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SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF GHANA

ASSESSMENT OF HOUSEHOLD CONTACT INVESTIGATION FOR TUBERCULOSIS; A CASE STUDY OF BONGO DISTRICT, UPPER EAST REGION

BY

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THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA IN PARTIAL FULFILMENT OF THE REQUIREMENT TO THE AWARD OF MASTER OF SCIENCE PUBLIC HEALTH MONITORING AND EVALUATION DEGREE

JANUARY 2023

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DECLARATION

I, **Stanley Mangortey** declare that this work is of my own research under the supervision of Prof. Justice Moses K. Aheto. Literatures from studies by other people have been duly cited.

For another degree, the whole or part of this work has not been presented to any other institution.

…… …….

Stanley Mangortey **Prof. Justice Moses K. Aheto**

(Student) (Supervisor)

Date: 17th January 2023 Date: 17th January 2023

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DEDICATION

I dedicate this work to my lovely wife, Rebecca Abigail Mangortey and our precious daughter Gabrielle Kierra Dede Mangortey. Thank you for the sacrifices, prayers, and the support.

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ACKNOWLEDGEMENT

In the first place, I owe a great debt of gratitude to the Almighty God for His infinite love and mercies in allowing me to get this far. Prof. Justice Moses K. Aheto, my supervisor, deserves my heartfelt gratitude for his tremendous commitment, direction, intentional effort, and supervision during this study. I sincerely want to appreciate my parents and siblings for their immense support and continued prayers in making this dream a reality. I want to acknowledge my HOD and the entire faculty of the School of Public Health, Monitoring and Evaluation. Finally, I'd want to thank my course mates for their encouragement and support, as well as the participants who agreed to engage in this research project.

God bless you all for making this a success.

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List of Abbreviations

AIDS	Acquired Immunodeficiency Syndrome
DHD	District Health Directorate
DHIMS2	District Health Information Management System 2
GHS	Ghana Health Service
HIV	Human Immunodeficiency Virus
MDR-TB	Multi-Drug Resistant Tuberculosis
NTP	National Tuberculosis Control Programme
PLHIV	Persons Living with HIV
TB	Tuberculosis
TPT	Tuberculosis Preventive Therapy
WHO	World Health Organisation

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Abstract

Background: Globally, Tuberculosis, caused by *Mycobacterium Tuberculosis* is still considered as an infectious disease with great public health concern especially in low- and middle-income countries. An estimated 10 million people worldwide fell ill with Tuberculosis in 2020. This included an estimated 44,000 people who developed TB in Ghana. A second national TB prevalence survey conducted in Ghana in 2013 revealed that the disease burden was four times higher than the estimation made by the WHO thus 290 cases per 100,000 population instead of 71 cases per 100,000 population. The main objective of this study is to evaluate TB contact investigation process, its impact on case notification and its implementation challenges in the Bongo District of the Upper East Region.

Methodology/Design: Mixed qualitative and quantitative methods were used to conduct an observational and cross-sectional study. Records of 46 Bacteriologically Confirmed Index TB Cases tested between March to June 2022 in the Bongo district were reviewed and evaluated for Household Contact Investigation. One focus group discussion was conducted to determine the challenges associated with household contact investigation. Participants included 7 health workers directly involved in household contact investigation.

Results: A total of 261 close household contacts were identified and screened for TB across the six sub-districts in the Bongo District. Out of this number, 94 of the contacts had presumptive TB but only 55 of them were able to produce sputum samples for test. Seven samples were rejected due to insufficient quantity and poor quality. The remaining 48 samples were tested using Gene Xpert Machine during which 4 new TB cases were detected. Sixty-five (65) contacts were needed to be screened to detect a positive case while 12 samples were needed to be tested to detect a

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positive case. Twenty-seven contacts were initiated on Isoniazid to prevent them from developing active TB. Household contact investigation challenges identified in this study are inadequate number of trained health workers for TB household contact investigation, limited means of transport and fuel, periodic shortage of sputum containers, TB screening tools and laboratory request forms, inability of some presumed TB contacts to produce sputum for examination, delay in receiving test results caused by periodic shortage of Gene Xpert Cartridges, limited number staff assigned for sputum examination and fear of stigma and discrimination.

Conclusion: Health workers in the Bongo District abide by international protocols when conducting household contact investigation. This study further confirms the impact of household contact investigation in TB case detection however, there is the need for a multi-level stakeholder engagement at all levels to address the numerous challenges facing household contact investigation in Ghana.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Tuberculosis (TB), an infectious airborne disease still remains a global public health challenge especially in low- and middle-income countries (WHO, 2022: Singh et al., 2013). This contagious bacterial disease is caused by *Mycobacterium Tuberculosis.* Tuberculosis mostly attacks the lungs (Pulmonary Tuberculosis) but can affect any other part of the body known as Extra Pulmonary Tuberculosis (Beyanga et al., 2018).

According to the 2021 Global Tuberculosis Report, an estimated 10 million people worldwide fell ill with Tuberculosis in 2020. Of the total infections, 5.6 million were men, 3.3 million females and 1.1 million children under 15 years of age (Global TB Report, 2021). Tuberculosis occurs in every country globally and in 2020, about 43% of the global new cases occurred in the WHO South-East Asian Region, 25% in the WHO African Region and 18% in the Western Pacific Region (Global TB Report, 2021).

For the past decades, Tuberculosis has consistently been ranked among the top 10 leading causes of death globally. In 2020, Tuberculosis became the 13th leading cause of death and the second leading infectious killer after COVID-19 and above HIV/AIDS. A total of 1.5 million people worldwide died from Tuberculosis in 2020. This included 214,000 people living with HIV (WHO, 2022).

According to the Stop TB Partnership 2020 Tuberculosis Situational Report, an estimated 44,000 people developed TB in Ghana. Among those infected with the disease were 6,600 children and 8,100 persons living with HIV. Tuberculosis is the fourth leading cause of death among

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communicable, maternal, neonatal and nutritional diseases in Ghana. In Ghana, an estimated 10,000 people died because of Tuberculosis in 2020. In 2019, the incidence of Tuberculosis in Ghana was 144 per 100,000 populations (Stop TB Partnership Situational Report, 2020).

The mode of transmission of Tuberculosis is from person to person through the air. When a person infected with Pulmonary TB (also known as Lung or Bacteriologically Confirmed TB) coughs, sneezes, spit, sings or speaks, they propel the TB germs into the air. Any person who inhales these droplets may become infected. The WHO estimates that about one-quarter of the world's population has latent TB infection. These people although infected by the TB bacteria do not have active TB disease and cannot transmit it.

People with Latent TB infection have a lifetime risk of 5-10% of developing TB disease. People living with HIV, diabetes, malnutrition and tobacco users also have a higher risk of developing TB due to a compromised immunity. Common symptoms of TB include; cough, fever, night sweat and significant unplanned weight lost. TB is curable and can be prevented. In Ghana, TB screening, diagnosis and treatment services are provided free of charge at no cost to the patient. This is championed by the National TB Control Programme (NTP) in partnership with the Ghana Health Service and other stakeholders.

1.1.1 Tuberculosis Contact Investigation Guidelines

The World Health Organization has in recent years recommended household contact investigation as an effective key component in containing the disease in low incidence countries (Beyanga et al., 2018). It ensures that household contacts with active TB are quickly identified and put on treatment to break the transmission chain and produce desirable treatment outcomes.

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In many countries across the world, household contact investigation is carried out as a routine activity with no clear policy and implementation guidelines; there is no definite definition of who constitute a close contact and the number of contacts to screen per an index client (Hwang, Ottmani, & Uplekar, 2011). In Ghana, the National TB Control Program and the Ghana Health Service has a country specific guideline which stipulates that at least four close household contacts of all Pulmonary TB clients should be screened at most two weeks after detecting and initiating the primary case on TB treatment (GNTP Annual Report, 2020)

1.1.2 Contribution of Household Contact Investigation in TB Case Detection

Household contact investigation has been proven to contribute significantly to TB case detection globally; in the Rajnandgaon district of India, household contact screening contributed additional 63% of TB cases compared to passive case detection alone (Khaparde et al., 2015; Pothukuchi et al., 2011). In a peri-urban population of South Delhi; India, Singh et al., (2013) reported 52 (62.7%) TB infections among first-degree relatives (contacts) of Index TB Patients, 18 (34.6%) infections among second-degree relatives and 12 infections among household contacts who were spouses of Index TB Patients (Singh et al., 2013).

Household contact investigation conducted from August to December 2016 in the Mwanza city of Tanzania contributed 29 Bacteriologically Confirmed cases among the 456 contacts screened (Beyanga et al., 2018). Another study conducted in the Greater Accra Region of Ghana by Ohene et al., (2018) reported that contact investigation yielded 53 cases out of 8,166 contacts of 3,267 Index TB clients screened. These studies shows that household contact investigation has the potential to contribute significantly to TB case detection when conducted properly.

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1.1.3 Household Contact Investigation Challenges

Despite the positive impact of TB household contact investigation on case finding, the practice is faced with numerous challenges. Some of these challenges in Ghana and other parts of the world include; inadequate personal protective equipment, harassment by some contacts, stigmatization, delay in processing test results, difficulty in locating contacts, inadequate staffing, poor remuneration, language barrier and transportation challenges among others (Asare et al., 2023; Ohene et al., 2018; Afum et al., 2021)

1.2 Problem Statement

Tuberculosis household contact investigation ensures early case detection and treatment which breaks further transmission and produce successful treatment outcomes. Despite the numerous challenges associated with household contact tracing, several studies have demonstrated the positive impact of household contact tracing when conducted according to approved guidelines. Khaparde et al., (2015) reported 63% contribution of household contact investigation to case detection compared to passive case finding. Singh et al., (2013) reported the detection of 52 (62.7%) TB cases among first-degree contacts, 18 (34.6%) cases among second-degree contacts and 12 cases among household contacts who were spouses of Index TB Patients (Singh et al., 2013). Jerene et al., (2015) reported 2.5% TB cases among 15,527 contacts screened.

