: Married)						
Single	0.96	0.42 – 2.18	0.95			
Widowed	0.48	0.03 – 8.01	0.61			
Divorced	0.48	0.03 – 8.01	0.60			
Occupation (ref: Unemployed)						
Self-employed	0.35	0.13 – 0.89	0.07			
Employed	1.11	0.38 – 3.24	0.82			
Student	1.86	0.20 –17.43	0.58			
Farmer	0.56	0.08 – 3.72	0.56			
Toilet Type (ref: Pit Latrine)						
Water-borne toilet	3.22	1.42 – 7.33	0.05	3.22	1.42 –7.33	0.05

*Final Model: Logistic regression model describing the effect of Toilet Type on having heard of typhoid fever among OPD client at four Health Centres in Luanshya district.

4. 4 THE MARKETEERS INTERVIEW RESULTS

Table 4.6 shows that among the participants, females (94%) were more than male respondents (6%) were. On the transmission typhoid fever, 59% did not know anything, while 31% referred it to faecal oral route, 12% associated it to being an airborne infection and 1% of the respondents said it is a sexually transmitted infection.

Concerning the source of information on typhoid, 30% learnt of it through television programs, 17% from the health centre, 12% through radio and community interactions, while only 2% had read about it. Considering the responses, marketeers did not view the component of personal hygiene to be important (2%), while 31% said boiling water would prevent typhoid, 11% highlighted early treatment, lastly 36% did not know way of preventing typhoid. The marketeers' responses on how to handle suspected typhoid patient were as follows; 40% did not know what they would do, 56% mentioned water therapy as a way to treat a patient, at the same time 1% of the respondents stated that they would report to the nearest health centre.

The practice among the marketeers (n=121) is that 69% washed their hands after using the toilet while 31% did not wash there hands. However, 97% of respondents use water only while 1% use either soap or ashes respectively. Among marketeers, 24% boiled their drinking water, 73% chlorinated it and 3% did not treat it at all. Indiscriminate disposal of refuse is common in most market areas from the respondents (n=91) answers, 57% disposed off refuse in their surroundings, 37% in the rubbish pit and 6% in gardens for manure purposes. Farmers/villagers from rural areas were the main suppliers of vegetables and fruits to 80% marketeers in markets, whereas 16% sold vegetables and fruits grown with raw sewer in townships and 4% marketeers grow vegetables and fruits for sale in there yards.

Table 4.6: Socio Demographics, Knowledge and Practices (Marketeer Participants)

Characteristic	Study population (n=124)	
	Frequency/ percentage (%)	
SOCIAL – DEMOGRAPHICS		
Distribution of marketeers across gender (n=124)		
Female	116	93.5
Male	8	6.45
KNOWLEDGE ON TYPHOID FEVER		
Suggested mode of transmission (n=124)		
Didn't know	72	58.54
Fecal oral	35	28.05
Airborne	15	12.20
Sexual intercourse	2	1.22
Source of information on typhoid fever among marketeers (n=67)		
Radio	12	18.29
Television	26	39.02
Health centre	17	21.95
Reading	2	2.44
Community	12	18.03
Marketeers opinion on typhoid prevention (n=61)		
Boiling of drinking water	31	50.82
Early treatment	7	11.48
Hygiene	1	1.64
Did not know	22	36.07
Marketeers response to typhoid suspect (n=82)		
Did not know	33	40.24
Report to the nearest clinic	1	1.22
Water therapy	48	58.54
PRACTICES AMONG MARKETEERS		
Hand wash after toilet use among marketeers (n=121)		
Yes	83	68.65
No	37	30.65
What marketeers use for hand wash after toilet use (n=121)		
Soap	1	1.10
Ashes	1	1.10
Water only	117	96.70

Whether marketeer respondents treat their drinking water (n=124)		
Did	55	44.35
Did not	24	19.35
Sometimes	45	36.29
Treatment of water among marketeers (n=111)		
Didn't treat	3	2.86
Boil	27	24.29
Chlorinate	81	72.86
Where the marketeers dispose off their refuse (n=91)		
Garden	5	5.65
Surrounding	52	57.26
Refuse pit	34	37.10
Where sold vegetables and fruit are grown (n=120)		
Raw sewer	19	16.13
Homes	5	4.03
Villages/farms	96	79.84

*Table continuation: Some of the social demographic, knowledge, attitudes and practices among marketeers

4.4.1 Mean age across gender among marketeer participants

Figure 4.4.1 shows that from 124 participants, there were more female respondents, some of which were older than 50 years of age, compared to the males who were less than 40 years of age. The mean age of female respondents was 33 years, while for males was 28 years.

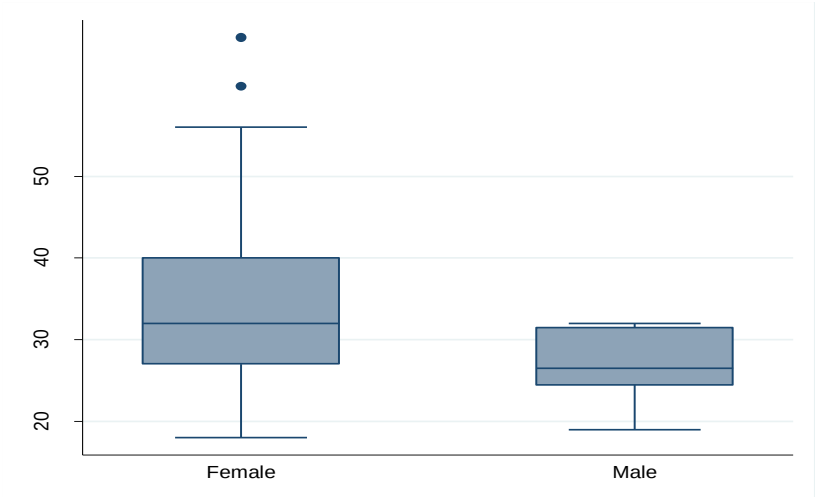
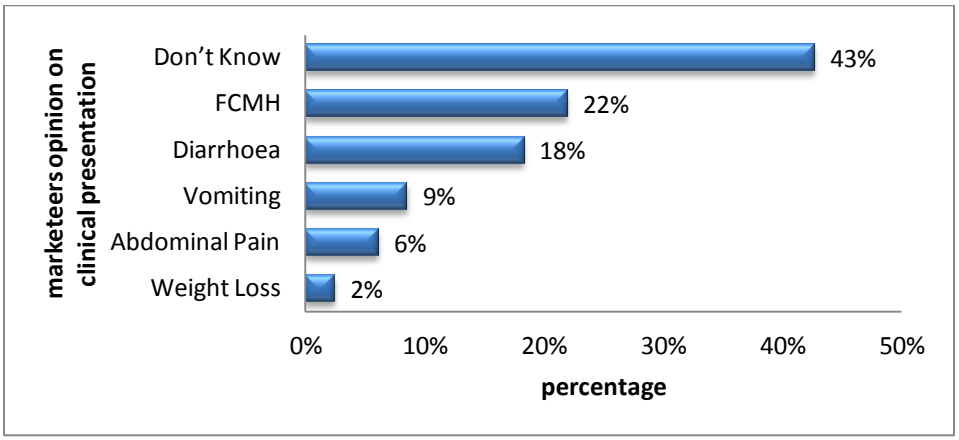


Figure 4.13: Mean Age across Gender of Marketeers

4.4.2 Marketeers Response on Clinical Presentation of Typhoid Fever

Figure 4.14 below shows that out of 82 respondents**,** 43% did not know any signs and symptoms of typhoid fever, whereas 22% mentioned four (FCMH) clinical presentations of the infection. The rest of respondents were the 18% who cited diarrhoea, 9% vomiting, 6% abdominal pains, lastly 2% singled out weight loss as clinical presentation of typhoid fever.



*** FCMH (fever, constipation, malaise, headache)**

Figure 4.14: Response on signs and symptoms of typhoid fever amongst marketeers

4.4.3 Marketeers Water Sources (n=124)

Figure 4.15 gives a picture of water sources from which the sampled marketeers get there water. The study revealed that 54% use piped water in there households, 44 % use water from shallow wells and the least use borehole water (2%).

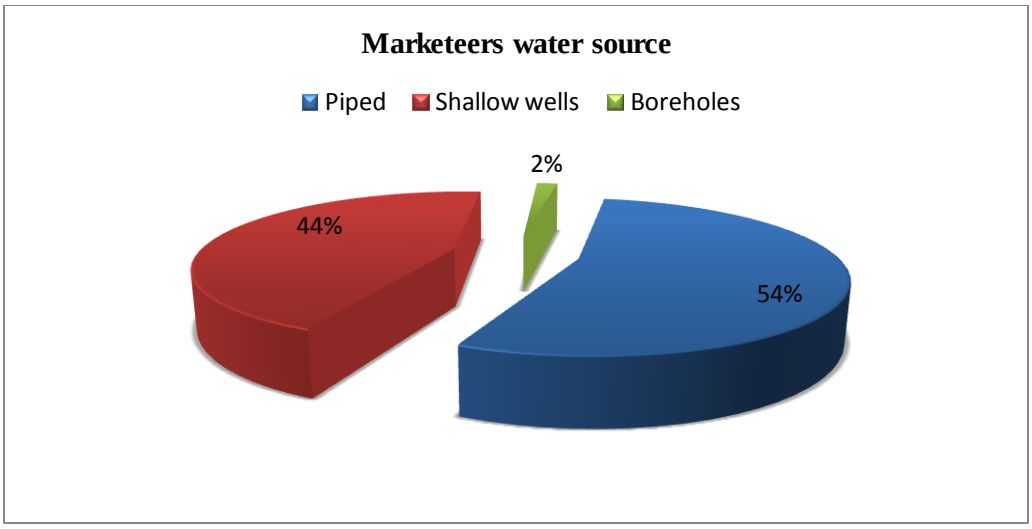


Figure 4.15: Marketeers Water Sources

4.4.4 Factors Influencing Knowing about Typhoid Fever among Marketeers

In our bivariate analysis (table 4.7), we determined the effect of individual covariates on the likelihood of knowing about typhoid fever and obtained odds ratios and p values. The resultant odds ratios and p values from the bivariate analysis indicated factors that constituted the final model and only factors with p values < 0.05 level of significance were included into the final model that described knowledge on typhoid fever among respondents. Among the marketeers interviewed from five markets in Luanshya district, was a comparison of individuals aged 18-25 years to marketeers aged 31-35 years old who were 4 times more likely to know about typhoid fever (Odds Ratio 3.7, 95% CI 1.2 - 11.4: P = < 0.024). In addition, marketeers aged 41-67 years old were 4 times more likely to know about typhoid fever (Odds Ratio 4.5, 95% CI 1.3-16.0: p = < 0.021). Those aged 26-30 and 36-40 were not significantly different from those in the reference group (18-25).