In South Africa, out of the 259 TB close contacts screened, 47.1% of them underwent clinical diagnoses while 17 new TB cases were detected among them (Kigozi, Heunis, & Engelbrecht, 2019). Within a period of five months (August to December 2016), household contact tracing contributed 29 cases in the Mwanza city of Tanzania (Beyanga et al., 2018). Ohene et al., (2018) reported a 53 TB cases among household contacts within the Greater Accra Region of Ghana.

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Several interventions adopted by the National TB Control Programme and the Ghana Health Service (GHS) to increase TB case detection across the country including TB Contact Investigation has not yielded the much-desired results as many cases are missed annually (NTP Annual Report, 2020). Literature search on household contact tracing conducted in the Bongo District and the Upper East Region in general did not return any useful results although this practice is routinely carried out across the entire region.

The Bongo District where this research will be conducted has for over the past three years recorded a steady increase in the number of Bacteriologically Confirmed TB Cases; from 42 cases in 2018 to 60 and 89 cases respectively in 2019 and 2020 (DHIMS2). Out of the 191 TB cases detected over the three year period, household contact tracing contributed only about 14.7% (28) of the total cases (Bongo DHD Annual Report, 2021). With this abysmal performance of contact tracing in the districts, there is the need to conduct this study to determine whether contact tracing protocols and guidelines are adhered to in the Bongo district and its associated challenges.

1.3 Research Questions

1. Is TB contact investigation conducted according to national guidelines (Protocols) in the Bongo District of the Upper East Region?
2. What is the contribution of TB contact investigation on case notification in the Bongo District of the Upper East Region?
3. What are the implementation challenges of TB contact investigation in the Bongo District of the Upper East Region?

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1.3.1 General Objective

The main objective of this study is to evaluate TB contact investigation process, its impact on case notification and its implementation challenges in the Bongo District of the Upper East Region.

1.4 Specific Objectives

1. To evaluate the implementation strategy of TB Case contact investigation in the Bongo District of the Upper East Region.
2. To determine the relationship between TB contact investigation and TB case notification in the Bongo District of the Upper East Region.
3. To determine TB contact investigation implementation challenges in the Bongo District of the Upper East Region.

1.5 Justifications and Significance of the Study

In 2020, about 31,326 TB cases were missed. Research has shown that untreated TB patients have the potential of infecting about 5-10 healthy close contacts within a year. Household contact investigation when appropriately conducted ensures early TB case detection and treatment. This is very essential in breaking the transmission chain, TB related deaths (10,000 deaths in 2020) and MDR-TB.

TB household contact investigation is not optimally implemented in the Upper East Region of Ghana. This has necessitated the need to conduct this study to evaluate the current contact investigation implementation strategy, identify the implementation challenges and make recommendations for improvement focusing on the Bongo District.

Findings of this study will be used by Ghana Health Service and the National TB Control Programme to increase TB case notification in Ghana.

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CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter contains a review of very relevant studies conducted globally on TB contact investigation. The major findings of these articles are further classified into; contact investigation policies adopted globally, impact of contact investigation on TB case detection and the challenges of implementing TB contact investigation in different settings. Literature search was done in Google Scholar, PubMed, Scopus, Science Direct and the Journal of Infectious Lung Diseases.

2.1 TB Contact Investigation Implementation Policy

Household contact investigation though not optimal, is conducted in almost all the sixteen (16) regions of Ghana. The National TB Control Program supports regions with funding and strategic leadership to conduct contact investigation for all bacteriologically confirmed TB cases across the country. Although there is a guideline of the minimum number of expose contacts of each case to be screened, there is no clear policy document on contact investigation in Ghana.

In January 2009, a research questionnaire was prepared and sent to all National TB Control Program Managers in 192 countries to assess the availability of standardised policy guidelines for TB index client household contact investigation in their respective countries. Out of the 192 countries, only 69 responded to the survey questionnaire and nearly 44% of the countries that responded were either low- or lower middle income while nine (13%) were classified as high TB burden countries. Sixty-five countries (94%) reported that contact investigation was part of their national TB policy, and 59 (86%) claimed that contact investigation was carried out as a routine procedure. However, among countries that responded in the affirmative, nine (14%) had an unclear or no definition of an index TB case, and 18 (28%) had an unclear or no definition of a contact.

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Only 27 (48.2%) countries said community workers were used for contact investigations, whereas 49 (88%) said that the staff asked index cases to bring contacts. Two thirds (*n* = 38, 66%) reported using a clinical examination first in the screening of contacts. Forty-eight (83%) reported use of a tuberculin (purified protein derivative) test, and 55 (93%) said isoniazid preventative therapy (IPT) was provided for TB contacts (Hwang, Ottmani, & Uplekar, 2011).

2.2 Impact of TB Contact Investigation on Case Notification

Contact investigation is highly important in finding contacts of people who have Tuberculosis (TB) disease so that they can be given treatment and stop further transmission especially in high burden settings (Abongo, Ulo, & Karanja, 2020; Beyanga et al., 2018; Velen, Shingde, Ho, & Fox, 2021). Several studies have established the significance of TB household contact investigation (Bartu, 2016). One of such research is Jerene et al., 2015. The aim of this study was to determine the yield of Tuberculosis household contact investigation in two regions of Ethiopia under routine program conditions. The researchers screened 15,527 household contacts of 6,015 bacteriologically confirmed TB cases in the regions of Oromia and Amhara between April 2013 and March 2014. The findings revealed 6.1% of the contacts had presumptive TB, 2.5% were diagnosed with All Forms of TB (40 contacts needed to be screened to detect a new case) while 0.76% were diagnosed with Pulmonary TB (132 contacts needed to be screened to detect a case). Out of 1687 eligible children aged <5, 323 were started on TB Preventive Therapy (TPT). The study concluded that the yield of household contact investigation was 10 times higher than the estimated prevalence in the general population and that household contact investigation when properly conducted can serve as the entry point for childhood TB care (Fair, Miller, Ottmani, Fox, & Hopewell, 2015; Jerene et al., 2015).

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A similar study was conducted to determine the yield of systematic household contact investigation for TB in a high burden metropolitan district of South Africa. Out of the 259 TB close contacts screened, 47.1% of them underwent clinical diagnoses and 17 new TB cases were detected among them. As little as fifteen contacts were needed to be screened to detect a new TB case. The number of TB cases detected was higher among male contacts and contacts of HIV negative index TB clients. This study demonstrated that targeted systematic household contact investigation may be an effective active case finding strategy (Kigozi, Heunis, & Engelbrecht, 2019).

According to the World Health Organisation, eight (8) countries account for two thirds of the global TB infections with India leading the count followed by China, Indonesia, the Philippines, Pakistan, Nigeria, Bangladesh and South Africa. TB household contact investigation is not routinely conducted in India. To determine the yield of systematic household contact investigation in 14 public health facilities in the Rajnandgaon district of India, 1,556 household contacts of 312 bacteriologically confirmed TB cases were screened from December 2010 to May 2011. 148 of the contacts were symptomatic, among these, 109 (73.6%) were evaluated by sputum examination resulting the detection of 11 bacteriologically confirmed TB cases (10.1%) and 4 smear negative TB cases. The household contact screening contributed additional 63% of TB cases compared to passive case detection alone (Khaparde et al., 2015; Pothukuchi et al., 2011).

Research conducted in 10 health facilities in the Greater Accra Region of Ghana from June 2010 to December 2014 revealed that out of 8,166 contacts of 3,267 index TB clients screened, 614 (7.5%) were identified as presumptive TB. A further sputum examination of 438 (71.3%) of those with presumptive TB led to the detection of 53 (12.1%) TB cases. The number needed to screen (NNS) and number needed to test (NNT) to detect a TB case of All Forms were 154 and 8 respectively (Ohene et al., 2018).

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2.3 TB Contact Investigation Implementation Challenges

TB index client close household contact screening has proven to contribute significantly to global TB case notification in different settings of the world. Despite the massive TB yield from contact investigation, the practice is faced with numerous challenges and barriers especially in resource limited countries (Sub Saharan African Countries). To identify barriers to and facilitators of TB contact investigation, a study was conducted in Kampala, Uganda by Ayakaka et al., 2017. In this study, the researchers held seven focus group discussions with 61 health care providers, two focus group discussions with 21 lay health care workers and one group discussion with four household contacts of newly diagnosed TB patients. In addition, they interviewed 32 from 14 households of index TB clients. The study identified stigma, limited knowledge about TB among contacts, insufficient time and space in clinics for counselling, mistrust of health staff among index clients and contacts, and high travel cost of lay health workers and contacts as the commonly noted barriers (Ayakaka et al., 2017; Shete et al., 2015; Tesfaye, Lemu, Tareke, Chaka, & Feyissa, 2020).

Chiang et al., 2015, research carried out in Lima Peru, identified insufficient household contact investigation as a major barrier to childhood TB case detection. The study attributed the insufficiency to some families' refusal of contact tracing due to stigma or denial, parents spending so much time at work, and children being in school. At the health system level, the study identified health staff shortage, limited logistics, safety concerns raised by female health worker (fear of health workers to visit dangerous neighbourhoods), providers having to use their own money for transportation and frequent movement of families from one location to another making it difficult for them to be traced and screened (Chiang et al., 2015; Minnery et al., 2013). Other studies that also identified insufficient household contact investigation as a barrier to childhood TB case

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detection are (Mandalakas et al., 2017) and (Assefa, Klinkenberg, & Yosef, 2015) conducted in Swaziland and Ethiopia respectively.