Table 4.7: Bivariate Analysis Results on Typhoid Fever Knowledge and Demographics of Marketeers.

Covariates	Bivariate Analysis			Final Model		
	Odds Ratio	**95% CI**	**p-value**	**Odds Ratio**	**(95% CI)**	**p-value**
Sex of Marketeer (ref: Female)						
Male	0.49	0.12 - 2.05	0.37			
Age group (ref: Age 18-25)						
26-30 years	1.27	0.42 - 3.80	0.66	1.38	0.45 - 4.20	0.52
31-35 years	3.39	1.12 - 10.35	0.02	3.69	1.19 - 11.44	0.04
36-40 years	2.98	0.74 - 11.93	0.13	3.25	0.80 - 13.15	0.08
41-67 years	4.12	1.17-14.50	0.08	4.49	1.2 - 19.01	0.01
Education (ref: No formal education)						
Primary	2.5	0.69 - 9.02	0.11			
Secondary	2.6	0.66 - 10.23	0.12			
Marital Status (ref: Married)						
Single	1.52	0.63 - 3.69	0.35			
Widowed	0.55	0.07 - 4.09	0.57			
Divorced	0.55	0.07 - 4.09	0.57			
Occupation (ref: Self-employed)						
Farmer	0.97	0.37 - 2.50	0.93			
Toilet Type (ref: Pit Latrine)						
Water-borne toilet	0.80	0.38 - 1.70	0.53			

*Final Model: Logistic regression model, describing the effect of Age on having heard of typhoid fever among marketeers in Luanshya district.

4.5 CHECKLIST RESULTS FROM 15 HEALTH FACILITIES

Table 4.8, results show that 20% (3 health facilities) of the 15 health facilities sampled had a defined isolation system, while 46.67% (7 health facilities) of the health facilities had qualified laboratory personnel and laboratory rooms. Only 27% (4 health facilities) had adequate laboratory reagents and inspection schedules displayed respectively at the time of the study. From the 15 health centres, 13.33% (2 health facilities) had food-sampling schedule on their work schedule. Water sampling activities and records of seized food items were rate at 6.67% (1 health facility) respectively. The study also found that 27% (4 health facilities) of the sampled health facilities had both schedule of activities and minutes of meetings. Finally, 20% (3 health facilities) of the sampled health centres had education schedules but only 13.33% (2 health facilities) had health education evaluation reports available.

Table 4.7: Health Centre Assessment Tool

Health Centre	1. Defined isolation system	2. Qualified lab tech	3. Lab Room	4. Adequate lab reagents	5. Health Inspection Schedule	6. Food Sampling Schedule	7. Water Sampling Schedule	8. Record of seized food items	9. Schedule of meetings	10. Minutes of meetings	11. Health education schedule	12. Health education evaluation reports	13. No. of Items present at Health Centre	14. Proportion of Items present at Health Centre (%)
1.													0	0
2.													8	67
3.													2	17
4.													0	0
5.													4	33
6.													4	33
7.													0	0
8.													5	42
9.													4	33
10.													0	0
11.													0	0
12.													7	58
13.													0	0
14.													8	67
15.													0	0
No. clinics reporting an item	**3**	**7**	**7**	**4**	**4**	**2**	**1**	**1**	**4**	**4**	**3**	**2**		
% HC reporting an item	**20**	**47**	**47**	**27**	**27**	**13**	**7**	**7**	**27**	**27**	**20**	**13**		

*Checklist Results: Assessment of Epidemic Preparedness activities in 15 Health Facilities of Luanshya District.

CHAPTER FIVE: DISCUSSION

5.1 Typhoid Fever Outbreaks (2009 to 2013)

Like other studies, this research found that typhoid cases were at their peak during rainy season (November to March), which could be attributed to possible high contamination of water, as the water table is high during rainy season (Radja, 2002). In addition, typhoid cases were reported in periods when temperatures are perceived to be high (September to November) this could be made possible as the bacterium multiplies more with warm temperatures. However, typhoid cases were recorded regardless of the season, implying that as long as the bacteria are present in the environment cases of typhoid fever would continue to spread and occur (Beyene, 2008).

It has been observed that typhoid fever cases were present between January to April 2009, thereafter no case was recorded until December of the same year, probably the relevant authority, such as Luanshya district health office, Luanshya municipal council and the water utility company could have put in necessary logistics to contain the disease. In addition, the people with the bacteria could have been treated, or due to antibiotics abuse the bacteria could not have been detected. However, in December 2009 there was a sharp rise of cases, since then (2009) their has been a continuous presence of typhoid fever cases in Luanshya district, though there was a fluctuating tendency of typhoid fever cases, the disease continued to occur suggesting that the disease is becoming endemic in the area.

The study also found that school going children aged 5 to 19 years were the most affected by typhoid in Luanshya district, and these results were similar to those of a study conducted in Nairobi, Kenya, which found more patients aged 6 to 17 years (Mweu, *et al.*, 2008).

These results give a good direction to policy makers and program implementers on the area of focus. In this vain, the Ministry of Community Development Mother and Child Health and Ministry of Education need to revamp and spearhead the school health services programs to prevent infections such as typhoid.

Older patients had recorded more deaths thereby different factors could have contributed to this event, among which are low immune system, late health seeking behaviour. We also note that females in the age range of 26 to 30 had significantly contributed to case fatality rate, youths most times prefer buying medicine from drug stores instead of having medical examination from a health facility. The total case fatality being 3% (2.90 %) implies that out of 100 confirmed cases of an outbreak there would be three deaths.

During 2009 to 2013 typhoid fever outbreaks, it was observed that many cases were from peri urban or high densely populated areas than those from urban areas, farms and villages. This is in line with the study conducted by WHO whose results indicated that the peri- urban areas were more at risk of having outbreaks of typhoid fever and other diarrhoeal infections (WHO, 2008). Similarly, a study conducted in Dhaka also found that urban slums recorded higher cases of typhoid fever (Vollaard, *et al*, 2004). The high number of cases in the densely populated areas is attributed to the poor quality of water supply, poor sanitation, overcrowding and poor health seeking behaviour.

5.2 Knowledge on Typhoid Fever

After analysing data, results showed that Health workers interviewed were knowledgeable of typhoid fever, though it gives a great concern that among the interviewed their were those who had not learnt of the infection and others had learnt of the infection during outbreaks. Health workers unaware of the infection could contribute to the spread of typhoid given the absence and insufficient laboratory services therefore the diagnosis could be missed. In addition, if refresher courses are not conducted in the among health workers there could be poor diagnosis and management of typhoid fever cases.

The OPD and marketeers were aware of typhoid fever existence in there areas but did not have adequate information on its signs and symptoms, transmission and the preventive measures. Therefore, such levels of unawareness are attributed lack of community sensitisation by the health workers and other relevant authorities such as Luanshya municipal council.

The study found that respondents among OPD clients who used waterborne toilet facilities presented a significant relationship with having heard of typhoid fever, it therefore indicates that an individual's economic status has an influence on having accesses to information. Besides, age factor of the respondents was found to have had an influence on their knowledge on typhoid fever, the middle aged and older people were more aware of the disease. This gives an impression to say people in their middle age and older ones tend to become concerned with their health. This is in comparison with a study conducted in Lusaka, people aged 40 and above were perceived to have been more concerned about health matters (Caroline, 2001)

5.3 Practices among Participants

Studies have highlighted the importance of educational campaigns for the control of typhoid but the inconsistence in the health education as observed in the study would contribute to the disease spread (Uneke, 2008). A study conducted in rural Egypt, showed that promotion of hand washing campaign alone had a great impact in the control of Typhoid Fever, however this study found that few people interviewed used soap for hand was after using the toilet. This gives much concern especially for the marketeers who handle food consumed by many people as a result they tend to be an important source of infection if left unchecked. Vegetables grown using sewer contaminated water is a potential of causing typhoid fever, therefore communities need continuous sensitisation on the dangers such a practice. If excreta and other refuses are not properly disposed, such have the potential of attracting flies, which can mechanically transfer the organism to food where the bacteria then multiply to achieve an infective dose.

5.4 Health Facility Infrastructure and Health Programs

Insufficient laboratory infrastructure, lack of equipment and reagents are a challenge for most developing countries (Lin, 2000). This study found that the health centres with laboratory facilities only conducted malaria and pregnancy test, while other suspected cases are referred to hospitals, where typhoid fever and other tests are conducted. Therefore, if no tests are conducted and typhoid is not treated, carriers would shade *Salmonella Typhi* in their excreta and spread it further.

The study also found that water, food sampling and testing were not programmed and conducted by the responsible officers (environmental health officers), the results were similar to the study conducted in Chawama, Lusaka Zambia (Chishimba, 2012). Close monitoring of water and sewer treatment by water utility company would ensure quality services to the community. If routine water sampling and testing is conducted at water sources from which people access there water, such as piped, borehole, well and the stream water then diseases would be contained. Food sampling and testing is also important in infection source tracing, moreover food handlers must be medically examined every six months, as it is law (Food and Drugs Act) and would contribute to disease prevention.

Educational campaigns on typhoid fever prevention and control or other infectious diseases were found to have contributed to behavioural change among the target groups hence reducing the infection incidences (Uneke, 2008). This study revealed that, community sensitization on health matters was done during the time of a given outbreak, thereby making it difficult for the community members to learn about the disease in a short period. Meetings are important in updating management on what is prevailing in any catchment area for monitoring and evaluation a given health event. Additionally, the recording of minutes on epidemic preparedness meetings and record keeping is important for reference purposes.

5.5 Study Limitations

- Secondary data (on typhoid cases) could have given underestimated or over estimated statistics as it was collected for other purposes.
- The results on the OPD clients and marketeers could not be generalised due to the small sample size.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Findings of this study gives a needed understanding on the distribution of typhoid fever over time, as well as knowledge and practices existing among health workers and community members in Luanshya district. Having found that typhoid fever cases were not just at their peak in the rainy season but continued in other months strengthens the hygiene hypothesis. Personal, institutional hygiene and laboratory test are most probable key drivers of typhoid outbreaks in Luanshya. Health promotion messages on typhoid fever need to be tailored towards improving personal and institutional hygiene processes. Community engagement could help strengthen the interventions given the existing awareness of typhoid fever in the communities interviewed. Further, the study informs policy makers on areas of focus in disease prevention and control in addition it opens up questions that need to be answered by doing additional research and with superior study designs.

6.2 Recommendations

I. **Interventions:** Ministries Of Health, Ministry of Community Development, Ministry of Local Government and Ministry of Education need to refocus and re-sharpen health promotion and education approaches to target most affected groups. Such approaches need to be grounded in community sensitive approaches. Community sensitization and awareness should be conducted routinely as opposed the outbreak periods only.