A nested case–control research was carried out to assess relevant knowledge, attitudes and practices in cases and controls in Vietnam within the context of a large cluster randomised controlled trial of active screening for TB in household contacts of patients with pulmonary TB. The study population comprised contacts (and their index patients) from 12 Districts in six provinces throughout the country. Cases were contacts (and their index patients) that did not attend the scheduled screening appointment. Controls were those who did attend. Results of this study revealed that acceptability of contact screening was high among both cases (n = 109) and controls (n = 194). Both cases (47%) and controls (36%) frequently reported discrimination against people with TB. Cases were less likely than controls to comprehend that sharing sleeping quarters with a TB patient increased their risk of getting the disease (OR 0.46, 0.27 – 0.78) or recognise TB as an infectious disease (OR 0.65, 0.39 – 1.08). A higher proportion of cases than controls held the mistaken traditional belief that a non-infectious form of TB caused the disease (OR 1.69, 1.02 – 2.78). The study concluded that knowledge, attitudes and practices of contacts and TB patients influences their participation in contact investigation (Fox et al., 2015).

2.4 Tuberculosis Contact Tracing Challenges with Respect to COVID-19

COVID-19 and Tuberculosis are both pathogenic diseases that affects the respiratory system and shares common clinical signs and symptoms (Afum et al., 2021). Since the start of the pandemic in the second half of 2019, the World Health Organization has estimated 771,151,224 global confirmed cases as at September 2023 with over 6,960,783 deaths worldwide (WHO, 2023: https://covid19.who.int). Ghana recorded is first case of COVID-19 in March 2020. The Bongo

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District where is study was conducted, a total 166 confirmed COVID-19 cases were reported with 4 deaths as at May 2022 (Bongo DHD Annual Report, 2022).

To combat the spread of COVID-19, many countries instituted several preventive measures including prolonged lockdowns, restriction on movements and international travels, and restriction of social gathering which significantly decreased OPD attendance in many health facility across the world thereby impacting negatively on TB services (Odume et al., 2020; Trajman et al., 2022). At the Connaught Hospital Chest Clinic in Freetown Sierra Leone, 2300 presumptive cases were tested in third quarter of 2020 compared to 2636 during same period in 2019; thus a decline by 12.7% (Lakoh et al., 2021). However, TB cases increased by 37% while treatment success rate also increased from 46.7% in 2019 to 55.6% in 2020 (Lakoh et al., 2021).

2.5 Summary

Many countries including Ghana do not have a clear policy on TB household contact investigation. When properly conducted, TB household contact investigation returns a high yield compared to routine active case finding as seen earlier. However, some of the major challenges confronting the practices of TB household contact investigation includes; stigma, limited knowledge about TB among contacts, limited health staff and logistics, mistrust of health staff among index clients and contacts, and high travel cost of health workers and contacts.

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CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter presents information on the background of the study area, the study design and type, characteristics of the various study populations, their sample size, sampling techniques, and details of the data collection tools to be used in this study. The chapter also contains a comprehensive description of how the data will be analyzed and the type of statistical analysis software to be used, the ethical considerations and the limitations of this research.

3.1 Background of the study Area

This research will be conducted in the Bongo District of the Upper East Region. Bongo District lies in the northern tip of Ghana's Upper East Region, nine miles from Bolgatanga, the capital of the Upper East Region. It shares boundaries with Burkina Faso to the north, Nabdam District to the east, Kassena-Nankana to the west and Bolgatanga Municipal to the south.

The district has a total land area of 459 square kilometres with about 84,545 inhabitants (47.6% Males and 52.4% females).

The area is generally flat with occasional outcrops of rocks at an elevation of 200 m. The landscape has little vegetation. The landscape borders on the Sudan Savannah Zone although technically in the Guinea Savannah Zone. The area is in danger of desertification. There is an average of 70 rain days a year, with an annual rainfall of 600–1,400 mm. The predominant occupation in Bongo District is subsistence farming along with some handicraft production.

In terms of health care delivery, the district is served by one district hospital, six (6) health centres (one in each sub-district) and twenty-two (22) CHPS facilities. Below is the Map of Bongo District.

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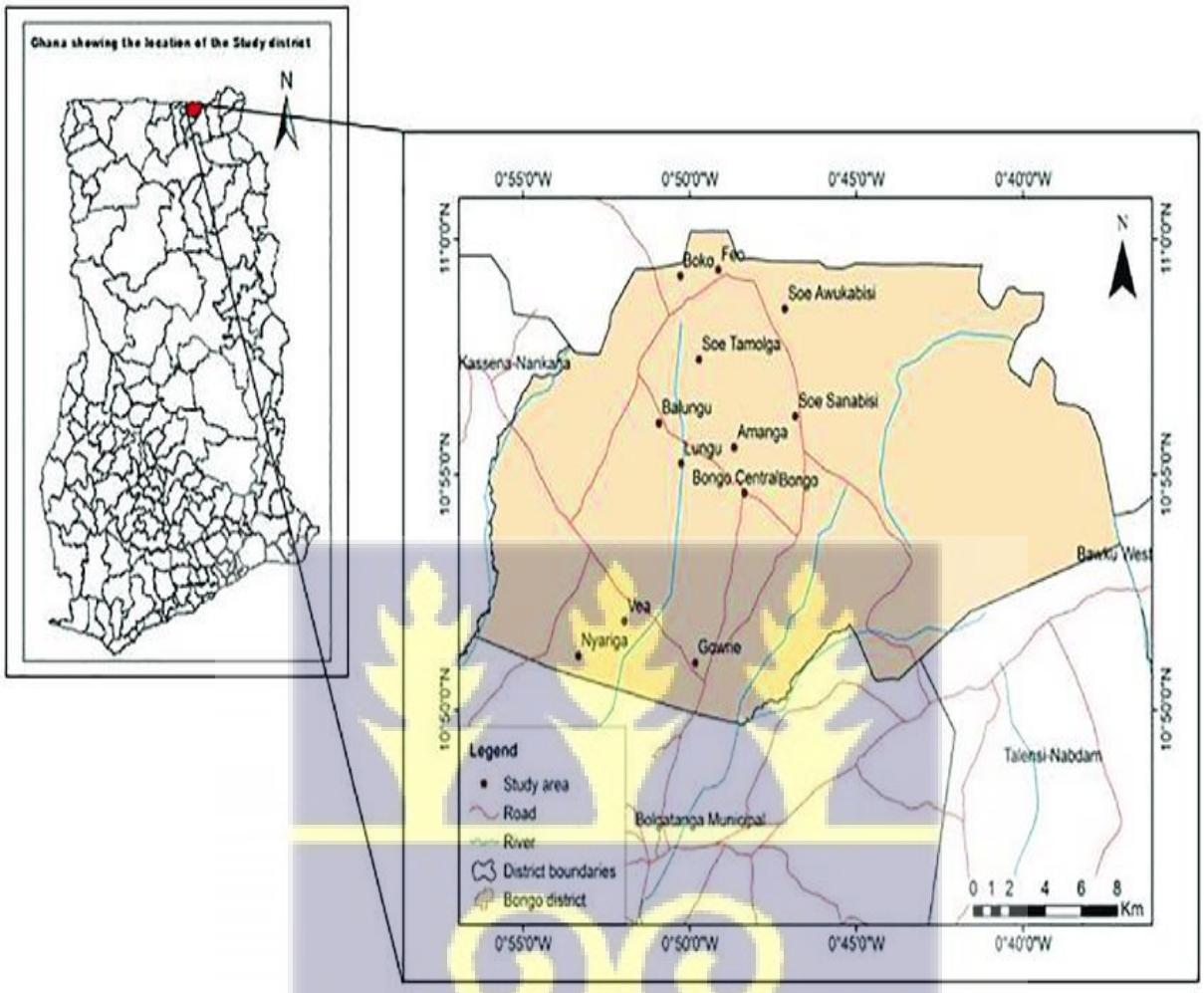

Figure 3.1: Map of Bongo District

3.2 Study Design and Type

The study utilized a retrospective data review and prospective observational study design to conduct a mixed method of both qualitative and quantitative descriptive research.

3.3 Study Population and Period

Three categories of study populations were included in this research. The first being health care workers responsible for household contact investigation in the Bongo District, bacteriologically

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confirmed TB cases initiated on treatment in the Bongo District and Household contacts of bacteriologically confirmed TB cases in the Bongo District. Only Bacteriologically Confirmed TB Patients who started treatment from March to June 2022 and their contacts were included in the study. These are TB patients who have been confirmed positive for at most 5 months.

3.4 Sampling Technique and Sample Size

3.4.1 Sampling Technique

Convenient sampling technique which is a non-probability sampling method was used to include Bacteriologically Confirmed TB patients into the study. This technique selected participants based on availability and willingness to participate in the study. Purposive sampling technique was used to select TB household contacts and the healthcare workers.

3.4.2 Sample Size

From March 2022 to June 2022, the Bongo district detected and initiated a total of 46 Bacteriologically Confirmed TB patients on treatment. The Ghana National TB Control Program recommends the screening of at least four (4) contacts of diagnosed Pulmonary TB patients. Therefore, the sample size of household contacts was calculated by multiplying the number of patients by four. Thus 46 X 4 = 184. However, a total of 261 household contacts were included in the study because some of the TB patients had more than 4 close contacts.

Seven (7) healthcare workers (One district TB Focal Person and Six Sub-district TB Focal Persons) took part in the focal group discussion to assess the healthcare system level challenges of TB household contact investigation.

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3.4.3 Study Variables

The main variables of interest of this study were;

- Health care workers compliance with TB Household contact investigation protocols
- Impact of TB household contact investigation and
- Health care system level challenges affecting optimal household contact investigation

3.5 Inclusion and Exclusion Criteria

Inclusion of TB patients and household contacts was based on willingness to participate. TB patients and household contacts not willing to participate were be excluded from the study. Pulmonary Negative and Extra Pulmonary TB patients and their contacts were also excluded from the study. Although this comes with some disadvantages, TB patients and contacts have the right to person privacy.