II. **Water and Sewerage:** The local authority (Luanshya Municipal Council) and the water utility company (Kafubu water and Sewerage Company) should ensure that safe water is provided to the community and sewer treated is done to the required standards.

Furthermore, ensure that the leaking or broken water and sewer pipes are repaired or replaced promptly to avoid water contamination.

III. **Surveillance:** The Ministry of Health and Ministry of Community Development Mother and Child Health to put up a functioning surveillance system for water quality, typhoid and infectious diseases.

IV. **Laboratory support:** Ministry of Health needs to ensure that laboratory facilities are well equipped, with laboratory equipment and reagents to effectively conduct laboratory investigations.

V. **Research**: More research need to be conducted in identifying risk factors contributing to continuous typhoid fever outbreaks, social and economic factors associated with typhoid in different parts of the country, Zambia.

VI. **Information Display:** In addition, the following information should be made available to the public, in areas such as schools, health centres, markets and churches.

How to avoid typhoid fever

- Avoiding intake of risky food and drinks
- Through vaccination against typhoid fever

Hygiene practices

- Washing hands with soap before eating and after using the toilet
- Cleaning hands with hand sanitizer containing 60% alcohol
- Avoiding close contact with affected persons, such as sharing eating utensils, cups or spoons.

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APPENDICES

Appendix 1: Interview Schedule for Health Workers

Section A: Personal Information

Questions	Coding categories
1. How old are you?	
2. Sex	1. Male 2. Female [ ]
3. What is your occupation?	Medical Doctor [ ] EHT Lab tech Clinical Officer Nurse Specify others….....

Section B: Level of Knowledge

Questions	**Coding categories**
1. Have you heard of typhoid fever? If not go to the next part.	1. Yes 2. No [ ]
2. Where did you acquire this information?	**1.** Workshop [ ] 2.Radio 3.Television 4. College/training institution 5. Other Specify….....
3. Have you ever gone for refresher training on prevention and control of typhoid fever?	1. Yes [ ] 2. No
4. Have you ever seen a typhoid fever patient?	1. Yes 2. No
5. If yes, what do you think is the causative agent of typhoid fever?	1. Bacterial agent [ ] 2. Viral agent 3. Protozoa 4. ……

6. How is it transmitted?	1. Faecal oral route [ ] 2. Airborne 3. Through mosquito bite 4. Other…..
7. What are the signs and symptoms of typhoid fever?	a. …….. b. …….. c. ……..
8. How can typhoid fever be prevented?	a. ..…… b. …….. c. …….....

Section C: Screening of Typhoid Fever Patients

Questions	Coding categories
What method do you use in diagnosis of typhoid fever	1. Clinical 2. Laboratory 3. Both clinical and laboratory [ ]
Do you have qualified laboratory personnel to conduct typhoid fever diagnosis?	1. Yes [ ] 2. No [ ]
Are the laboratory reagents always available?	1 Yes [ ] 2. No [ ]
Which age group is mostly affected with typhoid fever?	…… ……

Section D: Food Monitoring and Awareness Campaigns

1. Do you frequently collect food and water samples for analysis?	1. Yes [ ] 2. No [ ]
2. If yes how often is the sampling conducted?	1. Monthly [ ] 2. Once per quarter [ ]

	3. More than once per quarter [ ] 4. Others specify……
3. Have you been conducting awareness campaigns to the community?	1. Yes [ ] 2. No [ ] 3. I'm not sure [ ]
4. If yes how often have you been conducting the awareness campaign programs?	1. Monthly [ ] 2. Once per quarter [ ] 3. more than once per quarter [ ] 4. Others specify.....……..
5. If no what could be the reasons for not conducting the awareness campaign?	1. Inadequate personnel [ ] 2. Inadequate transport [ ] 3. Others specify…….....
6. What other measures has the health centre put in place to address the occurrences of typhoid fever?	1…… 2……
7. How would you rate the health centres response in addressing the persistent occurrences of typhoid fever in Luanshya District?	1. High [ ] 2. Average [ ] 3. Low [ ]
8. What do you think should be done to effectively address typhoid fever in Luanshya District?	…… …..…… …….……

Date ……../……/2013

Interviewee's Name ……..

Interviewer's Signature ……..

Appendix 2: Interview Schedule for OPD Clients

Part A: Demographic and Socio Economic Information

Questions	Coding categories (Tick were applicable)
1. How old are you?	…….
2. Sex	1. Male 2. Female [ ]
3. What is the highest education level you have attained?	1. Primary [ ] 2. Secondary 3. Tertiary 4. No formal education
4. What is your marital status?	1.Married [ ] 2.Single 3.Widowed 4.Divorced
5. What is your occupational status?	1. Farmer [ ] 2 .Employed 3 .Self employed 4 .Unemployed

Part B: Knowledge of typhoid fever

Questions	Coding categories
1. Have you ever heard of typhoid fever before? If not go to the next part.	1. Yes [ ] 2.No [ ]
2. If yes how is typhoid fever transmitted?	1.Faecal and oral route [ ] 2.By Skin contact 3.Airborne 4.Mosquito bite

	5. Other……
3. What are the signs and symptoms of typhoid fever?	1. Sustained fever, constipation, malaise Headache [ ] 2.Vomiting 3. weight lose 4.Loss of sight and memory 5. Other…….
4. What type of disease can typhoid fever be mistaken for?	1.Malaria [ ] 2.Dysentery 3.Cholera 4.I don't know Other ……
5. What happens to an infected person with Typhoid fever who is untreated for a long period?	1.Develop immune resistance [ ] 2.Become a health carrier 3.Can recover 4. Other…… ……..
6. How do you respond to a patient who exhibits signs of suspected typhoid fever?	1.Administer medication [ ] 2.Provide water therapy 3.Report to nearest health facility 4.Don't know
7. Do you think that typhoid fever can be prevented?	1. Yes [ ] 2. No 3. I Don't know
8. How can typhoid fever be prevented?	1. Boiling drinking water [ ] 2. Proper disposal of excreta 3. By sleeping under an insecticide treated mosquito net 4. Other…..
9. How did you know about typhoid fever	1.Radio programs [ ]

signs, mode of spread and prevention	2.Television 3At health Centre 4.Reading 5Other …….

10. How do you think typhoid fever can be prevented?	1. Boiling drinking water [ ] 2. Proper disposal of excreta 3. By sleeping under an insecticide treated mosquito net 4. Other……
11. Who do you think are responsible for the prevention of typhoid fever?	1.Ministry of health/ community development mother and child health 2. Water utility company 3. Everyone 4. Other……

Part C: Water Supply and Sanitation.

Questions	Coding categories
2. What is the source of your drinking water?	1. Piped water [ ] 2. Shallow well 3. Stream 4. Other ……
3. Do you always treat your drinking water?	1. Yes [ ] 2. No 3. Sometimes
4. If yes, how do you treat drinking water?	1.Boiling [ ] 2.Chemical treatment (chlorine) 3. Other ……

5. Do you have a toilet facility at your house?	1. Yes [ ] 2. No
6. If yes what type of toilet facility do you have?	1.Pit latrine 2.Waterborne toilet 3.Communal toilet
7. How many people use the toilet facility?	1.Less than 10 people/toilet [ ] 2.More than 10 people/toilet [ ]
8. Do you wash hands after using the facility?	1. Yes [ ] 2. No [ ]
9. If yes what type of cleaning material do you use?	1. Soap [ ] 2. Ash [ ] 3 Water only [ ]
10. Where do you dispose off the household refuse?	1. Sewage system 2. Garden 3. Surrounding 4. Rubbish pit

Part D. Management of Typhoid Fever

1. Have you ever seen anybody who suffering from typhoid?	1. Yes [ ] 2. No [ ]
2. Has any member of your family suffered from typhoid fever?	1. Yes [ ] 2. No [ ]
3. Have you ever suffered from typhoid fever?	1. Yes [ ] 2. No [ ]
4. Did you seek medical attention at health Centre?	1. Yes [ ] 2. No [ ]
5. Was the treatment promptly given?	1. Yes [ ] 2. No [ ] 3. Other ……..

Thank you for Your Response

Date ……./……/2013

Interviewers Signature……

Appendix 3: Interview Schedule for Marketeers

Part A: Demographic and Socio Economic Information

Questions	Coding categories (Tick were applicable)
1. How old are you?	……
2. Sex	1. Male 2. Female [ ]
3. What is the highest education level you have attained?	1. Primary [ ] 2. Secondary 3. Tertiary 4. No formal education
4. What is your marital status?	1.Married [ ] 2.Single 3.Widowed 4.Divorced
5. What is your occupational status?	1. Farmer [ ] 2 .Employed 3 .Self employed 4 .Unemployed 5. Other……

Part B: Knowledge of typhoid fever

Questions	Coding categories
1. Have you ever heard of typhoid fever before? If not go to the next part.	1. Yes [ ] 2.No [ ]
2. If yes how is typhoid fever transmitted?	1.Faecal and oral route [ ] 2.By Skin contact 3.Airborne 4.Mosquito bite 5. Other……..
3. What are the signs and symptoms of typhoid fever?	1. Sustained fever, constipation, malaise Headache [ ] 2.Vomiting 3. weight lose 4.Loss of sight and memory 5. Other…….
4. What type of disease can typhoid fever be mistaken with?	1.Malaria [ ] 2.Dysentery 3.Cholera 4.I don't know Other ……
5. What happens to an infected person with Typhoid fever who is untreated for a long period?	1.Develop immune resistance [ ] 2.Become a health carrier 3.Can recover 4. Other…… ……..
6. How do you respond to a patient who exhibits signs of suspected typhoid fever?	1.Administer medication [ ] 2.Provide water therapy 3.Report to nearest health facility 4.Don't know

7. Do you think that typhoid fever can be prevented?	1. Yes [ ] 2. No 3. I Don't know
8. How can typhoid fever be prevented?	1. Boiling drinking water [ ] 2. Proper disposal of excreta 3. By sleeping under an insecticide treated mosquito net 4. Other……
9. How did you know about typhoid fever signs, mode of spread and prevention	1.Radio programs [ ] 2.Television 3.At health Centre 4.Reading 5. Other ……..

10. How do you think typhoid fever can be prevented?	1. Boiling drinking water [ ] 2. Proper disposal of excreta 3. By sleeping under an insecticide treated mosquito net 4. Other……
11. Who do you think are responsible for the prevention of typhoid fever?	1.Ministry of health/ community development mother and child health 2. Water utility company 3. Everyone 4. Other……

Part C: Water Supply and Sanitation.