3.6 Data Collection

Three different set of data were collected and analyzed; data of bacteriologically confirmed TB patients, data of the contacts of the bacteriologically confirmed TB patients and data from health workers directly involved in TB contact tracing activities in the Bongo District.

The first set of data was collected using Kobo Collect version V2021.2.4, an open-source statistical software. This data was collected by reviewing the District TB Register to identify eligible bacteriologically confirmed cases, collect their demographic details (age, sex, educational level, religion, marital status) and a follow up call was made to seek their consent and map their contacts for screening.

The next set of data was collected by observing health workers carrying out contact investigation across the six sub-districts in the Bongo District while the researcher administered a checklist

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coded on Kobo Collect. The third set of data was obtained from a focus group discussion with health workers directly involved in TB contact tracing being the participants. With the consent of the participants, discussion session was recorded using an audio recording device.

3.6.1 Data Analysis

The data collected using Kobo Collect was exported into Microsoft Excel Version 2016 and cleaned. During the cleaning process, data entities with missing data elements and other irregularities were rectified while others were deleted. The cleaned data was then imported into Epi Info 7 statistical packaged and analyzed. The researcher made a descriptive analyses by running univariate analyses, Single Sample T-test, Cross Tabulations, probabilities, odds ratios and simple rates. The results are presented in statistical graphs, diagrams and tables for easy understanding and interpretation in chapter four of this study.

3.7 Limitation of the Study

The major limitation of this research are the deaths and loss-to-follow-ups. Household contacts of dead bacteriologically confirmed TB patients and those who discontinued treatment due to loss-to-follow-up were not included in the study. The sample may not be representative of all characteristics such as age or sex due to the willingness to participate approach.

3.8 Ethical Consideration

Ethical approval was obtained from the Ghana Health Service Ethical Review Committee (GHS/ERC). Letter of introduction from the School of Public Health, University of Ghana and approval letter from the GHS/ERC were delivered to the Bongo District Director of Health Services (DDHS) for onward submission to the sub-district capital facility heads in all the six sub-districts.

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To ensure data protection and confidentiality especially at the household level, identified contacts were given the chance to determine when and where they will be comfortable to engage the contact investigation team. Unlinked anonymous method was used to collect participants' information, personal identifiers such as names were removed to ensure confidentiality and make it impossible to trace or identify them. Data collected was strictly used for the intended academic purpose only and protected from unauthorized access.

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CHAPTER FOUR

RESULTS

4.0 Background

Contact investigation plays a vital role in breaking the Tuberculosis transmission chain. The practice when properly conducted, ensures early TB Case detection and improves treatment outcomes among patients. The National TB Control Programme recommends that at least four (4) contacts of Bacteriologically Confirmed TB Patients should be screened for TB within first two weeks after detection. The health facilities that manage the cases are responsible for conducting contact investigation and in other situations, the district health management team takes up that responsibility. This chapter contains the main results of the study presented with the aid of logic model and results framework.

4.1 Conceptual Framework

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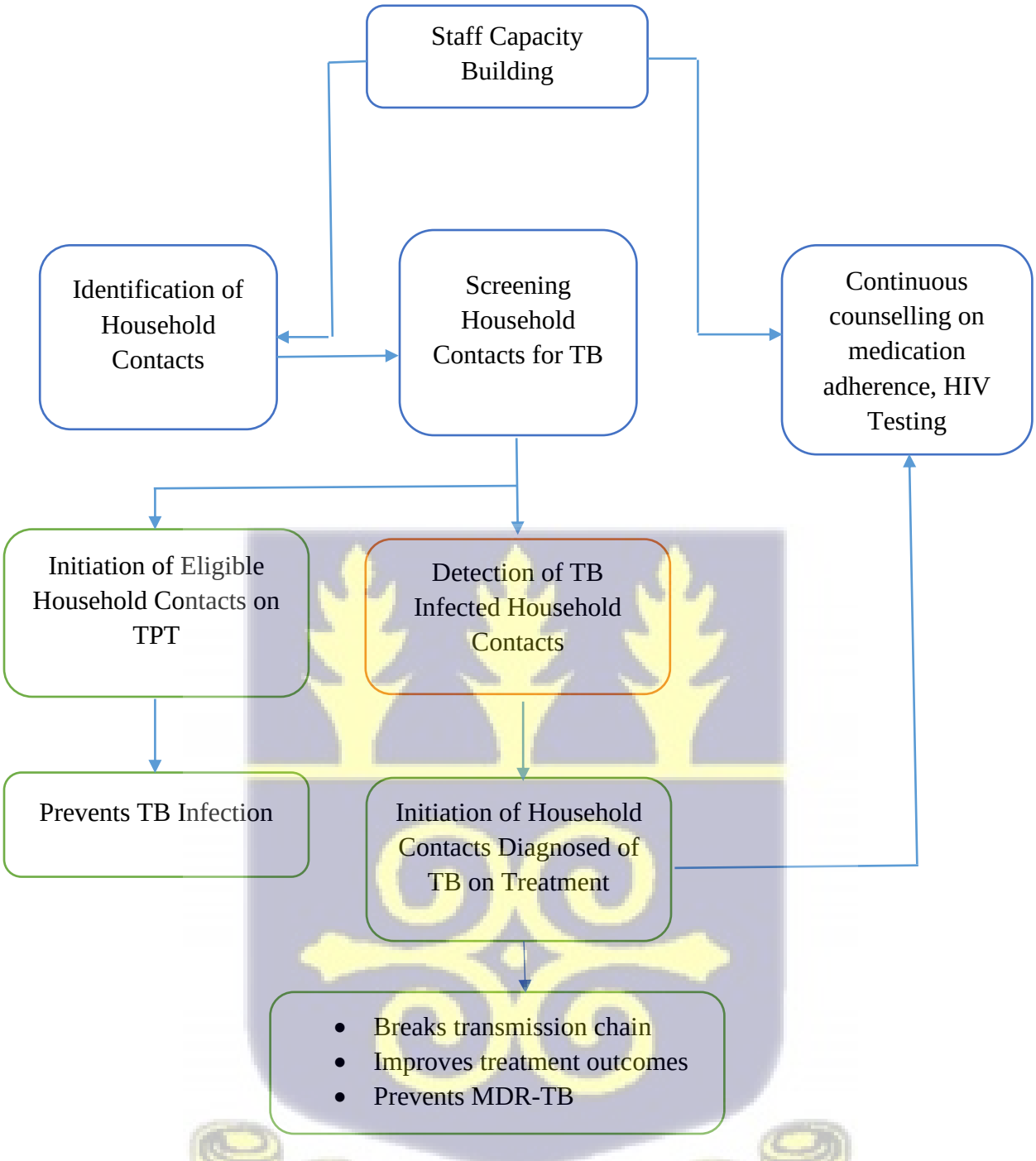