Questions	Coding categories
2. What is the source of your drinking water?	1. Piped water [ ] 2. Shallow well 3. Stream 4. Other ……
3. Do you always treat your drinking water?	1. Yes [ ] 2. No 3. Sometimes
4. If yes, how do you treat drinking water?	1.Boiling [ ] 2.Chemical treatment (chlorine) 3. Other ……
5. Do you have a toilet facility at your house?	1. Yes [ ] 2. No
6. If yes what type of toilet facility do you have?	1.Pit latrine 2.Waterborne toilet 3.Communal toilet
7. How many people use the toilet facility?	1.Less than 10 people/toilet [ ] 2.More than 10 people/toilet [ ]
8. Do you wash hands after using the facility?	1. Yes [ ] 2. No [ ]
9. If yes what type of cleaning material do you use?	1. Soap [ ] 2. Ash [ ] 3 Water only [ ]
10. Where do you dispose off the household refuse?	1. Sewage system 2. Garden 3. Surrounding 4. Rubbish pit

11. Where are vegetables and fruits you sale grown from.	1.Sewage 2.Homes 3.Farmers from villages 4. Other…….
12. Where do you draw for gardening?	1.Tap 2.Well 3. Other……

Part D. Management of Typhoid Fever

1. Have you ever seen anybody who suffering from typhoid?	1. Yes [ ] 2. No [ ]
2. Has any member of your family suffered from typhoid fever?	1. Yes [ ] 2. No [ ]
3. Have you ever suffered from typhoid fever?	1. Yes [ ] 2. No [ ]
4. Did you seek medical attention at health Centre?	1. Yes [ ] 2. No [ ]
5. Was the treatment promptly given?	1. Yes [ ] 2. No [ ] 3. Other ……..

THANK YOU FOR YOUR RESPONSE

Date ……./……/2013

Interviewers signature ……

Appendix 4: Checklist

Checklist for Health Center on typhoid fever Management and control

Name of Institution: University of Zambia, School of Medicine.

Name of interviewer: ……

Date of data collection:……..……/……/ 2013

SCREENING OF TYPHOID FEVER PATIENTS			
	Present	Not Present	Comments
Laboratory Room			
Qualified Lab Personnel			
Adequacy of Lab Reagents			
FOOD AND WATER MONITORING			
Health Inspection Schedule	Present	Not Present	
Food Sampling Schedule	Present	Not Present	
water sampling schedule			
Records of Seized food items	Present	Not Present	
EPIDEMIC PREPAREDNESS MEETINGS			
Schedule of Meetings	Present	Not Present	
Minutes of Meetings	Present	Not Present	

HEALTH EDUCATION AND AWARENESS PROGRAMME			
Health Education Schedule	Present	Not Present	
Health Education Evaluation Reports	Present	Not Present	

Appendix 5: Permission Letter from Assistant Dean, Postgraduate

THE UNIVERSITY OF ZAMBIA
SCHOOL OF MEDICINE

Telephone: 252641
Telegram: UNZA, Lusaka
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Email: selestinenzala@yahoo.com

P.O. Box 50110
Lusaka, Zambia

==========

03rd September, 2013

Ms Priscilla Mweetwa
Department of Public Health
School of Medicine
LUSAKA

Dear Ms Mweetwa,

RE: GRADUATES PROPOSAL PRESENTATION FORUM (GPPF)

Having assessed your dissertation entitled **"Assessment of Factors Associated with Typhoid Fever Occurrence in Luanshya District".** We are satisfied that all the corrections to your research proposal have been done. The proposal meets the standard as laid down by the Board of Graduate Studies.

You can proceed and present to the Research Ethics.

Yours faithfully,

Dr. S.H. Nzala
ASSISTANT DEAN, POSTGRADUATE

CC: HOD – Public Health

UNIVERSITY OF ZAMBIA
SCHOOL OF MEDICINE
03 SEP 2013
ASSISTANT DEAN (PG)
P.O. BOX 50110, LUSAKA

ERES CONVERGE

33 Joseph Mwilwa Road
Rhodes Park, Lusaka
Tel: +260 955 155 633
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Cell: +260 966 765 503
Email: eresconverge@yahoo.co.uk

I.R.B. No. 00005948
F.W.A. No. 00011697

23rd October, 2013

Ref. No. 2013-Sept-003

The Principal Investigator
Ms. Priscilla Mweetwa
The University of Zambia
Dept. of Public Health
P.O. Box 50110,
LUSAKA.

Dear Ms. Mweetwa,

RE: Assessment of Factors associated with Typhoid Fever occurrence in Luanshya District.

Reference is made to your corrections dated 22nd October, 2013. Noting that all concerns have been addressed the IRB resolved to approve this study and your participation as Principal Investigator for a period of one year.

Review Type	Ordinary	Approval No. **2013-Sept-003**
Approval and Expiry Date	Approval Date: 23rd October, 2013	Expiry Date: 22nd October, 2014
Protocol Version and Date	Version-Nil	22nd October, 2014
Information Sheet, Consent Forms and Dates	• English.	22nd October, 2014
Consent form ID and Date	Version-Nil	22nd October, 2014
Recruitment Materials	Nil	22nd October, 2014
Other Study Documents	Interview schedules, Checklist.	22nd October, 2014
Number of participants approved for study	240	22nd October, 2014

Specific conditions will apply to this approval. As Principal Investigator it is your responsibility to ensure that the contents of this letter are adhered to. If these are not adhered to, the approval may be suspended. Should the study be suspended, study sponsors and other regulatory authorities will be informed.