Figure 4.1: TB Household Investigation Conceptual Framework

4.2 Logic Model for TB Household Contacts Investigation

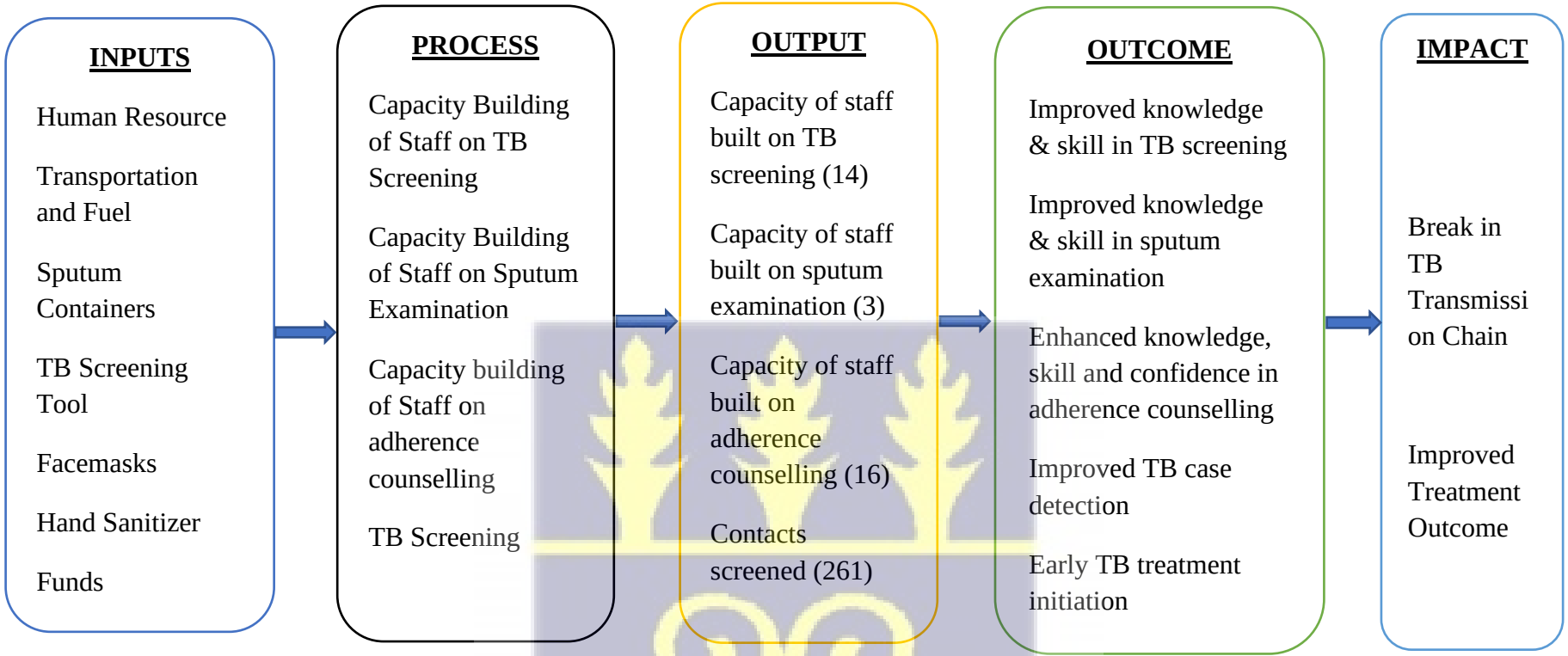

Figure 4.2: TB Household Contact Investigation Logic Model

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The diagram above illustrates the Logic Model for Household Contact Investigation. The Inputs that were required by the district to embark on the TB household contact investigation included; human resource comprising of Disease Control Officers, Public Health Officers, Community Health Nurses, Biomedical Scientist, Physicians and Facility Managers. Other required inputs were means of transportation in the form of Pickup Vehicles, Motorbikes, and fuel for moving contacts investigation teams to and from the communities as well as transporting collected sputum samples to the Gene Xpert Testing Laboratory. Sputum Containers, Laboratory Request Forms, TB Screened Tools and funds to provide lunch and water for the contact investigation teams were the other inputs required. To observe COVID-19 protocols and prevent the spread of the virus, Facemasks and Hand Sanitizers were also required as inputs and used by the contact investigation teams.

After ensuring the availability of the inputs, next was the process. The processes involved in the contact investigation exercise was the re-orientation and training of 14 health workers to build their capacity on TB screening, training of 15 health workers on adherence counselling and 3 Biomedical scientists on sputum sample examination. All the 55 sputum samples collected were examined by the Biomedical Scientist and tested using the Gene Xpert Machine. Another process that took place was the treatment of all contacts confirmed to have TB and testing them for HIV.

The immediate output of the exercise is that the capacity of 14 health workers was built on TB screening, 3 on sputum examination and 16 on adherence counselling. This led to an improved knowledge and skills in TB screening, sputum examination and effective strategies on adherence counselling.

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This resulted in an increase TB notification in the Bongo district, early TB treatment initiation of the four detected TB cases which will break further transmission and ensure a desirable treatment outcome. In addition, 27 contacts who did not have TB were initiated on Isoniazid for a period of six months to prevent them from developing active TB in the future.

Table 4.1: Demographic Information of Index TB Patients

Variable	Frequency (%)
Gender / Sex	
Male	32 (69.6)
Female	14 (30.4)
Age Distribution	
0-14	0 (0.0)
15-24	2 (4.3)
25-34	9 (19.6)
35-44	16 (34.8)
45-54	13 (28.3)
55-64	5 (10.9)
65 +	1 (2.2)
Marital Status	
Single	7 (15.2)
Married	33 (71.7)
Divorced	2 (4.3)
Widow	4 (8.7)
Educational Level	
None	27 (58.7)
Primary	6 (13.0)
Junior High School	8 (17.4)
Senior High School	3 (6.5)
Tertiary	2 (4.3)

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Religion	
African Traditional Religion	20 (43.5)
Christianity	17 (37.0)
Islam	7 (15.2)
Non-Religious	2 (4.3)

Table 4.1 above shows the demographic information of the Bacteriologically Confirmed TB Patients whose contacts were screened for TB. Out of the 46 Bacteriologically Confirmed TB Patients detected in the Bongo District from March to July 2022, 69.6% of them representing 32 patients were males while the remaining 14 patients (30.4%) were females. Majority of the patients were between the ages of 25-54 years; 9 (19.6%) were 25-34 years, 16 (34.8%) were 35-44 years, 13 (28.3%) were 45-54 years, 5 (10.9%) were 55-64 years while 1 patient (2.2) was 65 years.

Seven of the TB patients (15.2%) were single, 33 (71.7%) were married, 2 (4.3%) were divorcees while the remaining 4 (8.7%) were widows. In terms of education, only 2 (4.3%) had tertiary education, 3 (4.5%) had Senior High School education, 8 (17.4%) had Junior High School education, 6 (13.0%) had primary education while the majority of patients thus 27 (58.7%) had no formal education. Majority of the TB patients; 20 (43.5%) practice African Traditional Religion, 17 (37.0%) were Christians, 7 (15.2%) were Muslims and 2 (4.3%) were non-religious.

4.3 Demographic Information of TB Household Contacts

Two Hundred and Sixty-one (261) contacts of the 46 Index TB patients were screened for TB. They included 104 (39.8%) males and 157 (60.2%) females. Of the contacts, 49 (18.8%) of them were from the ages of 0-14 years, 63 (24.1%) were 15-24 years, 46 (17.6%) were 25-34 years, 39 (14.9%) were 35-44 years, 22 (8.4%) were 45-54 years of age while 42 were 64 years and above as seen in table 4.2 above.

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The results also revealed that majority of the contacts were married (133, 51.0%), 119 contacts were single (45.6%), Seven (2.7%) were widows while the remaining 2 (0.8%) were cohabiting as at the time of the study.

Table 4.2 Demographic Information of Household Contacts

Variable	Frequency (%)
Gender / Sex	
Male	104 (39.8)
Female	157 (60.2)
Age Distribution	
0-14	49 (18.8)
15-24	63 (24.1)
25-34	46 (17.6)
35-44	39 (14.9)
45-54	22 (8.4)
55-64	26 (10.0)
65 plus	16 (6.1)
Marital Status	
Single	119 (45.6)
Married	133 (51.0)
Divorced	0 (0.0)
Widow	7 (2.7)
Cohabiting	2 (0.8)

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Relationship to Index Client	
Child of Index Client	96 (36.8)
Co-Tenant	19 (7.3)
Co-worker	18 (6.9)
Parent	23 (8.8)
Sibling	87 (33.3)
Spouse	10 (3.8)
Others	8 (3.1)

The study further established the relationship of each contact to the Index TB Patients and it was revealed that 96 (36.8%) were children of the index clients, 87 (33.3%) were siblings of the index clients, 23 (8.8%) contacts were parents of the index clients, 19 (7.3%) were co-tenant of the index patients, 18 (6.9%) were co-workers of the index patients, 10 (3.8%) were spouses of the index clients while the remaining 8 (3.1%) were students of the index TB patients. See table 4.2 above.

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4.4 Contact Investigation Protocols

Table 4.3 Household Contact Investigation Guideline

S.no	Questions	Yes	No
		N (%)	N (%)
Q1	**Did the contact investigation team seek informed consent from the Contact**?	261 (100%)	0 (0)
Q2	Did the Contact give his/her consent to be screened?	261 (100%)	0 (0)
Q3	**Did the Contact investigation team inform the contact about the importance of TB contact screening?**	261 (100%)	0 (0)
Q4	**Did the Contact Investigation Team capture the following on the screening tool?**		
	▪ Date	261 (100%)	0 (0)
	▪ Name of Contact	261 (100%)	0 (0)
	▪ Age of Contact	261 (100%)	0 (0)
	▪ Sex of Contact	261 (100%)	0 (0)
Q5	**Did the Contact Investigation Team ask for the presence of the following signs and symptoms?**		
	▪ Cough of any duration	261 (100%)	0 (0)
	▪ Productive cough	261 (100%)	0 (0)
	▪ Haemolysis (coughing out blood)	261 (100%)	0 (0)
	▪ Chest pain	261 (100%)	0 (0)
	▪ Fever	261 (100%)	0 (0)
	▪ Unexplained weight loss	261 (100%)	0 (0)
	▪ Poor general condition	261 (100%)	0 (0)

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The Curry International TB Centre recommends that before embarking on TB household contact investigation exercise, the contact investigation teams should consider, modify according to setting and implement the steps listed below.

1. Collection and Evaluation of Index TB Case Information: Decide Whether to Initiate a Contact Investigation
2. Interview the Index TB Case
3. Determine the Infectious Period
4. Examine Sites of Transmission
5. Prioritize Contacts
6. Locate and Evaluate Contacts
7. Treat and Follow up Contacts
8. Evaluate Contact Investigation Activities

Aside the steps outlined above, the contact investigation teams also applied certain basic protocols and guidelines on how to conduct contact screening or investigation. Among the guidelines included seeking the consent of the Index TB Patients before screening his/her contacts. It is equally important and ethical to seek informed consent from each contact before screening them for TB which was done in the form of writing. The researcher observed six contact investigation teams across the six sub-districts in the Bongo district as they embarked on household contact investigation.

All the 46 bacteriologically confirmed TB patients agreed and consented for their close contacts to be screened. The teams also obtained informed consent from all the 261 contacts before screening them using the symptoms-based TB screening tool. Basic information such as name,

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age, sex, screening date were captured on the screening tool for all household contacts screened. See table 4.3 above.

4.5 Outcome of Household Contact Investigation

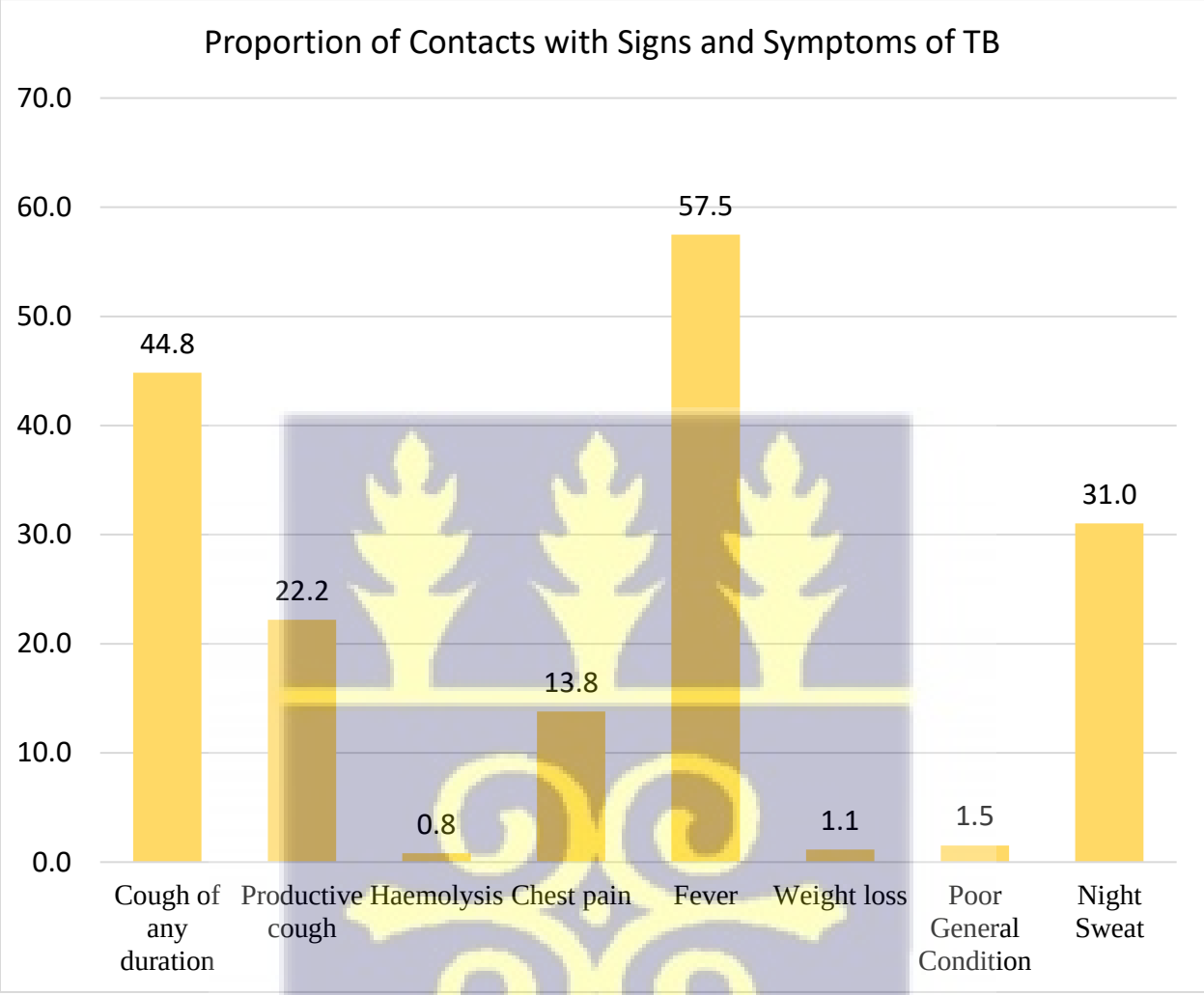

Figure 4.3 Signs and Symptoms of TB among Household Contacts

Out of the Two Hundred and Sixty-one (261) Household Contacts screened, 57.5% (150) of them reported Fever, 44.8% (117) reported cough of any duration, 22.2% (58) of the contacts reported productive cough, 31.0% (81) had night sweats, 13.8% (36) experience chest pain, and 1.5% (4) exhibited poor general condition while 1.1% (3) complained of weight loss. Two (0.8%) household contacts complained of seeing blood stains in their sputum.

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The study went further to explore the signs and symptoms among the various types of household contacts. It was discovered that among the 96 contacts who were children of the index TB clients, 54.2% (52) of them had cough of any duration, 19.8% (19) reported productive cough (produces sputum), 53.1% (51) had fever, 33.3% (32) complained of night sweat while 2.1% (2) had chest pain.

Table 4.4: TB Signs and Symptoms among Household Contacts

Signs & Symptoms of TB	Children of Index Client N=96	Co-Tenants N=19	Co-workers N=18	Parents N=23	Siblings N=87	Spouses N=10	Others
Cough	52(54.2)	4(21.1)	8(44.4)	10(43.5)	36(41.2)	5(50.0)	2(25.0)
Productive Cough	19(19.8)	4(21.1)	6(33.3)	4(17.4)	22(25.3)	2(20.0)	1(12.5)
Haemolysis	1(1.0)	0(0.0)	0(0.0)	0(0.0)	1(1.1)	0(0.0)	0(0.0)
Fever	51(53.1)	14(73.7)	8(44.4)	14(60.9)	52(59.8)	6 (60.0)	5(62.5)
Chest Pain	2(2.1)	7(36.8)	2(11.1)	3(13.0)	19(21.8)	1(10.0)	2(25.0)
Weight Loss	0(0.0)	1(5.3)	0(0.0)	1(4.3)	1(1.1)	0(0.0)	3(37.5)
Night Sweat	32(33.3)	2(10.5)	5(27.8)	5(21.7)	31(35.6)	3(30.0)	0(0.0)
Poor Condition	0(0.0)	1(5.3)	0(0.0)	1(4.3)	1(1.1)	0(0.0)	1(12.5)

For household contacts who were Co-tenants of the Index TB Clients, 73.7% (14) of them had fever, 4 (21.1%) had productive cough, 1 (5.3%) complained of unexplained weight loss, 2 (10.5%) reported nigh sweat, 1 (5.3%) had poor general condition while 36.8% (7) reported chest pain. Of the 18 Co-workers of the Index TB Clients, 8 (44.4%) reported cough of any duration, 6 (33.3%) reported productive cough, while 8 (44.4%) of the Co-worker contacts also had fever.

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Majority of the parents (60.9%) of the Index TB Patients screened had fever, 59.8% (52) of the Siblings of the Index TB Patients also had fever, while 50.0% (5) of spouses reported cough of any duration. See table 4.4 above.

4.5.1 TB Diagnosis and Sample Collection

Out of the 261 household contacts screened for TB, based on the reported and observed signs and symptoms, a total of 94 contacts were presumed to have TB, representing a TB presumption rate of 36.0%. These included 29 children of the Index TB Clients, 5 Co-tenants, 12 Co-workers, 8 parents of the Index Clients, 33 siblings, 5 spouses and 2 students of the index clients. Ideally, sputum samples are to be collected from all presumed TB clients for testing. However, out of the 94 presumed or eligible household contacts, only 55 of them were able to produce sputum for examination, representing a sample collection rate of 58.5%. The remaining 39 eligible household contacts could not produce sputum for examination.

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Table 4.5 TB Symptoms among Contacts

Relationship to Index Patient	Number Screened	Number Presumed TB	TB Presumption Rate (%)	Number of Sputum Samples Collected	Sputum Collection Rate (%)
Child	96	29	30.2	17	58.6
Co-Tenant	19	5	26.3	3	60.0
Co-worker	18	12	66.7	6	50.0
Parent	23	8	34.8	4	50.0
Sibling	87	33	37.9	22	66.7
Spouse	10	5	50.0	2	40.0
Other	8	2	25.0	1	50.0
Total	**261**	**94**	**36.0**	**55**	**58.5**

4.5.2 Outcome of TB Household Investigation

After the household contact investigation exercise, a total of 55 sputum samples were collected and sent to the Bongo District Hospital Laboratory for Gene Xpert examination. Seven (7) of the 55 sputum samples sent to the laboratory were rejected; 3 samples were saliva instead of sputum while the remaining 4 samples contained food particles. All the 48 accepted sputum samples were tested using the Gene Xpert Machine. Out of the 48 sputum samples tested, 4 contacts were confirmed to be TB infected. The contacts confirmed to have TB included; 2 Siblings of two different Index TB Patients, 1 Parent of an Index TB Patient and a Spouse of an Index Patient. This is indicated in Table 4.6 below.

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Table 4.6 Contacts Diagnosed TB

Relationship to Index Patient	Sputum Samples Collected	Sputum Samples Rejected	Sputum Samples Tested	Contacts Confirmed TB
Child	17	4	13	0
Co-Tenant	3	0	3	0
Co-worker	6	0	6	0
Parent	4	1	3	1
Sibling	22	2	20	2
Spouse	2	0	2	1
Other	1	0	1	0
Total	**55**	**7**	**48**	**4**

Out of the 4 household contacts confirmed to have TB, 3 of them were males and 1 female. The results also revealed a sputum sample rejection rate of 12.7% (7 out of 55 samples) and a TB positivity yield of 8.3% (4 TB positives out of 48 samples tested. All the four TB positive contacts were taken through medication adherence counselling, psychosocial support, nutritional education and the potential side effects of the TB medicines before treatment initiation.

Each of the TB patients were also assisted to appoint a treatment supporter from their communities while health care workers were assigned to them as treatment monitors. As recommended, with an informed consent, all the four confirmed TB cases were tested for HIV. All tested negative.

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4.6 Outcome of Focus Group Discussion

In order to determine the health system challenges associated with TB household contact investigation, the study conducted a focus group discussion in which participants included the District TB Coordinator and the TB Coordinators from all the six sub-districts of the Bongo District. In all, seven people participated in the focus group discussion.

All the seven participants were males between the ages of 34-45 years. By profession, they were all Disease Control Officers (DCO) which is a male dominated area. Five (5) of the seven participants have been in TB care for the past 2-3 years while the remaining participants have been in TB care for more than 4 years. All the seven participants revealed that they have received some form of household contact investigation training both on the job and formal training in the past 2 years.

During the discussion, it was revealed that the district and all six sub-districts have TB household contact investigation teams. The district team is composed of the District TB Coordinator, the District Public Health Nurse, Bongo District Hospital Institutional TB Coordinator and all the six sub-district TB Coordinators. At the facility level, the team is made up of the Sub-district TB Coordinator, Facility In-charge/Prescriber and a Community Health Nurse.