Conditions of Approval

- No participant may be involved in any study procedure prior to the study approval or after the expiration date.
- All unanticipated or Serious Adverse Events (SAEs) must be reported to the IRB within 5 days.
- All protocol modifications must be IRB approved prior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address.
- All protocol deviations must be reported to the IRB within 5 working days.
- All recruitment materials must be approved by the IRB prior to being used.
- Principal investigators are responsible for initiating Continuing Review proceedings. Documents must be received by the IRB at least 30 days before the expiry date. This is for the purpose of facilitating the review process. Any documents received less than 30 days before expiry will be labelled "late submissions" and will incur a penalty.
- Every 6 (six) months a progress report form supplied by ERES IRB must be filled in and submitted to us.
- ERES Converge IRB does not "stamp" approval letters, consent forms or study documents unless requested for in writing. This is because the approval letter clearly indicates the documents approved by the IRB as well as other elements and conditions of approval.

Should you have any questions regarding anything indicated in this letter, please do not hesitate to get in touch with us at the above indicated address.

On behalf of ERES Converge IRB, we would like to wish you all the success as you carry out your study.

Yours faithfully,
ERES CONVERGE IRB

Mrs. M.M Mbewe
RNM, DNE, BSc., M.Ed.
ACTING CHAIRPERSON

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I.R.B. No. 00005948
F.W.A. No. 00011697

15th April, 2014

Ref. No. 2013-Sept-003

The Principal Investigator
Ms. Priscilla Mweetwa
The University of Zambia
Dept. of Public Health
P.O. Box 50110,
LUSAKA.

Dear Ms. Mweetwa,

RE: Amendment: Assessment of Factors associated with Typhoid Fever occurrence in Luanshya District.

We acknowledge receipt of your letter dated 8th April, 2014.

The amendments are approved as submitted.

Yours faithfully,
ERES CONVERGE IRB

Dr. E. Munalula-Nkandu
BSc (Hons), MSc, MA Bioethics, PgD R/Ethics, PhD
CHAIRPERSON

PHO/CB/101/1/1

REPUBLIC OF ZAMBIA
MINISTRY OF HEALTH
COPPERBELT PROVINCIAL HEALTH OFFICE
P. O. BOX 70032, PWD YARD, KABOMPO ROAD, NDOLA
Tel: (260) 2 681274 Fax: (260)680953

November 12, 2013

The Principal Investigator
Ms. Priscilla Mweetwa
The University of Zambia
Dept. Of Public Health
P. O. Box 50110
LUSAKA

Dear Madam

Re: **ASSESSMENT OF FACTORS ASSOCIATED WITH TYPHOID FEVER OCCURRENCE IN LUANSHYA**

Reference is made to the captioned subject.

We hereby acknowledge receipt of your letter dated November 6, 2013 in which you are requesting for permission to conduct a research on the above stated subject.

This office has no objection to your request. However, we urge you adhere to the conditions given by the Ethics Committee.

Yours faithfully
PROVINCIAL HEALTH OFFICE

Dr. Lyapa Sikazwe
A/PROVINCIAL MEDICAL OFFICER
COPPERBELT PROVINCIAL HEALTH OFFICE
MINISTRY OF HEALTH

LUANSHYA MUNICIPAL COUNCIL

TOWN CLERK
TELEFAX: +260 212 511950

CIVIC CENTRE
FOURTEENTH STREET
P O BOX 80140
LUANSHYA
ZAMBIA

YOUR REF:

OUR REF:

13th November, 2013

Ms Priscilla Mweetwa
C/O University of Zambia
P.O.BOX 50110
LUSAKA

Dear Sir/Madam

RE: REQUEST TO INTERVIEW THE LOCAL COMMUNITY/COUNCIL REPRESENTATIVE ON LAND POLICY/ PROCESS

The above captioned matter refers.

Council raises no objection to your request to interview the local community and Council representative on land policy process.

Yours Faithfully
LUANSHYA MUNICIPAL COUNCIL

M K SIMBAO
DIRECTOR ADMINISTRATION

Cc: Commanding Officer- Luanshya

Republic of Zambia
Ministry of Community development, Mother and Child Health
LUANSHYA DISTRICT COMMUNITY HEALTH MANAGEMENT TEAM
P O BOX 90170
LUANSHYA

Tel: 512779 Fax: 512900

22nd July, 2013

The Postgraduate Coordinator
University of Zambia
School of Medicine
Department of Public Health
PO Box 50110
LUSAKA

Dear Sir

RE: REQUEST FOR PERMISSION FOR MASTERS OF PUBLIC HEALTH STUDENT IN LUANSHYA DISTRICT – PRISCILLA MWEETWA: TO COLLECT DATA

We are in receipt of the above stated letter dated 13th March 2013 from your Institution.

Luanshya District Community Development Mother and Child Health department is not against the proposal - Data collection to help in her research study as long the proposal is approved by the Ethics Committee.

Thank you.

Yours faithfully
LUANSHYA DISTRICT COMMUNITY HEALTH MANAGEMENT TEAM

DR P. MULENGA
District Medical Officer

REPUBLIC OF ZAMBIA
MINISTRY OF COMMUNITY DEVELOPMENT
MOTHER AND CHILD HEALTH
22 JUL 2013
DISTRICT MEDICAL OFFICER
L.D.C.H.M.T
P.O. BOX 90170 LUANSHYA