The study also wanted to know whether or not health care workers assigned the responsibility of household contact investigation know the category of TB patients whose contacts should be screened for TB. All the seven participants in the group discussion knew that household contact investigation is recommended for contacts of all bacteriologically confirmed TB cases. It was also revealed that the National TB Control Programme through the Regional Health Directorate supports the district with funding to undertake periodic household contact investigation. However,

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it is the responsibility of the district to provide vehicles and motorbikes for contact investigation and sputum sample transportation to the testing laboratory.

After running the test on sputum samples collected during household contact investigation, the results are either communicated in person or through a phone call. For household contacts who tested negative, the contact investigation team call them to inform them of the outcome of the results and for those confirmed to have TB, the results are communicated in person and to further make arrangements for early treatment initiation. In instances where presumed TB clients are not able to produce sputum for Gene Xpert examination, the district makes arrangements to transport them to the Bongo District Hospital for X-Ray to be taken.

4.6.1 TB Household Contact Investigation Associated Challenges

During the group discussion, participants were asked to indicate the challenges that impedes their efforts in conducting household contact investigation. Participants were further asked to group their challenges under human resources, transportation and fuel, TB screening logistics, diagnostics capacity and funding. Below are the findings in this regard.

Inadequate Trained Human Resource; one challenge that prevailed across all the six sub-districts and at the district level is the inadequate number of trained staff assigned for household contact investigation and other TB activities. Participants revealed that even there are contact investigation teams in each sub-district and at the district level, only few members take part in implementing household contact investigation, mainly the TB focal persons. When enquired why? A participant remarked; “This is because most of the other team members are always engaged in other routine service delivery activities”.

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Inadequate Means of Transportation and Fuel; it was revealed during the discussion that none of the six sub-districts has an official Pickup Vehicle for services delivery. However, the district has two Pickup Vehicle with only one functioning which is assigned to the District Director of Health Services making it inaccessible when needed for household contact investigation. Each sub-district reported having at least two functioning official Motorbikes. "When the need for TB household contact investigation arises, we don't get funding to fuel our Motorbikes to move into the communities" one participant remarked. "Officers end up using their personal motorbikes and fuel for TB household contact investigation without any compensation for tear and wear" another added.

Periodic Shortage of TB Screening Logistics; another challenge participants reported was the periodic shortage of TB screening logistics and tools such as Sputum Containers, chest infection screening tools and laboratory request forms.

Presumed Contacts Unable to Produce Sputum; this challenge was observed by the researcher at first hand. Some presumed TB contacts could not produce sputum even though they had cardinal signs and symptoms of TB. For presumed contacts who cannot produce sputum, it is recommended that X-Ray be conducted. But for this to be possible, the client would have to be transported to the hospital. However, due to the meagreness of the means of transportation and fuel, health workers are not able to send such clients to the hospital for X-Ray examination.

Community Stigma and Discrimination; another challenge identified during the focus group discussion is the negative impact of stigma and discrimination meted at TB patients and their contacts by community members. All the participants reported that some TB patients in their sub-districts decline to give informed consent for their contacts to be screened due to anticipated stigma

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and discrimination when members of the community get to know that they have TB. “In such situations, we adopt a targeted community screening approach which enables us to screen close contacts and other community members without disclosing the status and identity of the index TB patient”.

Delay in Receiving Results from Gene Xpert Testing Laboratory; the entire Bongo District has only one Gene Xpert Machine situated at the Bongo District Hospital where sputum samples from all the sub-districts are sent for testing. Because of the high volumes of samples received daily at the laboratory coupled with limited number of staff assigned for TB testing, it takes very long time for samples to be tested and results sent back. “On an average, it takes more than a month after sample submission to receive results” one participant said.” Another factor responsible for the delay in getting results is the frequent shortages of Gene Xpert Cartridges” another participant added.

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CHAPTER FIVE

DISCUSSIONS, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

The results of this study presented in chapter four are discussed in this chapter. The discussion primarily focuses on the implications of the findings compared with the findings of similar research, articles as well as national and global recommendations on TB household contact investigation. The chapter also contains recommendation made by the researcher to improve TB household contact investigation in the Upper East Region and Ghana at large.

5.1 Discussion

The main aim of this study was to determine by observation whether health workers in the Bongo District apply the recommended protocols when conducting TB Household Contact Investigation. The study was also interested in the contribution of TB Household Contact Investigation to TB case detection and challenges associated with conducting TB Household Contact Investigation.

The results of this study reveals that TB household contact tracing in the Bongo District is carried out according to the laid down contact investigation protocols and guideline. Each of the 46 bacteriologically confirmed cases whose contacts were investigated were dully notified, and interviewed by the screening teams with informed consent sorted. During the contacts screening process, all relevant information and questions recommended by the National TB Control Programme were captured and asked appropriately.

With regards to the second study objective, the contact investigation yielded 4 bacteriologically confirmed TB cases out of the 261 contacts screened. This represents a positivity rate of a little over 1.5%. The four confirmed cases included one parent of an index client, two siblings of index

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clients and one spouse of an index client. In addition, 27 contacts benefitted from TB Preventive Therapy (TPT).

Paramount among the challenges associated with TB household contact investigation in the Bongo District includes; inadequate trained staff for contact tracing, inadequate means of transport and fuel to move into the communities for contact tracing, periodic shortage of essential contact tracing logistics such as screening tools, sputum containers, bio-hazard bags and laboratory request forms (TB05/06), lack X-RAY services for TB presumed contacts who cannot produce sputum, community stigma and discrimination prevents people from opting for screening and the last but not least challenge is the high work load at the geneXpert testing laboratory resulting in delays in getting sputum test results on time to take the necessary action.

5.1.1 Application of TB Household Investigation Protocols

According to the Curry International TB Centre (2018), the first step in household contact investigation includes the evaluation of index TB patients' information, interviewing index TB patients to determine the possible period of infection, examine sites of transmission, identify and prioritize contacts, locate and screen contacts. This was not so different from the approach used by the contact investigation teams in the Bongo District. The teams first identified and evaluated all TB cases detected in the Bongo District from January to July 2022 before narrowing it down to 46 bacteriologically confirmed TB patients detected from March to July 2022. The Index TB Patients were then interviewed and all potential contacts identified and listed for the screening at designated dates.

As the researcher observed, in line with the National TB Control Program's guideline, the contact investigation teams obtained written informed consents from all the 261 contacts screened. For

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contacts below the age of giving consent (below 15 years), informed consent was obtained from their parents and in some cases, their legal guardians. In addition, the household contact investigation teams educated each contact on the common signs and symptoms of TB, mode of transmission, treatment, and the importance of household contact investigation.

5.1.2 Outcome of TB Household Contact Investigation in the Bongo District

The ultimate goal of TB household contact investigation is to identify and screen contacts of pulmonary TB patients at risk of developing the infections. This study anticipated to observe the screening of at least 184 contacts of 46 pulmonary TB patients but in the end, a total of 261 household contacts were screened. Thus 77 additional contacts were screened across the six sub-districts. Of the 261 household contacts screened, less than half (36.0%) were presumed to have TB. Sputum samples were collected from more than half (58.5%) of the presumed TB contacts and transported to the Gene Xpert Testing site for examination. However, 12.7% of the samples were rejected due to poor quality while more than 80% of the collected sputum samples were tested, during which 4 new TB cases were diagnosed presenting a positivity yield of 1.5%. Sixty-five contacts were needed to screen to detect one new TB case.

The impact of the household contact investigation recorded in this study is quite different from other similar studies. For instance, Kigozi et al., (2019) reported household contact screening TB positivity yield of 6.6%, thus 17 new TB cases were detected among 259 contacts screened while 15 contacts were needed to be screened to detect a positive new TB case. This is a high impact compared to the results of this study. Another study that reported a new TB case positivity yield than this study is Pothukuchi et al., (2011) where 11 new TB cases (10.1%) were detected among 109 household contacts evaluated by sputum examination in 14 public health facilities in the Rajnandgaon district of India. In the Greater Accra Region of Ghana, Ohene et al., (2018) reported

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a yield of 53 new TB cases detected through household contact screening over a period of 4 years across ten health facilities. The implication of these findings is that TB household contact investigation is an effective strategy in TB active case detection.

5.1.3 Challenges Associated with TB Household Contact Investigation

The final objective of this study was to determine some of the major challenges confronting TB household investigation in the Bongo District. To determine the associated challenges, the study conducted a focus group discussion involving key health workers directly involved in conducting TB household contact investigation across the district. Participants reported; inadequate number of trained health workers for TB household contact investigation, limited means of transport and fuel, periodic shortage of sputum containers, TB screening tools and laboratory request forms, inability of some presumed TB contacts to produce sputum for examination, delay in receiving test results caused by periodic shortage of Gene Xpert Cartridges, limited number staff assigned for sputum examination and fear of stigma and discrimination from community members.

These challenges or barriers are not unique to the Bongo District or Ghana. Several studies conducted in different parts of the world also reported similar challenges. For instance, Ayakaka et al., (2017) identified challenges such as; stigma, limited knowledge about TB among contacts, insufficient time and space in clinics for counselling, mistrust of health staff among index clients and contacts, and high travel cost of lay health workers and contacts in Uganda. Chiang et al., (2015), reported refusal of contact tracing due to stigma or denial, parents spending so much time at work, and children being in school, health staff shortage, limited logistics, safety concerns raised by female health worker and providers having to use their own money for transportation as challenges associated with TB household contact investigation in Peru. Studies conducted in other parts of Ghana (Ohene et al., 2018: Afum et al., 2021: Asare et al., 2023) also identified issues

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such as; inadequate personal protective equipment, harassment by some contacts, stigmatization, delay in processing test results, difficulty in locating contacts, inadequate staffing, poor remuneration, language barrier and transportation challenges among others.

This implies that although TB household contact investigation plays a vital role in breaking the transmission chain and ensuring favourable treatment outcome, its practice is faced with so many similar challenges across the globe. National Health Systems, TB Control Programmes, Policy makers and international bodies (WHO, STOP TB Partnership, Global Fund etc) should channel resources and technical support to healthcare workers to mitigate the effects of these challenges the world over.

5.2 Monitoring and Evaluation

Monitoring and evaluating the progress of household contact investigation process enables facility leaders and contact investigation teams to make critical changes intended at enhancing performance and overall impact. The district TB focal person is responsible for monitoring and evaluating household contact investigation activities throughout the district. During the contact investigation activities observed by this study, the district TB team led by the district TB Coordinator carried out the role of monitoring and evaluation across the district.

5.3 Conclusion

The result of this study shows that TB household contact investigation in the Bongo District is conducted according both national and international protocols and best practices. As was observed by the research, the contact investigation teams followed the Curry International TB Centre household investigation steps. Informed consents were obtained from both Index TB Cases and Contacts before and during community entry for the screening. Index TB Cases were also provided

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with enhanced medication adherence counselling while contacts were sensitized on the common symptoms of TB, the mode of transmission of TB and how to ultimately avoid TB infection.

The study further revealed that household contact investigation contributes significantly to TB case detection and treatment uptake. After identifying and screening 261 household contacts, 4 new TB cases were detected and immediately initiated on treatment. Also, out of 81 contacts eligible for TB Preventive Therapy (TPT), 27 of them received Isoniazid to prevent them getting TB active infection in the future.

Despite the positive impact of household contact investigation, the practice of this very important activity is faced with a lot of challenges not only in the Bongo District and Ghana but the world over. These challenges such as; inadequate number of trained health workers for TB household contact investigation, limited means of transport and fuel, periodic shortage of sputum containers, TB screening tools and laboratory request forms, inability of some presumed TB contacts to produce sputum for examination, delay in receiving test results caused by periodic shortage of Gene Xpert Cartridges, limited number staff assigned for sputum examination and fear of stigma and discrimination have to be address holistically at all levels.

5.4 Recommendations

An optimal household contact investigation is very necessary in achieving the intended desired outcome. This study has made the under listed recommendation in the hope that when implemented will go a long way to improve the process and outcomes of household contact investigation not only in the Bongo district and Ghana, but the entire world since most of the challenges facing household contact investigation are similar across nations.

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- All sub-districts should be provided with at least one motorbike and supplied with fuel quarterly for household contact investigation
- The National TB Control Program with support from the Regional Health Directorate must ensure that Gene Xpert Cartridges are available at all times to avoid delays in testing sputum samples and providing results to requesting sites.
- Additional Biomedical Scientists should be trained and assigned to sputum sample testing at the Gene Xpert Testing Laboratory.
- Community engagement and sensitization should be conducted across major communities in the Bongo district to reduce stigma and discrimination against TB patients and their contacts.
- Alternative methods of TB diagnosis such as X-RAY examination should be adopted to take care of contacts who cannot produce sputum for Gene Xpert Examination.

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APPENDICES

Appendix I: Consent Form

ASSESSMENT OF HOUSEHOLD CONTACT INVESTIGATION FOR TUBERCULOSIS, A CASE STUDY OF BONGO DISTRICT, UPPER EAST REGION

PARTICIPANTS' STATEMENT

I acknowledge that I have had the purpose and contents of the Participants Information Sheet read and all questions satisfactorily explained to me in a language that I understand (English). I fully understand the contents and any potential implications as well as my right to change my mind (withdraw from the research) even after I have signed this form. I voluntarily agree to be part of this research.

Name of Participant…….

Participants' Signature ……..... OR Thumb Print……

Date…….

Contact Details ……

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Appendix II: Investigator Statement and Signature

Brief statement or declaration that investigator has given enough information to participants to make informed decisions.

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name… …….

Signature ……..…….

Date……..……

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Appendix III: Bacteriologically Confirmed TB Patients Data Collection Tool

1. Patient ID (**District / Facility TB Number**)
2. Age of Bacteriologically Confirmed TB Patient
3. Gender
    a. Male
    b. Female
4. Patient Educational Level
    a. None
    b. Primary
    c. Junior High School
    d. Senior High School
    e. Tertiary
5. Date of TB diagnosis ……//……. //…… (**DD//MM/YY**)
6. Date of Treatment Initiation ……//……. //…… (**DD//MM/YY**)
7. Health facility managing patient ……
8. Name of community where patient resides ……
9. Number of identified close household contacts ……..
10. Do you have a treatment supporter?
    a. Yes
    b. No

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11. Do we have your permission to screen your contacts for TB?

    a. Yes

    b. No

12. If **NO to Q11**, Reasons for refusal ……...

.....

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Appendix IV: Household Contacts Investigation Checklist (observational)

Instructions: Please observe team carry out household contact investigation process and complete the following questions.

1. Index TB Client ID (district / facility TB Number) …….
2. Serial Number of Household Contact ……..
3. Age of Contact (years) ……..……
4. Gender of Contact
    a. Male
    b. Female
5. Contact relationship to Index Client
    a. Spouse
    b. Child
    c. Sibling
    d. Parent
    e. Co-tenant
    f. Co-worker
    g. Others (Specify) ……..
6. Did the contact investigation team seek informed consent from the Contact?
    a. Yes
    b. No

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7. Did the Contact give his/her consent to be screened?
    a. Yes
    b. No
8. Was the Contact educated on the mode of TB transmission? (**ONLY for contacts aged >=15 years**)
    a. Yes
    b. No
9. Did the Contact investigation team inform the contact about the importance of TB contact screening?
    a. Yes
    b. No
10. Did the Contact investigation team indicate the screening DATE?
    a. Yes
    b. No
11. Which of the following Contact Information did the contact investigation team capture on the screening tool? (**Multiple Selection**)
    a. Name of Contact
    b. Age of Contact
    c. Sex of Contact
    d. None of the Above

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12. Did the contact investigation team establish the HIV status of the Contact?

    a. Yes

    b. No

13. Did the contact investigation team ask for the presence of the following SYMPTOMS?

    (**Multiple Selection**)

    a. Cough of any duration

    b. Cough more than 2 weeks

    c. Haemolysis (coughing out blood)

    d. Chest pain

    e. Unexplained weight loss

    f. Night sweats

    g. Fever

    h. Poor general condition

14. Which of the following SYMPTOMS were present in the Contact? (**Multiple Selection**)

    a. Cough of any duration

    b. Cough more than 2 weeks

    c. Haemolysis (coughing out blood)

    d. Chest pain

    e. Unexplained weight loss

    f. Night sweats

    g. Fever

    h. Poor general condition

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15. Screening outcome

    a. Presumed TB

    b. Not Eligible for TB diagnosis

16. Is Contact eligible for TPT?

    a. Yes

    b. No

17. If YES to Q16, was Contact put on TPT?

    a. Yes

    b. No

18. Was the Contact able to produce sputum?

    a. Yes

    b. No

19. Which of the following types of test (examinations) was conducted?

    a. Sputum examination using Gene Xpert Machine

    b. Sputum examination using smear microscopy

    c. X-Ray examination

20. Test results of Contacts Presumed to have TB

    a. MTB+ Rifampicin Susceptible

    b. MTB+ Rifampicin Resistant

    c. X-Ray Suggestive

    d. MTB Negative

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21. If Q20a-c Applies, has Confirmed TB client been initiated on treatment?
    a. Yes
    b. No

Appendix V: Focus Group Discussion Data Collection Tool

Participants Demographic Information

1. Name of sub-district
    a. Bongo Central
    b. Dua
    c. Valley Zone
    d. Namoo
    e. Anafobisi
    f. Bongo-Soe
2. Age of participants
    a. 15 – 24 years
    b. 25 – 34 years
    c. 35 – 44 years
    d. 45 – 54 years
    e. 55 – 64 years
    f. 65 years plus
3. Sex of participants
    a. Male
    b. Female
4. Cadre of respondent
    a. Disease Control Officer
    b. Public Health Officer
    c. Others, (specify) ……

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5. Respondent number of years in TB care
    a. Less than 1 year
    b. 1 – 2 years
    c. 3 – 4 years
    d. 5 or more years
6. Have you been trained on TB household contact investigation?
    a. Yes
    b. No

Questions for group Discussion – (Audio Recording)

7. Is there a TB contact investigation team in your district or sub-district?
8. If yes, which cadre of staff makes up the contact investigation team?
9. Which category of TB patients do you conduct contact investigation?
10. Who provides means of transport and fuel for TB contact investigation?
11. How are sputum test results communicated to presume contacts?
12. What happens to contacts presumed of TB who cannot produce sputum?
13. What challenges do you encounter in your sub-district when conducting household contact investigation in terms of;
    - Staff strength and training
    - Transportation
    - Logistics (sputum containers, screening tools, laboratory request forms)
    - Diagnostics (testing laboratory, results turn-around-time)
    - Funds
14. What do you think can be done to address these challenges?

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Appendix VI: Ethical Clearance Letter

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

Research & Development Division
Ghana Health Service
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My Ref. GHS/RDD/ERC/Admin/App 122/400
Your Ref. No.

15th September, 2022

Stanley Mangortey
P. O. Box KB 493 Korle-Bu, Accra

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC: 037/06/22**
Study Title	Assessment of Household Contact Investigation for Tuberculosis. A Case Study of Bongo District, Upper East Region
Approval Date	15th September, 2022
Expiry Date	14th September, 2023
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of a yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report after completion of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

You are kindly advised to adhere to the national guidelines or protocols on the prevention of COVID -19

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
Mr. Kofi Wellington
(GHS ERC Vice Chairperson)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra