SCHOOL OF PUBLIC HEALTH, COLLEGE OF HEALTH SCIENCES, UNIVERSITY OF GHANA

PULMONARY TUBERCULOSIS PREVALENCE AMONG FEMALE COMMERCIAL HEAD PORTERS IN ACCRA, 2011

By

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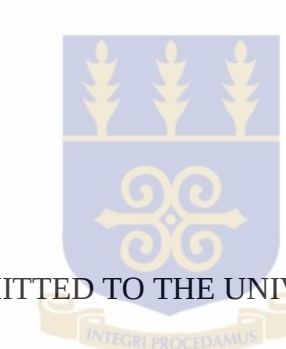

THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MPHIL APPLIED EPIDEMIOLOGY AND DISEASE CONTROL DEGREE

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DECLARATION

This work is the result of an independent investigation under the supervision of Professor Anthony Andrew Adjei and Professor Edwin Afari. Where my work is indebted to the works of others, I have fully acknowledged. I declare, therefore that this dissertation has not been presented elsewhere, either in part or in whole for another degree.

Signed by Resident……

Brain Worlanyo Pida

1. Supervisor……

   Professor Andrew Anthony Adjei

2. Supervisor……

   Professor (Col rtd) Edwin Afari

DEDICATION

This work is dedicated to Richael my dear wife for her immeasurable support and to Sedinam for coping with the stress associated with my absence from home. Dad, Christian Pida and Prosper Kokuma the two stalwarts who encouraged me to enroll onto this study but could not live to see its fruition. This work is also dedicated to all Kayayei especially those living in and around Mallam Atta Market in Accra.

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Above all, I thank the God almighty for bringing me this far.

ABSTRACT

Background: Tuberculosis (TB) affects persons mostly in their productive lives. Ghana relies on passive case finding strategy to detect TB which has resulted in low case detection. Female rural-urban migrants ("Kayayei") have poor health care seeking habits and prevalence of TB among them is unknown. Kayayei may lack basic knowledge about TB which could contribute to their healthcare seeking behavior resulting in low TB case detection.

Objective: To determine PTB prevalence rate among Kayayei in Mallam Atta market in Accra.

Method: A cross-sectional study was conducted between October and November 201 at the Mallam Atta Market which was randomly selected among other markets through a box draw. About 846 Kayayei were screened out of which 160 met the eligibility criteria. Eligible Kayayei completed structured questionnaire for socio-demographic characteristics, risk factor profile, knowledge and symptoms of PTB. Sputa were obtained from participants for detection of *Mycobacterium tuberculosis.* Positive samples were expressed per 100,000 populations. Factors associated with health seeking behavior and PTB knowledge were analyzed at 95% confidence level.

Results: Of the 160 Kayayei who participated, one tested positive by smear microcopy and two tested positive using liquid culture, giving a prevalence rate of 120 per 100,000 and 230 per 100,000 respectively. Three fourth 120/160 (75%) had no formal education while 130/160 (81.3%) had been coughing for two weeks and more. One hundred and thirty seven (85.6%) did not know the mode of transmission while 120/160 (75%) were ignorant about the signs and symptoms of TB. Fifteen (9.5%) had heard about TB from health workers. Most 144/160 (90%)

would seek care through traditional methods. Participants who had never had TB were less likely (Prevalence odds =0.07, 95% CI= 0.01- 0.9) to have knowledge of the signs and symptoms.

Conclusion: Pulmonary TB among Kayayei poses serious public health threat especially to clientele of head porterage. PTB prevalence found in this study is 120 per 100,000 Kayayei compared to the national prevalence of 92 per 100,000. In this study, poor knowledge about the mode of PTB transmission, signs and symptoms, and inappropriate health care seeking behavior among study participants were identified.

Keywords: Tuberculosis Prevalence, Active case finding (ACF), Kayayei, Accra Ghana

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ABBREVIATIONS

ACF	Active Case Finding
ACSM	Advocacy, communication and social mobilization for TB control
AIDS	Acquired Immunodeficiency Syndrome
BACTEC	
BCG	Bacillus Calmette-Guerin
BMI	Body Mass Index
CI	Confident Interval
DEDC	Disease Endemic Developing Countries
DOTS	Directly Observed Treatment Short Course
DST	Drug susceptibility testing
GAC	Ghana AIDS Commission
GCLS	Ghana Child Labour Survey
HIV	Human Immunodeficiency Virus
KBTH	Korle Bu Teaching Hospital
LED	Light-Emitting Diodes
L-J	Lowenstein- Jensen
MARPs	Most-at-risk populations
MDR-TB	Multi Drug Resistance Tuberculosis
MGIT	Mycobacterium Growth Indicator Tube
MODS	Microscopically Observed Drug Susceptibility
MTB	Mycobacterium tuberculosis
NOS2A	Nitric Oxide Synthase
NPHRL	National Public Health Reference Laboratory
NRAMP	Natural Resistance-Associated Macrophage Protein
NTP	National Tuberculosis Control Programme
OR	Odds Ratio
PANTA	Polymyxin B, Amphotericin B, Nalidixic Acid, Trimethroprim and Aziocillin
PCF	Passive Case Finding
PTB	Pulmonary Tuberculosis
PZA	Pyrazinamide
SIRE	Streptomycin, Isoniazid, Rifampin and Ethambuthol
SPSS	Statistical Product and Service Solutions
SSM	Sputum Smear Microscopy
TBciD	Tuberculosis complex Identification Test

TB	Tuberculosis
TNF	Tumor necrosis factor
UTALD	International Union against Tuberculosis and Lung Diseases
VDR	Vitamin D Receptor
WHO	World Health Organization
XDR	Extensively Drug Resistance
Z-N	Zeihl Neelsen

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Tuberculosis (TB), a disease caused by *Mycobacterium tuberculosis* is the second leading cause of death worldwide (Brooks *et al.*, 2004) and it affects mostly young adults in their most productive years (WHO Fact Sheet 104, 2011). TB kills more women than all causes of maternal mortality combined (Dami *et al*., 2010). Pulmonary TB (PTB) or smear positive TB accounts for over 90% of transmission of all forms of TB diagnosed (Siddiqi *et al*, .2003). If PTB is left untreated, infected persons will infect about 10-15 persons every year (WHO Fact Sheet 104, 2011). Therefore early reporting for care, accurate diagnosis and prompt initiation of treatment are essential for effective TB control. However delay in reporting and diagnosis may worsen the disease and enhance its transmission resulting in increased TB related morbidity and mortality (Chandrashekhar *et al*., 2009). Globally, 700 000 women die from TB every year (Marais, *et al.*, 2010). With the global burden of TB amongst women and children very huge, it is believed that, the Millennium Development Goal (MDG) four on child health and MDG 5 on maternal health will not be reached unless consented efforts are made to improve TB care among women and children (Marais e*t al*., 2010, McNally, 2007).

Human migration continues to play a major role in the spread of TB. Migrants are disproportionately affected by TB because they are poor; with increased incidence of the disease, have inadequate health-care and public health infrastructure back at their origins (Hargreaves *et al*., 2009).

Studies have shown that areas with higher incidence of TB have worsening housing conditions, crowding and high population densities which increase their risk to TB infection (Mangtani *et al.,* 1995; Bhatti *et al.,* 1995). Ghana is confronted with cross border migrants from the West African Sub Region (Owusu G, 2010) and internal rural - urban migration with increasing urban slum dwellings in the cities (Awumbila M *et al*., 2007). A major consequence of rural-urban migration is the ever increasing young female migrant porters in Ghana's commercial cities. These migrants are mostly young girls aged between 12-18 years and are called *"kayayei"* meaning women who carry head loads for a negotiated fee (Awumbila M, 2007; Yeboah, 2008). According to the 2006 Ghana Living Standards Survey (GLSS), Ghana's three northern regions where female porters mostly hail from are markedly deprived. Income levels are generally poor with associated under-nutrition. In the cities, they live under impoverished conditions and in ethnic groups. They form semi-permanent conjugal unions and sexual partnerships for both protection and financial support (Jawula MD, 2010). They are exposed to physical, mental and reproductive health risks, in particular sexually transmitted diseases including HIV/AIDS (Yeboah, 2010). The most vulnerable are those who sleep on the pavements or in front of stores in the night, making them victims to abuse and rape (Yeboah & Appiah-Yeboah, 2009).

Studies have documented the fact that, high risk sexual behavior and poor living conditions of Kayayei predispose them to HIV infection and other communicable diseases such as TB (Awumbila *et al.,* 2008; Yeboah M, 2010). According to an audit report by USAID on Ghana's Efforts to Integrate Gender into HIV/AIDS Activities (2009), Kayayei belong to most-at-risk populations (MARPs) with high HIV prevalence (GAC Annual Status Report, 2009). In addition, important determinants of developing active TB and spread such as poverty, overcrowding and malnutrition (Lee *et al*., 2008; Lonroth, *et al* 2008) are common among Kayayei.

Presently health sector TB case detection is based on Passive Case Finding (PCF) strategy followed by Directly Observed Treatment Short Course (DOTS) (The National Tuberculosis Health Sector Strategic Plan for Ghana 2009-2013). As a result, Ghana detects only 26% of all forms of TB of which 36% are smear positive TB cases (The National Tuberculosis Health Sector Strategic Plan for Ghana 2009-2013). Dye and colleagues demonstrated in their study that, PCF approach alone to TB case detection cannot help countries to meet the WHO case detection targets (Dye *et al*., 2005). Active Case Finding (ACF) can complement PCF and has been shown to be effective in detecting 60–82% of active TB cases (Golub *et al*., 2005). It is most likely these poor migrant girls would not seek TB care although they are vulnerable to TB infection. Their illnesses therefore will most probably go undetected. Targeted efforts must be made, to avail them the opportunity for early detection and prompt treatment to reduce transmission of TB among Kayayei and their contacts.

1.2 Problem Statement

To achieve the 2015 TB millennium development goal, the Ghana Health Service desires vulnerable groups and persons at high risk of TB infection to have equitable access to TB care. Kayayei are rural-urban migrants who are prone to TB (along with HIV) as they live under poor overcrowded conditions, are malnourished and have poor health seeking habits (Yeboah, 2010; Awumbila *et al.,* 2008). According to the Technical Policy and Guidelines for HIV/TB Collaboration report on Ghana, 60-70% of TB cases occur among persons in the reproductive age groups of 15-49 years. Persons in this age group engage in risky sexual behaviors (Awumbila *et al.*, 2008) with higher likelihood of contracting HIV who may have a 30-50% higher risk of developing active TB (Christopher O and Bosede I 2010). Kayayei, about a third of whom are mothers, belong to this group. Previous governments' efforts to return home and reintegrate Kayayei into mainstream skills training and education rather resulted in Kayayei

considering themselves as being unjustifiably discriminated against (Bibir-Ghana, 2009). This has contributed to their poor health seeking practices as they fear to be tracked with biographic data demanded at health facilities prior to commencement of TB care. However their numbers continue to increase with worsening living conditions.

The present PCF strategy where TB suspects present themselves for care at a health center excludes a lot of people including Kayayei. A major drawback of this PCF strategy is that, suspects do not seek health care from onset of TB symptoms resulting in increased disease transmission among contacts (Mushtaq *et al*., 2011). Thus a PTB case among Kayayei might never be diagnosed and such a case could possibly infect between 10 and 15 (WHO Fact Sheet, 2011) contacts annually.

Although the National Tuberculosis Program (NTP) has planned ACF to screen at risk groups to improve case detection, Kayayei were not targeted (The National Tuberculosis Health Sector Strategic Plan for Ghana 2009-2013). The pulmonary TB prevalence rate, knowledge and health seeking practices among Kayayei are unknown. Also, the potential contribution of ACF in improving case detection of TB among Kayayei has not been explored. This study sought to determine the prevalence of PTB among Kayayei using active case finding strategy.

1.3 Justification

This study was in support of the National Tuberculosis Health Sector Strategic Plan for Ghana 2009-2013 which seeks to provide equitable access to TB care among persons at high risk of TB infection. Low case detection of PTB has been a major problem of National TB Program in Ghana hence this study sought to demonstrate the significant contribution of ACF in improving case detection.

The true prevalence of PTB among Kayayei is not known and this study sought to provide that answer.

1.4 Objectives

General Objective

- To determine Pulmonary Tuberculosis prevalence among Kayayei at the Mallam Atta market in Accra, using ACF strategy.

Specific Objectives

- To determine prevalence of PTB rate among Kayayei at the Mallam Atta market in Accra.
- To assess the knowledge of Kayayei on PTB and their health care seeking practices

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Microbiology of Mycobacterium

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis* complex. This complex comprises Mycobacterium *(M) tuberculosis, M. bovis, M. africanum, M. microti and M. canetti* all causing tuberculosis, however, humans are the principal host for *M. tuberculosis* pathogen (Grange JM, 2009). Avian complex, *M. avium and M. kansasii* have been implicated as causative agents of pulmonary tuberculosis (PTB) among immunocompromised persons such as persons living with HIV/AIDS. The consequences of infection depends on host immune response affected by age, sex, underlying immune status, coexisting disease, malnutrition, intake of corticosteroids, use of immune suppressive medications, immunization with Bacillus Calmette-Guerin (BCG) vaccine, virulence and site of infection (Donald *et al.*, 2010; Grange,2009).

In most infected individuals, the organism is contained by immunological control thus infected individuals are asymptomatic. Whenever the immunological mechanism fails to contain the organism, active disease then results (Christopher O and Bosede I 2010). Left untreated, person with PTB will infect about 10-15 persons every year (WHO Fact Sheet, 2011). Symptoms associated with active disease are lowered appetite, cough, and increased peripheral leukocyte count, drenching night sweats, malaise and anemia. Chest pains and purulent sputum production are other signs of pulmonary TB (Chris *et al.*, 2005; Brooks *et al.*, 2004).

The *Mycobacterium* is an aerobic, acid-fast, non motile, non-encapsulated, non-spore forming bacillus. It grows best in tissues with high oxygen tension mainly lungs however other body systems such as circulatory, lymphatic, genitourinary, and the central nervous systems, bones,

skin and joints can also be infected (Brooks *et al.*, 2004). The *mycobacterium* have a lipid-rich cell which is relatively impermeable to basic dyes unless combined with phenol. Replication rate is extremely slow hence its ability to persist in a latent state resulting in the need for long durations of chemotherapy (Grange, 2009).

Studies regarding strain variation with regard to transmission and pathogenesis found the Beijing family strains with origins in Asia, strain *W* and strain *W*-like families responsible for many cases of drug resistance. This family of strains is distributed worldwide however; no study implicates this family as having genetic advantage for its pathogenesis and drug resistance (Domenech *et al.*, 2010). Other studies in Burkina Faso and Cameroun implicate *M. tuberculosis* species as the main causative agent of pulmonary tuberculosis (Godreuil *et al*., 2007). In Ghana studies show that *M. tuberculosis* accounted for 73% of pulmonary tuberculosis whilst *M. africanum* and *M. bovis* respectively accounted for 23% and 3% (Addo *et al*., 2007). This is similar to a recent study done in Northern Nigeria presented at the 2010 Global TEPHINET conference Cape Town, South Africa which reported a yield of 89.2% *M. tuberculosis and 10.8% M. africanum.*

2.2 Epidemiology

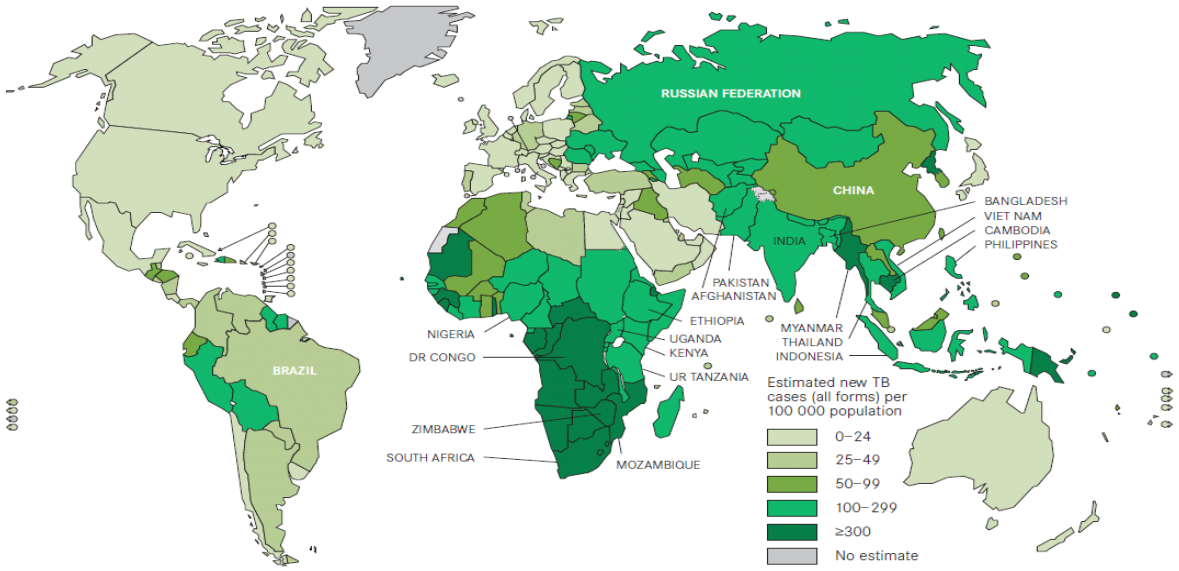
The estimated global burden of disease in 2009 is 9.4 million incident cases, 14 million prevalent cases, 1.3 million deaths among HIV-negative people and 0.38 million deaths among HIV-positive people (WHO, 2010). Therefore no country can be spared the threat of TB to public health (Joint Tuberculosis committee of the British thoracic Society; 2000). Eighty percent of the worldwide burden of TB is accounted for by 22 countries and first to fifth highest ranking countries being India, China, South Africa, Nigeria, and Indonesia (WHO, 2010). Twelve out of the 15 countries estimated to have the highest TB incidence are in Africa (WHO, 2010). Also the

African region is the worst of three epidemiological regions where TB incidence is still on the rise (WHO, 2010). However Ghana is not among the most endemic countries (Stopping TB in Ghana, 2003).

The Prevalence of TB

In 2010, there were 12 million TB cases globally equivalent to 178 cases per 100,000 population (WHO Global TB Report, 2011). **Figure: 1 shows** the global geographical prevalence of TB with highest prevalence in Asia and Africa. Presently, India and China together account for almost 40% of the world's TB cases and the African Region contributing 24% of the world's cases with the highest rates of cases per capita (WHO Global TB Report, 2011).

Figure 2.0: Global Prevalence of Tuberculosis



Source: WHO Global TB Report, 2011

The only WHO sponsored survey of TB burden in Ghana was in 1957 which estimated the annual risk of infection between 3 and 4 per 100 000 population in gold mining towns (The

National Tuberculosis Health Sector Strategic Plan for Ghana 2009-2013). Presently WHO estimates the prevalence of all forms of TB in Ghana to be 92 per 100,000 populations (WHO International TB Country Data Profiles, 2011). According to the WHO this prevalence accounts for only 27 percent of all forms of TB and 38 percent of smear positive TB cases (The National Tuberculosis Health Sector Strategic Plan for Ghana 2009-2013). Some contributing factors to this prevalence are the reliance on countrywide passive TB case detection strategy (WHO International Country data Profiles, 2011), HIV/AIDS epidemic with about 25-30 % of HIV/TB co infection by the year 2009 (Guidelines for the Clinical Management of TB and HIV Co-Infection, 2007) cross border migration within the West African Sub Region (Awumbila M *et al*., 2007) and rural- urban migration with increasing urban slum dwellings (Owusu G. 2010).

2.3 Active case finding (ACF)

One of the main strategies for the early detection of pulmonary tuberculosis (PTB) is through the screening of individuals with symptoms compatible with PTB. The ultimate goal of active TB case finding is to improve case detection and minimize diagnostic delays leading to reduction the TB transmission in the community (Golub et al 2005). However the choice of appropriate case finding strategy must be based on the epidemiological situation of tuberculosis in a particular country (Golub *et al.,* 2005**;** Mitruka *et al*., 2011). Ghana has a relatively stable HIV epidemic with pockets of high prevalence amongst risk groups whilst 23% of all TB cases are persons living with HIV/AIDs (Ghana Technical Policy and Guidelines for HIV/TB Collaboration, 2007). It is ideal to target these vulnerable pockets of high risk groups for screening in order to improve TB case detection. Dye and colleagues attested to the fact that PCF approach alone cannot help countries in meeting their regional targets (Dye C *et al*, 2005). In their review, Golub and colleagues found that the application of ACF was effective in detecting 60–82% of active

TB cases (Golub *et al.*, 2005). A Zimbabwean study in two urban primary health care clinics showed a high prevalence of 43% TB among chronic coughers (Munyati *et al., 2005*). Another cross-sectional study to assess active case-finding strategy for the identification of smear-positive TB in a rural district of Ethiopia resulted in 80 per 100,000 population prevalence. The study revealed further a very high proportion of undiagnosed TB indicating large infectious pool with significant transmission within the community (Yimer *et al.,* 2009). To demonstrate scaling up of TB services in cost effective manner within vulnerable groups, Sugata and colleagues piloted ACF among rural urban-urban migrants in Allahabad which detected PTB prevalence of 600 per 100,000 (Sugata M *et al* 2008). The living conditions and circumstances of these rural urban migrants are similar to Kayayei.

2.4 Kayayei (Commercial Female Head Porters)

Kaya is a Hausa language which means luggage, load or goods. *Yoo* means woman in Ga, the language of the indigenes of Accra, the Ghanaian capital. A *kayayoo* is therefore a woman who carries load. The plural form of *yoo* is *yei*, hence *kayayei* are women head porters (Opare, 2003). Kayayei is therefore a trade name given children and adults from Northern Ghana comprising Upper West, Upper East and Northern Regions, who migrate to the Southern sector of the country to engage domestic labor or head porterage for negotiated fee. This practice has been in existence in Ghana for over three decades and children under the ages of 18 including adults as old as 45 years indulge in the trade (Ziem J, 2009). They live under impoverished situations, in ethnic groupings, form semi-permanent conjugal unions and sexual partnerships for both protection and financial support (Jawula MD, 2010). They are exposed to physical, mental and reproductive health risks, in particular sexually transmitted diseases including HIV/AIDS (Yeboah M, 2010). Many of the children engage in this trade as a short-term job in order to build a seed capital for future engagements (Yeboah M, 2010). The high demand for Kayayei services,

forced marriages, poverty, inequities in access to education, frequent conflicts and natural disasters are factors that drive Kayayei trade (Taylor, 2005; Jawula, 2010). Their earnings are low resulting in self-medication and traditional medicinal methods usually employed among persons living in the slummy situations (Yeboah M, 2009).

According to the Ghana Child Labour Survey (GCLS, 2003), Accra is the most preferred destination for Kayayei. Within the Accra Metropolis Kayayei activities are most vibrant in the Makola, Agbogblshie, Kaneshie and Mallam Atta markets classified as central markets by the Metropolitan Authority. These markets are big**,** busy, mostly unstructured and unorganized. They are managed under Accra Metropolitan Assembly (AMA). Kayayei sleep in front of shops, poorly ventilated rooms/stores, under market or lorry station sheds and in polythene rubber tents especially during raining seasons. Averagely, they work for 18 months and return to their communities (Opare, 2003; Awumblia, 2007). Although in the year 2000 Ghana ratified and adopted International Labour Organization (ILO) policy of elimination of worst form of child labor including hazardous work, the non-enforcement of these child protection laws is evident in the Kayayei situation. A previous effort by government to return home and reintegrate them into mainstream skills training and education rather resulted in Kayayei considering themselves as being sought after, to be sent home. This may contribute to the poor health seeking practices as they fear to be tracked with biographic data demanded at health facilities. In their home regions the consumption of unpasteurized milk which has been linked to bovine TB in humans (Cataldi *et al.*, 2007; Ofukwu, 2008) is common in the Northern Ghana where local staples such as borkina, fula and nunu are prepared with unpasteurized milk (Ofukwu, 2008).

Kayayei are rural urban migrants thus belong to most-at-risk populations (MARPs) (National HIV& AIDS Strategic Plan, 2010; Audit of USAID/Ghana's Efforts to Integrate Gender into

HIV/AIDS Activities Report, 2012). According to the Ghana AIDS Commission, the MARPs have high HIV prevalence between 25.1% - 38.7 % **(**GAC Annual Status Report, 2009) with HIV/TB co infection of about 25-30 % (Guidelines for the Clinical Management of TB and HIV Co-Infection, 2007).

Hence the estimated TB prevalence can be deduced to be between 6.5% - 11.6 % from the estimated prevalence above. In addition, important determinants of developing active TB and spread such as poverty, overcrowding and malnutrition (Lee, *et al* 2008; Lonroth, *et al* 2008) are common among Kayayei.

2.5 Risk Factors

Tuberculosis remains a disease of poverty that is inextricably associated with overcrowding and malnutrition. Studies have found that increase in body weight lowers the risk of tuberculosis infection whilst body mass index (BMI) below 18.5 increases the risk by 2-3 times (Lonnroth *et al.*, 2010; Bates *et al.*, 2004). According to the Stop TB partnership, persons infected with HIV are 20 times more likely to develop TB than non HIV infected persons. Studies reported that HIV infection has fuelled three to five times increases in tuberculosis incidence rates in many high HIV prevalence countries in sub-Saharan Africa (WHO, 2009). Old age and smoking are major risks with about twice increased risk of infection and progression to active TB (Donald *et al.*, 2010; Bates *et al*., 2007). Other risk factors include heavy alcohol consumption, end stage renal failure, and malignancies (Lonnroth, 2008; Hussein, 2003). Diabetes is three-times associated with tuberculosis and accounted for about 20% of smear-positive TB cases in India in 2000 (Stevenson *et al.*, 2007). Immunosuppressive drugs such as corticosteroids have long been associated with the risk of tuberculosis, but tuberculosis associated with tumor necrosis factor (TNF) antagonists for the treatment of rheumatological disorders is now an increasing problem

in industrialized countries (Wallis RS, 2008). The consumption of unpasteurized milk has also been linked to bovine TB in humans (Cataldi *et al*, 2007; Ofukwu, 2008). This is common in the three Northern Regions of Ghana where local staples such as borkina, fula and nunu are prepared with unpasteurized milk (Ofukwu, 2008).

2.6 Diagnosis

Worldwide, TB patients are diagnosed by sputum smear microscopy (SMM) whereas in well resourced settings the standard of care is sputum culture with diagnostic sensitivity testing (DST) if culture indicates growth (WHO Global Tuberculosis Control 2008). However microscopy remains limited by low sensitivity (on average 50% of culture-positive samples are smear-positive).SMM is also constrained by diagnosing childhood tuberculosis and lack of DST capability (Steingart *et al.,* 2006). Due to the challenges of smear microscopy, new methods that can optimize the yield and accuracy of smear microscopy have been explored (Mase *et al.,* 2007; Steingart *et al*., 2006). These include light-emitting diode (LED)-based fluorescence microscopy, use of sputum processing methods, and optimization of specimen collection for same-day diagnosis (Cambanis *et al.,* 2006). Meta-analyses have shown that liquid culture techniques are more sensitive for detection of mycobacteria and may increase the case yield by 10% compared with solid media (Cruciani *et al.,* 2004). The automated liquid culture systems are the gold standard for the diagnosis of tuberculosis as they are substantially faster and have a 10% greater yield than solid media (Dinnes *et al.,* 2007). The BACTEC MGIT 960 (Becton Dickinson) liquid culture system detects mycobacteria in clinical specimen averagely 2 weeks after inoculation (Somoskövi *et al*., 2000).

An alternative inexpensive noncommercial culture and DST methods endorsed by WHO in 2009 as an interim solution in the resource constrained settings include microscopically observed drug susceptibility (MODS) and the nitrate reducate assay (Pai *et al*.,2009;WHO,2009) LED

fluorescence microscopy and liquid culture systems were recommended by WHO to be used in combination with antigen-based species confirmation for diagnosis and drug susceptibility testing (DST) in low-income and middle-income countries (WHO, 2008).

2.7 Tuberculosis Control

2.7.1The National Tuberculosis Control Programme (NTP)

The NTP of Ghana implemented the WHO DOTS Strategy in 1994 and achieved 100% coverage countrywide within the public health sector by the year 2000 (Ghana Health Service Tuberculosis Control Programme, 2011). According to news commentary (2012) on the Ghana Broadcasting Corporation with nationwide coverage, NTP exceeded in 2010 the WHO treatment success rate target of 85% of all newly diagnosed cases. Presently, the NTP is implementing the new Stop TB Strategy of WHO to achieve the 2015 TB related Millennium target (Ghana Health Service Tuberculosis Control Programme, 2011**).** Data available indicates TB patient male-female ratio of 2:1 with females within their most productive years and reproductive ages of 25-34 years (The National Tuberculosis Health Sector Strategic Plan for Ghana 2009-2013). From their study in Nigeria, Christopher and Bosede reported a mean age of 22.2 years among females studied (Christopher O and Bosede I 2010).

Although Ghana has a stable HIV epidemic, 23% of all TB cases are amongst persons living with HIV/AIDs (Ghana Technical Policy and Guidelines for HIV/TB Collaboration, 2007). These persons are most vulnerable to TB with about 30-50% higher risk of developing active TB thus serving as reservoir for resurgence of the disease (Christopher O and Bosede I 2010). Health authorities in Ghana have recognized low TB case detection as a result of the implementation of the DOTs strategy (The National Tuberculosis Health Sector Strategic Plan for Ghana 2009-2013**).** To address this gap, the health sector strategized efforts geared towards improving

hospital-based TB case detection through front desk offloading, contact tracing of index TB cases and public private partnerships (PPP) (The National Tuberculosis Health Sector Strategic Plan for Ghana 2009-2013). The KICK TB program which aims at increasing awareness and knowledge, dispel common myths and misconceptions to promote behavioral changes intended to address childhood TB is also ongoing (GBC, 2012).

2.7.2 Knowledge about TB

The DOTS strategy relies on passive case finding for TB treatment hence its effectiveness depends on client's ability to recognize early TB signs and symptoms for immediate self-reporting (Chandrashekhar *et al*., 2009). This implies that, basic knowledge about the disease and health seeking behavior of people must be optimal to minimize undue delays in seeking care to prevent disease transmission within communities. Some studies identified the lack of TB knowledge as an important barrier to TB diagnosis and treatment of TB (Mushtaq MU *et al* 2011, Malhotra R *et al* 2002). Varied misconceptions about the mode of transmission of TB abounds whereas the sources of TB information also vary depending on the geographical location and level of education among different settings (Buregyeya E *et al* 2010).

However in most jurisdictions there is a local name for the disease thus most inhabitants would have heard of TB. A study found that the knowledge of the mode of TB transmission are smoking and alcohol consumption (Ganapathy S *et al* 2008), sharing eating and drinking utensils and sleeping with a TB patient (Mushtaq MU *et al* 2011). In a population-based survey among individuals with a cough for more than three weeks, limited knowledge of the causes, transmission modes, symptoms, and curability of TB were noted. This study also found that higher level of education was found to be significantly related to seeking healthcare and seeking hospital care for cough (Hoa *et al* 2003). In 2006, an effort to enhance DOTS strategy in

meeting the TB-related Millennium Development Goals targets, the Stop TB Partnership and World Health Organization endorsed advocacy, communication and social mobilization (ACSM) as a vital tool relevant to successful implementation of the DOTS program (Stop TB Partnership and World Health Organization 2006). A study in India reported doctors and health care workers to be a major source for disseminating information on tuberculosis by 50.2% followed by mass media 33.8% and 34.7% mentioned interaction with others in the community (Malhotra R *et al* 2002). The most commonly recognized symptoms in a study in Pakistan were cough 83.5%, fever 54.7%, chest pain 24.7%, and hemoptysis accounting for 24.7% (Mushtaq MU *et al* 2011). Similarly, in a study conducted among a Delhi population in India, symptoms of TB were reported as cough with sputum 73.7%, weakness and breathlessness 40.4%, fever 34.3% and hemoptysis 30% (Malhotra R *et al* 2011).

2.73 Care Seeking Behavior of TB Suspects

The Technical Policy and Guidelines for HIV/TB Collaboration on Ghana has identified late reporting of patients for medical care, late diagnosis and HIV TB co-infection as challenges confronting the DOTS implementation (Guidelines for the Clinical Management of TB and HIV Co-Infection, 2007). Yodi and colleagues in their study of healthcare utilization pattern of smear positive TB patients prior to diagnosis and treatment by DOTS services found that 38.3% of TB patients in the rural districts would seek care at public health centres as first choice (Yodi M 2008). Seeking care from traditional healers, who are within reach are common in developing countries and has been suggested to account for observed delay among TB clients (Barker R *et al* 2006). This is not the same among urban settlers as found in a study conducted in Lima, Peru (Oeser C *et al* 2005). In a cross sectional survey in rural Southwest Ethiopia among TB suspects cough etiquette 69.9% and 63.1% proper disposal of sputum were the cited preventive practices

by respondents (Abebe G *et al* 2010). Client knowledge of exact symptoms would help focus health care giver's intuition in probing for TB signs thus aiding prompt diagnosis of TB. Studies reported unresolved cough for more than 2 weeks with antibiotic use, occasional chest pain, breathing difficulty, weight loss, fever and with hemoptysis being the most strongly associated symptom with TB (Buregyeya E 2011; Mushtaq MU 2011). In another study in rural Delhi, Malhotra R and colleagues reported 73.7% cough with sputum, weakness and breathlessness 40.4%, fever 34.3%, and hemoptysis 30% were symptoms of TB mentioned by the study participants (Malhotra R 2011).

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Study Design

A cross-sectional study was conducted among Kayayei between October and November 2011 at Mallam Atta Market.

3.2 Study Area

This study was conducted in the Greater Accra region of Ghana which lies in the South Eastern part of the country along the gulf of Guinea and have coastal, savanna and a bit of forest area inland towards the Eastern region. It had a population of 1,963,264 in 2011, accounting for 15.4 percent of Ghana's population; occupying a total land surface of 3,245 square kilometers made up of 1.4 percent of the total land area of Ghana.

Figure 3 shows a map of the study area where this study was carried out. Mallam Atta market is located within the Ayawaso West sub metropolitan area in the Accra metropolis. The settlements in and around the market is a mix of property owners and squatters who live in unauthorized wooden structures. The entire environment is dirty, over-crowded and therefore persons living here are potentially at high risk for contracting communicable diseases such as PTB. An assessment by the Metro Planning Unit Report in 2008 recommended the entire market infrastructure for rehabilitation.

Figure 3.0: Map Showing Location of Mallam Atta Market

Source: Geography Dept, University of Cape Coast, Cape Coast.

3.3 **Sampling**

3.3.1 Study Population

Participants of this study were all Kayayei operating as head porters at the Mallam Atta Market in Accra.

Inclusion Criteria

Kayayei who consented to be part of the study with productive cough (≥2 weeks) and or tuberculosis symptoms score of ≥7 were enrolled during this study. The symptoms included: coughing up blood (haemoptysis), drenching night sweats, fever, chest pain and loss of weight in last 3 months.

Exclusion Criteria

Kayayei who did not consent, refused to give a traceable address and those with unproductive cough were excluded from the study.

3.3.2 Sample Size Determination

We assumed non variability of PTB prevalence among Kayayei within principal markets in Accra. Considering available resources in terms of cost and accessibility of laboratory diagnostic work space, the sample size of 160 was estimated using a single proportion sample size formulae (Gorstein 2007) considering the following parameters: 10 % prevalence (Guidelines for the Clinical Management of TB and HIV Co-Infection, 2007; GAC Annual Status Report, 2009) at 95% confidence interval, 5% margin of error and 5% adjustment of non-submission of specimen and 10% contamination of sputa.

$$n = \frac{1.96^2\, p(1-p)(DEFF)}{d}$$

Where p= estimate of expected prevalence

d =desired level of absolute precision

DEEF=estimated design effect

$$n = \frac{1.96^2\, (0.1)\,(0.9)(1)}{0.05^2}$$

Adjusting for 5% non-submission and 10% contamination of sputa at culture, sample size of 160 was arrived at.

3.3.3 Sampling Method

Mallam Atta Market was randomly selected through a box draw from among three other designated principal markets within the Accra Metropolitan Area (Makola, Agbogblshie and Kaneshie markets). Resident Kayayei market chief and queen mother listed all female leaders

(households) in the market. This was the frame from which ten female leaders were randomly selected through box draw without replacement weekly. All consented subordinate girls from the selected households were recruited and screened weekly at health screening durbars until 160 out of 840 participants who met the inclusion criteria were enrolled into the study.

3.4 Data collection

3.4.1 Tools and Techniques

A structured questionnaire with sections on eligibility, risk factors for TB and knowledge about TB was used to obtain data from the participants. Sections for the questionnaire were adapted from a handbook for tuberculosis prevalence surveys (2010), advocacy, communication and social mobilization for TB control guide (ACSM, 2008) and the NTP TB screening tools. The questionnaire was pre-tested among Kayayei at the Makola Market for ease of understanding and administration as well as to identify inherent challenges. During the pretesting phase it was found that some participants were not comfortable with male interviewers and persons who do not hail from Northern Ghana. Two (2) nurses who are indigenes of Northern Ghana with experience in adolescent care were recruited to conduct the interviews translated into Hausa (appendix C).

3.4.2 Measurement of Variables

The purpose and benefits of the study was explained in Hausa to the Kayayei. Anthropometric measurements were taken with weighing scale and tape measure. Consenting participants with history of reproductive cough (≥2 weeks) and or tuberculosis symptoms score of ≥7 were recruited in to the study. Each study participant was administered a structured questionnaire to collect data on variables such as socio-demographic characteristics, presence of signs and

symptoms of tuberculosis, risk factors, knowledge of TB and health seeking behaviors. Weight and height of each participant were measured. Participants were advised to produce 2-3 ml sputum in open air away from others into a wide mouth sterile leak proof receptacle. Two sputum specimens were collected an hour apart according to WHO recommended sampling strategy (Policy statement on same-day diagnosis of TB by microscopy, 2010).

Specimens were labeled with unique individual identification numbers. The sputa were immediately placed in icebox maintained at 3-8 degrees Celsius and transported to laboratory within 4 hours after collection.

3.5 Laboratory Methods

The study was carried out at the Chest Clinic Laboratory of the Korle-Bu Teaching Hospital from November 2011 through February 2012. This laboratory receives various clinical samples for diagnosis of TB from all over the country and currently serves as a referral laboratory for DST because the TB laboratory within the National Public Health and Reference Laboratory (NPHRL) is under renovation and all resources had been transferred to the Chest Clinic Laboratory.

A total of 160 sputa were processed during the study period. Decontamination of specimens was carried out by standard N-acetyl-L-cysteine NaOH digestion-decontamination method (Kent *et al*, 1985). A final concentration of 4% NaOH was used for decontamination. Two to three (2-3 drops of the processed specimens were placed on a glass slide to prepare a smear. All smears were stained with Ziehl-Neelsen (ZN) acid fast staining and reported according to the protocol described by Ellis and Fujiki (Ellis *et al*, 1993; Fujiki A. 2001). All positive slides and 10% of negative slides were re-examined for confirmation by a senior laboratory technician at the NPHRL.

3.5.1 Specimen processing for culture by Löwenstein-Jensen and BACTEC MGIT® 960

Two unconcentrated sputa per study participant were combined and directly smeared for Ziehl-Neelsen acid-fast staining (Pardini *et al.,* 2005).

The rest of the sputum was processed by the N-acetyl-l-cysteine-NaOH method, using a commercial kit (MycoPrep; Becton Dickinson, Cockeysville, MD). The supernatant was discarded into 20% phenol decontaminant and the pellet was re-suspended in sterile phosphate buffer to make a final volume of 2 ml. An inoculum from this suspension was smeared on a slide for Ziehl-Neelsen acid-fast staining. A blood agar plate was inoculated and incubated at 37°C overnight to check sterility of each prepared suspension.

An inoculum from each suspension was added into a BACTEC MGIT® 960 tubes (0.5 ml/tube) containing 0.8 ml of MGIT oleic acid-albumin-dextrose-citrate enrichment (Becton Dickinson) and 0.1 ml of antibiotic mixture MGIT PANTA (polimyxin B, nalidixic acid, trimethoprim, and azlocillin). The contents were mixed by inverting the tube 3-4 times, barcode was scanned and tube inserted into the MGIT 960 system at 37°C which automatically monitors the inoculated tubes for 6 weeks or until an alarm signal indicates mycobacterial growth. In addition, two Löwenstein-Jensen slants were inoculated with 0.25 ml of each suspension, incubated at 37°C for 8 weeks, and inspected weekly for the appearance of visible colonies. When the BACTEC MGIT 960 system indicated positivity, the sample was removed and subjected to microscopic confirmation and species identification of mycobacteria by the TBcID confirmation test. At the end of the six weeks incubation, smears were prepared from all the negative tubes and stained by ZN staining technique to look for false negative tubes.

3.5.2 Smear microscopy

A disposable wooden applicator stick was used to prepare a direct smear from participant sputa prior to pretreatment of sputum. These smears were prepared alongside with sputum from known positive and negative stocks. The sputum smears were stained using hot Ziehl-Neelsen staining technique (Pardini *et al* 2005;Fujiki A. 2001) and read by two independent technicians. Positive smears were quantified using the International Union against Tuberculosis and Lung Disease standards (Fujiki A , 2001; Enarson DA *et al* 2000).

Table 3.0 : Scoring of Z-N stained slides (Fujiki , 2001)

No AFB was seen for 100 fields examined	No AFB seen
1-10 AFB seen for 100 Fields examined	Scanty
More than 10 AFB seen for 100 fields examined	+
1-10 AFB seen for 50 Fields examined	++
More than 10 AFB seen for 20 fields examined	+++

3.5.3 Limitations of data collection

The TB laboratory within the NPHRL was under renovation with all resources transferred to Korle Bu Chest Clinic. Due to financial constrains positive isolates and 10% percent of negative samples could not be submitted for external quality control. The listing of female leaders (households) was done by local chief or queen mother and it may be possible they may not have included households they considered as recalcitrant.

3.5.4 Quality Control

Stains and staining process of each batch of smear was conducted by including one unstained known positive (2+) smear to serve as a positive control and unstained known negative smear to serve as negative control. For verification a laboratory technologist randomly selected 10% of all negative slides and rescreened them.

H37Ra ATCC 25177 of *Mycobacterium tuberculosis* was inoculated in each new batch of MGIT tubes as positive control. A MGIT tube inoculated with 0.5 ml phosphate buffered saline was used as negative control. Ten percent (10%) inoculum stocks of negative growths were repeated on Lowenstein-Jensen slants and BACTEC MGIT 960 method.

3.6 Data Analysis

Data was entered into MS Excel and analyzed using Epi Info version 3.5.1 (Centers for Disease Control and Prevention, Atlanta, GA, USA) and SPSS v.16 software. Percentages and proportions of PTB related factors such as socio demography, PTB health seeking behavior, and knowledge were calculated. Factors associated to PTB health seeking behavior and knowledge was described at 95% confidence interval.

3.7 Ethical Considerations

Ghana Health Service Ethical Review Board gave approval for the commencement of this study (APPENDIX E- Protocol ID NO: GHS-ERC: 16/09/11). Oral consent was obtained from each participant and unique identifiers were assigned to participants to ensure confidentiality for all the information provided.

The team of researchers on this protocol with considerable experience in issues involving informed consent and participation of human subjects in research had been involved in designing the protocols. Recognizing the critical role of the volunteer, the study was carried in an environment where no coercion was applied and where volunteers were adequately informed of the purpose, nature, procedures, risks and hazards of the study. Informed consent was voluntarily obtained working hand in hand with market queens (in charges/custodians of markets) local chiefs and queen mothers (representing traditional areas where Kayayei migrated from), sectional/opinion leaders (who offer protection/guidance) at the markets where they live and work to incorporate an intimate understanding of local beliefs, fears, customs, anxieties and perceptions into the informed consent process. Prior to the initiation of this protocol, a team of investigators visited the market site to discuss the objectives and method and usefulness of the study. All groups and individuals indicated they understood the purpose and principles of the study, and agreed to participate in health screening durbars announced using a public address system throughout the Kayayei community in and around Malam Atta market. Thus it was only after the community of Kayayei was informed that individual consents were obtained and documented. When eligible Kayayei were identified the interviewer described briefly the study and if she expresses willingness to be considered for the study, a fuller explanation was given.

All explanations and consent procedures occurred in twi (most widely spoken local Ghanaian language) or Hausa (a local dialect spoken by all Kayayei). Points emphasized included the freedom to participate or decline any time without penalty or alteration of quality of counseling and health care provided: continuous access to counseling and health care throughout the course of the study and risks and the benefits of participating. Consent was documented on the attached Consent Document Form approved by the Research and Ethical Review Committee of the Ghana Health Service.

Data was handled anonymously with survey questionnaire and laboratory data sheets completed, signed by study investigators only, stored in bound folders while in use, and then secured in locked metal file cabinets until data entry. Data was doubly entered and checked for entry errors. During data entry and validation, database files were accessible to study investigators only, and password protected.

Referrals for TB Treatment and Further Medical Assessment

The two participants who tested positive to PTB were sent to Achimota Hospital DOTS centre for notification and free TB care. Chronic coughers with negative smear results as well as Kayayei who had contacts with the PTB cases were advised to seek care at the Mallam Atta Market Clinic.

CHAPTER FOUR

4.0 RESULTS

This study was a cross-sectional study conducted between the months of October-November, 2011 amongst 160 Kayayei at Mallam Atta Market. ACF strategy was applied to collect socio-demographic characteristics, anthropometric measurements (weight and height) and risk factors. A total of 320 sputa were collected for unlinked anonymous testing for the presence of *Mycobacterium tuberculosis*. Out of a total number of 846 respondents screened 160 met the eligibility criteria and none of the 160 persons declined to take part in the study. Of the 160 Kayayei enrolled unto the study, majority 69/160 (43.1) were within ages 15–20 years (Table 2). Mean age of the participants was 20.2 ± 6.55 and their ages ranged from 7–35 years. One hundred and twenty (75%) had no formal education, 96(60.6%) had no child and majority 154 (96.3%) were Muslims. Majority of the study participants belong to tribes within the Northern Region of Ghana.

Table 4.0: Socio demographic characteristics of Kayayei at Malam Atta Market, 2011

Variable	No. (%)
Age range	
5 - 9	2(1.3)
10-14	31(19.4)
15-20	69(43.1)
21-24	21(13.1)
25-29	13(8.1)
30-34	18(11.3)
35-48	6(3.8)
Education level	
None	120(75)
Basic	31(19.4)
Religious schooling	9(5.6)
Parity	
No child	97(60.6)
1-2 children	46 (28.8)
3+ children	17(12.5)
Religion	
Muslim	154(96.3)
Christian	3(1.9)
Traditionalist	3(1.9)
Tribe	
Mamprusi	56 (35.0)
Mole Dagbani	44 (27.5)
Tamplim	22 (13.8)
Grusi	17 (10.6)
Tamplega	13 (8.1)
Burkinabe-Malian	8 (5.0)

Table 4.1: Respiratory Symptoms of PTB among Kayayei at Mallam Atta Market, 2011.

Response	No. (%)
Are you coughing ≥2 wks?	
Yes	130(81.3)
No	30(18.8)
Drenching night sweats	
Yes	62(38.8)
No	98(61.3)
Fever	
Yes	76(47.5)
No	84(52.5)
Blood in sputum	
Yes	8(5)
No	152(95.0)
Weight loss	
Yes	44(47.5)
No	116 (72.5)
Chest pain	
Yes	45(28.1)
No	115 (71.9)

One hundred and thirty (81.3%) participants mentioned they had been coughing for two weeks and more, blood in sputum 8(5%), weight loss 44(47.5) and 45(28.1%) mentioned chest pain as respiratory symptoms they had been experiencing.

Table 4.2: Anthropometry of Kayayei at Mallam Atta Market, 2011.

BMI g/m^2		**No. (%)**	**95%CI**
Malnourished	<18.5	79(49.4)	41.4-57.4
Normal	18.5-24.9	73(45.6)	37.7-53.7
Obese	>25	8(5.0)	2.2-9.6

About half of the study participants 79 (49.4%) had BMI less than 18.5g/m^2 considered a risk factor for TB disease (Table 4.2).

Laboratory Results

Of the combined 160 sputum specimens collected from the study subjects, only one (0.6%) was positive by direct smear microscopy. Fifteen samples could not be processed for culture because of inadequacy and contamination of the specimens. Out of the 145 samples cultured, 141 (97.2%) were negative, 3(2.1%) were positive by solid culture and 4 (3.8%) were positive by liquid culture (MGIT). Two (50%) of the 4 MGIT isolates were confirmed *Mycobacterium tuberculosis* and were sensitive to streptomycin, isoniazid, ethambutol, rifampicin, and pyramizymide. The other two isolates were confirmed atypical or non-tuberculous mycobacteria (NTM using TBciD technique.

Table 4.3: Prevalence Rate of PTB by method among Kayayei at Mallam Atta Market Accra, 2011.

Age category	No. Subjects	Microscopy(ZN)/10^5	L&J /10^5	MGIT/10^5	TBc Id/10^5
<15 yrs	33	0	0	0	0
≥15 yrs	127	1(78.7)	3(86.0)	4(315.0)	2(158.0)
Total	160	1(62.5)	3(187.5)	4(250.0)	2(125.0)
Prevalence/10^5 population					
Population screened	**864**	**1(120)**	**3(350)**	**4(460)**	**2(230)**

Table 4.3 shows the number of positive yield was detected among persons aged below 15 years using all techniques. Among persons aged 15 years and above, microscopy yielded one positive, L&J yielded three and Mycobacterium Growth Indicator Technique (MGIT) yielded four isolates of which two (2) were confirmed MTB complex using TBcID identification test. The prevalence rate among the study population using microscopy was 120 per 100,000 (1/864) which takes into account both suspected TB cases and non TB cases. Using liquid culture the prevalence found was 230/100,000 participants screened.

Table 4.4: Knowledge about PTB among Kayayei at Mallam Atta Market, 2011.

Response	No. (%)
Heard about TB?	
No	2(1.3)
yes	158(98.8)
Where did you first learn about TB?	
Radio/TV	33(19.6)
Family and friends	112(70.9)
Health workers	15(9.5)
Mode of transmission	
When a person with TB coughs or sneezes	22(13.8)
Through handshakes	1(0.6)
Do not know	137(85.6)
Perceived signs and symptoms	
Do not know	120(75)
Coughing up blood	8(5.0)
Weight loss	5(3.1)
Chest pain	2(1.3)

Majority 112 (70.9%) of the participants first heard of TB through family and friends while very few participants 15(9.5%) heard about TB from health workers. One hundred and thirty seven (85.6%) do not know the mode of transmission of TB, 22 (13.8%) and one person (0.6) mentioned hand shake as a means of transmission. Regarding symptoms of TB 25(15.6%) mentioned cough that lasts longer than 2 weeks as a symptom of TB while 120 (75%) were ignorant about the signs and symptoms of TB (Table 9).

Table 4.5: Univariate analysis of factors associated with knowledge about signs and symptoms of PTB among Kayayei at the Mallam Atta Market, Accra 2011.

Variable	Yes (%)	No (%)	OR	95% C I	
Case patient					
Had TB before	3(75)	1(25)	0.07	.01	0.9
Never had TB	37(23.7)	119(76.3)	1		
Educational Level					
Basic Education	11(35.5)	20(64.5)	2.2	0.3	18.3
Religious Schooling only	1(11.1)	8(88.9)	4.2	0.5	40.0
No education	28(23.3)	92(76.7)			
Marital status					
Married	19(23.8)	61(76.2)	2.8	0.2	42.3
Single	20(27)	54(73)	3.2	0.2	49.4
Divorced	1(16.7)	5(83.3)			
Parity					
1-2 children	11(23.9)	35(76.1)	1.6	0.6	5.5
3+ children	24(24.7)	73(75.3)	1.1	0.4	2.9
No child	5(29.4)	12(70.1)			
Age					
15 yrs and above	33(26)	94(74)	1.2	0.4	3.1
Below 15yrs	7(21.2)	26(78.8)	1		

a. The reference category is: Do not know.
b. Signs and symptoms of TB are: Cough and or fever without clear cause that lasts longer than 2weeks, coughing up blood, chest pain, shortness of breath and ongoing fatigue
C.All those factors that were OR ≤ 1 were introduced into the multivariate analysis for best fit final model.

Participants who had never had TB were less likely (OR=0.07, 95%CI= 0.01-0.9) to have knowledge on the signs and symptoms of TB while participants who had some religious education were four times more likely to know the signs and symptoms TB but this finding was not statistically significant. No significant association also was found between having TB signs

and symptoms knowledge, parity, marital status and to be aged 15 and above years. All which yielded OR<1 were introduced into multivariate analysis fro a best fit final model

Table 4.6: Multivariate analysis of factors associated with knowledge about mode of transmission of TB among Kayayei at Mallam Atta Market, Accra 2011.

Variable	Response				
	Yes (%)	**No (%)**	**OR**	**95% C I**	
Age					
Below 15yrs	4 (12.12)	29 (87.9)	0.9	0.3	2.9
15 yrs and above	18 (14.2)	109 (85.8)	1	1	
Case TB					
Never had TB	2(20)	136 (87.2)	0.1	0	0.8
Had TB before	2 (50)	2 (50)	1	1	
Educational Level					
Basic Education	8 (25.8)	23 (74.1)	0.8	0.1	7.3
Religious Schooling Only	1 (11.8)	8 (88.9)	2.8	0.3	25.6
No education	13 (10.8)	107 (89.2)	1	1	

a. The reference category is: Do not know.
b. Mode of transmission is: through breathing air from a TB person 's coughs or sneeze
c. All those factors that were OR ≤ 1 were introduced into the multivariate analysis for best fit final model.

From table 11 above although an association between having religious education and knowledge about the mode of transmission of TB exists among Kayayei, are not significant.

Table 4.7 : PTB care seeking practices among Kayayei at Malam Atta Market,2011

Response	No. (%)
How do you treat cough	
Herbal remedies	144(90)
Drugs from hospitals	16(10)
Praying	0
Home rest without medicine	0
Preventive practices	
Cover mouth/ nose when someone cough or sneezes	37(23.1)
Sleeping in airy room	1(0.6)
Good nutrition	1(0.6)
By prayers	2(1.3)
Avoid shaking hands places	22(1.3)
Do not know	117(73.1)

Most of the study participants 144(90%) would resort to herbal or traditional medication as compared to 16(10%) that would seek appropriate medical care to treat cough. About 117(73.1%) of the participants do nothing to prevent themselves from getting TB however 37 (23.1%) mentioned covering their mouth/nose when coughing or sneezing as a means to prevent oneself from being infected by TB (Table 4.7).

Table 4.8: Multivariate analysis of factors associated with health seeking behavior among Kayayei at Mallam Atta Market, Accra 2011.

	Health Seeking Behavior				
Variable	**Appropriate care N (%)**	**Not appropriate N (%)**	**OR**	**95% CI**	
Case patient					
Had TB before	15(9.6)	141(90.4)	2.2	1.0	24.0
Never had TB	1(25)	3(75)	1		
Educational Level					
Basic Education	12(10)	108(90)	1.2	0.1	11.3
Religious Schooling Only	3(9.7)	28(90.3)	1.1	0.1	13.4
No education	1(11.1)	8(88.9)	1		
Age					
15 yrs and above	15(11.8)	112(88.2)	0.2	0.0	1.9
Below 15yrs	1(3)	32(97)	1		
Parity					
1-2 children	1(5.9)	16(94.1)	1.5	0.2	13.3
3+ children	6(13)	40(87)	0.7	0.2	2.3
No child	9(9.3)	88(90.7)	1		

a. The reference category is: appropriate care.
b. Appropriate Health Seeking Behavior=Visits to health institutions, Not appropriate = visits to sources other than health institutions
c. All those factors that were OR ≤ 1 were introduced into the multivariate analysis for best fit final model.

From the table above, there was no significant association between parity, being aged 15yrs and above, having some form of education and never had TB and practicing appropriate health seeking behavior.

CHAPTER FIVE

5.0 DISCUSSION

The application of ACF strategy in this study led to the detection of unreported PTB cases among Kayayei. It has been established that, every case of PTB identified represents a high possibility of transmission to 10-15 case contacts (WHO Fact Sheet, 2011). Apart from devastating effect on their female reproductive health (Marais e*t al*., 2010), PTB among Kayayei poses serious public health threat to customers who patronize head porterage. In this study, we identified poor knowledge of PTB mode of transmission, signs and symptoms, and inappropriate health care seeking behavior among study participants.

The study participants were aged between 7-35 years which is lower than the age distribution of 11-55 years reported by Yeboah and colleagues (Yeboah MA *et al.*, 2009). In their study majority of Kayayei were between 16 and 35 years old while in this study majority of the Kayayei were between the ages of 15-20 years. Persons in this age group are economically productive and sexually active with a higher risk of contracting PTB. This age range overlaps the NTP reported ages of 25-34 years of the general Ghanaian population with higher risk of contracting TB (The National Tuberculosis Health Sector Strategic Plan for Ghana 2009-2013).

One hundred and twenty of the participants (75%) had no formal education. This finding is higher compared to the 65% of non formal education found in a study conducted among Kayayei in Accra and Kumasi (Yeboah MA, 2010). According to Christopher and colleagues a minimum of 10 years education is enough to impact desirable health seeking behavior among all persons (Christopher O and Bosede I 2010). This study reflects how Kayayei business may be hampering the promotion of girl child education in Northern region of Ghana where majority of study participants come from. This lack of education can subsequently impact on the poor health

seeking behavior noted in this study. Further, the high parity observed in this study is similar to findings from studies conducted by Yeboah and Awumbila (Yeboah MA, 2010; Awumbila *et al.*, 2008).

To aid prompt diagnosis of TB in order to reduce treatment delays, the exact symptoms reported by client can help focus health care giver's intuition in probing for TB. In this study, reported respiratory TB symptoms included coughing for two weeks or more 130 (81.3%), fever 76(47.5%), hemoptysis 8(5%), weight loss 44(47.5%) and 45 (28.1%) chest pains. Similarly Malhotra and colleagues also reported high figures for cough (73%) but with rather low figures for fever 34.3% among participants in their study (Malhotra R, 2002). On the contrary, they recorded a rather high percentage of hemoptysis (30%) while we had 5% of our participants having hemoptysis as a symptom. In addition, other studies conducted elsewhere (Golub *et al*., 2005; Munyati *et al., 2005*; Sanchez-Perez *et al.*, 2002) have reported cough history of more than 2 weeks duration similar to our study. Therefore cough query during ACF could be a cost effective tool to apply in order to increase case detection instead of mass radiography and physical examination which has also been cited by Golub and Mitruka (Golub *et al.*, 2005**;** Mitruka *et al*., 2005).

In this study SSM detected one PTB case whilst four isolates were detected from the MGIT technique of which two (2) were confirmed MTB complex by TBcID identification technique.

Using the automated liquid culture systems as the gold standard (Dinnes *et al.*, 2007), validity of SSM in this study showed sensitivity of 50%, specificity of 100% and overall accuracy of 99.3%. The low sensitivity of SSM in this study is consistent with that reported by Steingart and colleagues (2006) (Steingart KR *et al.*, 2006).

This study identified four (4) isolates from the liquid culture compared to three (3) isolates obtained from the solid media culture. This observation is 25% lower compared to the 10% higher yield noted by Dinnes and colleagues (2007) (Dinnes *et al.,* 2007). In Ghana, the decision to initiate PTB treatment is routinely based on positive sputum smear microscopy whilst treatment failures undergo culture and sensitivity testing. However this service is limited and our finding has shown that NTM colonization is common, hence the need to expand access to culture and sensitivity testing services is justified.

Using the automated liquid culture systems as the gold standard, the validity of the solid media culture in this study was of 100% sensitivity, 99.3% specificity and overall accuracy of 99.3% (appendix F). The sensitivity found in this study is however higher than what Cruciani and colleagues (2004) found in their meta-analyses of liquid culture techniques compared with solid cultures for the detection of mycobacterium (Cruciani *et al.,* 2004).

Presently the true burden of TB in Ghana is yet to be determined from the National TB prevalence survey currently underway. According to the WHO estimates, prevalence of all forms of TB in Ghana is 92 per 100,000 populations with PTB accounting for over 90% of this estimate (WHO international TB country data, 2011). In this study, PTB prevalence rate of 120 per 100,000 Kayayei and 230 per 100,000 Kayayei was found by employing microscopy and MGIT liquid culture techniques respectively. The prevalence found in our study is higher than the national estimate (WHO international TB country data, 2011) and that of Yimer and colleagues who found 80 per 100,000 population among rural dwellers during active case-finding survey in rural Ethiopia (Yimer *et al.,* 2009). The difference between our study prevalence and the national estimate may be due to the fact that national estimates rely on PCF strategy (WHO international TB country data, 2011) as compared with ACF employed in this study.

However prevalence found in our study is lower than the 600 per 100,000 population detected among rural-urban migrants in Allahaba India (Sugata *et al.,* 2008). This high prevalence is due to the fact that India together with China account for almost 40% of the world's TB cases (WHO Global Report, 2011). The prevalence observed in this study may be an indicator of 'pockets' of high TB prevalence existing among MARPS and emerging slums in Accra, other than the general population.

Knowledge about TB plays a vital role in the early reporting and detection of the mycobacterium. It has been documented that lack of TB knowledge is the main barrier to TB diagnosis and treatment **(**Mushtaq *et al.*, 2011, Malhotra *et al.*, 2002). Findings from this study show that 158 (98.8%) of the participants heard about TB. Of these, majority (70.9%) heard of TB from their family and friends, followed by 19.6% and 9.5% who heard about TB on radio and from health workers respectively. This finding varies from what was identified in an Indian study. In that study, 50% of the participants had heard of TB through their health workers, 33% through the mass media and 34.7 % through members of their community (Malhotra *et al.*, 2002). It is therefore imperative that TB education has to be intensified by health workers targeting MARPS. There are varied misconceptions about the mode of transmission of TB depending on the information provider and level of education among community members (Buregyeya *et al.*, 2011). It is expected that persons who had good knowledge about the transmission methods of TB might protect themselves from the diseases. Majority (85.6%) of our study participants did not know the mode of transmission of TB. However in a study conducted among TB suspects in a community in Ethiopia, 83.8% of study participants identified coughing as a mode of transmission while 34.2% stated other modes such as drinking unclean water.

In our study only one person thought of shaking hands as a mode of transmission of TB. Generally, poor knowledge about the mode of transmission of TB was evident among Kayayei regardless of their age, having ever been TB patient, and educational status in this study. This is worse than what was found in a cross-sectional study conducted within urban and rural districts of Pakistan's Punjab province. Poor knowledge deficit exist within the rural areas regarding mode of transmission compared to the urban setting (OR 1.93, 95% CI 1.44-2.59) (Mushtaq *et al.,* 2011). However this study shows no significant association between, parity, marital status, age and TB signs and symptoms as indicated in table 10. While participants who had some religious education were four times more likely to know the signs and symptoms of TB, this was not statistically significant. Generally, poor knowledge of TB signs and symptoms was evident among Kayayei regardless of their age, having ever been TB patient, and educational status.

Seeking care from traditional healers, are common in developing countries and has been suggested to account for observed delay among TB clients (Barker *et al.,* 2006). Majority of the study participants 144(90%) would resort to herbal or traditional medication as first choice for care seeking for cough. This study found that only 16(10%) would seek appropriate medical care to treat cough. Health care seeking behavior was therefore very poor among study participants compared to 38.3% reported by Yodi and colleagues **(**Yodi *et al.,* 2008**)** and 25.2% by Abebe and colleagues (Abebe G *et al.,* 2010). In our study, practicing appropriate health seeking behavior was not affected by parity, being aged 15yrs and above, having some form of education and previous history of TB. Similarly, health care seeking behavior was not affected by gender, educational level, marital status and age (Gemeda Abebe *et al*., 2010).

The finding in this study is contrary to that reported by Gemeda and colleagues. They reported that those who had previous history of TB were more likely to take appropriate action to seek

care than those that have never been diagnosed (Gemeda *et al.*, 2010). Also a population-based survey carried out within a demographic surveillance site in Vietnam showed health care seeking behavior was influenced by study participant's level of education (Hoa *et al*., 2003). The greatest predictor of health seeking behavior of the respondents in another study conducted in capital city of Ekiti State of Nigeria among TB clients ranked level of education, followed by gender and age (Christopher O and Bosede I 2010) as factors that influence health care seeking behaviour.

Limitation of the study

The findings in this study cannot be generalized since cluster sampling of all markets would be preferred to sampling done in this study. Comparism in this study was constrained by lack of comparative studies among target group like Kayayei. Thus most of the comparism were done with studies among TB clients as a proxy to Kayayei.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Pulmonary TB among Kayayei poses serious public health threat especially to clientele of head porterage. Pulmonary TB prevalence found in this study is 120 per 100,000 Kayayei compared to the national prevalence 92 per 100,000 in the general population. In this study, poor knowledge about the mode of PTB transmission, signs and symptoms, and inappropriate health care seeking behavior among study participants were identified.

6.2 Recommendations

- NTP should introduce targeted ACF among TB high risk populations such as Kayayei.
- NTP must collaborate with GHS Health Promotion Unit should intensify education of PTB care among Kayayei and persons living in urban slums.
- GHS must support the NTP to expand the capacity of diagnostic facilities to offer liquid culture services.

REFERENCES

A handbook for tuberculosis prevalence surveys (2010) (http: // www.who.int /tb/ advisory_bodies/ impact_measurement_taskforce/meetings/ prevalence_survey/ps_oct10_pr_red_book. pdf) accessed May 2011

Abebe G, Deribew A, Apers L, Woldemichael K, Shiffa J, Tesfaye M, Abdissa A, Deribie F, Jira C, Bezabih M, Aseffa A, Duchateau L, Colebunders R(2010): Knowledge, Health Seeking Behavior and Perceived Stigma towards Tuberculosis among Tuberculosis Suspects in a Rural Community in Southwest Ethiopia. PLoS One 2010**,** 5**(**10**):**e13339

ACSM (2008) World Health Organisation: Advocacy, communication and social mobilization for TB control: a guide to developing knowledge, attitude and practice surveys. World Health Organisation,Geneva,Switzerland;2008.(http://www.stoptb.org/assets/documents/resources/publications/acsm/ACSM_final_24%20Nov./pdf) accessed May 2011

Addo KK, Owusu –Darko K, Yeboah –Manu D, Caulley P, Minamikawa M, Bonsu F, Lienhardt C, Akpedunu P, Ofori- Adjei D (2007). Mycobacterial species causing pulmonary tuberculosis at the Korle Bu Teaching Hospital,Accra,Ghana Ghana Medical Journal, (41); 52-57

Audit of USAID/Ghana's Efforts to Integrate Gender into HIV/AIDS Activities Report No. 7-641-12-006-P Accessed May 2012 (http://oig.usaid.gov/sites/default/files/audit-reports/7-641-12-006-p.pdf)

Awumbila M, Manua T, Quartey, Adoquaye Tagoe, Bosiakoh (2007). A Migration Country Paper Ghana. Accessed(http://www.imi.ox.ac.uk/pdfs/ghana-country-paper)

Barker R, Millard F, Malatsi J, Mkoana L, Ngoatwana T, Agarawal S, de Valliere S (2006): Traditional healers, treatment delay, performance status and death from TB in rural South Africa. Int J Tuberc Lung Dis 2006, 10(6):670-675.

Bates I, Fenton C, Gruber J (2004). Vulnerability to malaria, tuberculosis, and HIV/AIDS infection and disease: part 1- determinants operating at individual and household level. *Lancet Infect Dis* 4: 267–77.

Bates MN, Khalakdina A, Pai M, Chang L, Lessa F, Smith KR.(2007) Risk of tuberculosis from exposure to tobacco smoke: a systematic review and meta-analysis. Intern Med 2007; 167:335–42.

Bhatti N, Law MR, Morris JK,Halliday R, Moore-Gillon J. (1995) Increasing Incidence of tuberculosis In England and Wales; a study of likely causes. BMJ 1995;310:967-9.

Bibir-Ghana (2009). Success story on kayayei project being carried out by bibir ghana in northern region and history behind "kayayei" in ghana. Accessed June 2010. (http://bibir.yolasite.com/resources/KAYAYEI.pdf)

Brooks GF, Butel JS, Morse SA (2004). Jawetz, Melnick and Adelberg's Medical Microbiology 23rd edition. International Edition, McGraw Hill Singapore, 319-324.

Buregyeya E, Kulane A, Colebunders R, *et al* 2011. Tuberculosis knowledge, attitudes and health-seeking behaviour in rural Uganda. International Journal of Tuberculosis and Lung Disease. 2011;15(7):938–942

Cambanis A, *et al* (2006). A one-day method for the diagnosis of pulmonary tuberculosis in rural Ethiopia. Int J Tuberc Lung Dis 2006; 10:230–2.

Cataldi A. *et al* (2007). *(http //* www.tuberculosistextbook.com/pdf/othmemb.pdf) Assessed March 2011

Chandrashekhar T, Sreeramareddy, Kishore V Panduru ,Joris Menten, J Van den Ende(2009) Time delays in diagnosis of pulmonary tuberculosis: a systematic review of literature.BMC *Infectious Diseases* 2009, **9:**91doi:10.1186/1471-2334-9-91

Chris G, Peter D (2005). New Tests for Identifying Tuberculosis Infection. The Biomedical Scientist 784-788

Christopher O, Bosede I (2010). Health seeking behaviour of tuberculosis patients in Ekiti State, Nigeria. Studies on Ethno-Medicine. 2010;4(3):191–197.

Cruciani M, Scarparo C, Malena M, (2004). Meta-analysis of BACTEC MGIT 960 and BACTEC 460 TB, with or without solid media, for detection of mycobacteria. J Clin Microbiol 2004; 42:2321–5.

Dami A Onifade, Angela M Bayer, Rosario Montoya, Marie Haro, Jessica Alva, Jessica Franco, Rosario Sosa, Betty Valiente, Enit Valera, Carolyn M Ford, Colleen D Acosta,and Carlton A Evans (2010). Gender-related factors influencing tuberculosis control in shantytowns: a qualitative study.*BMC Public Health*. 2010; 10: 381

Dinnes J, Deeks J, Kunst H, (2007). A systematic review of rapid diagnostic tests for the detection of tuberculosis infection. Health Technol Assess 2007; 11:1–178

Domenech P, Kolly GS, Leon-Solis L, Fallow A, Reed MB (2010). Massive gene duplication event among clinical isolates of the *Mycobacterium tuberculosis* W/Beijing family. *J Bacteriol* 192: 4562–70.

Donald PR, Marais BJ, Barry CE III (2010). Age and the epidemiology and pathogenesis of tuberculosis. Lancet 2010; 375:1852–54

Dye C, Watt CJ, Bleed DM, Hosseini SM, Raviglione MC (2005). Evolution of tuberculosis control and prospects for reducing tuberculosis incidence, prevalence, and deaths globally. JAMA. 293(22):2767-75.

Dye C, Williams BG (2010) .The population dynamics and control of tuberculosis. *Science* 2010; 328(5980):856-61

Ellis R. C. and Zabrowarny, L. A. (1993) .Acid fast bacilli staining protocol. Journal of Clinical Pathology 46, 559-560

Enarson DA, Rieder HL, Arnadottir T, Trébucq A (2000). Management of tuberculosis: a guide for low-income countries. 5th ed. International Union Against Tuberculosis and Lung Disease; France

Fujiki A. (2001) .Quality control /assurance for TB microscopy – Report on workshop on quality control /assurance for AFB microscopy. The Research Institute of Tuberculosis (RIT), Japan Anti-Tuberculosis Association (JATA)

Ganapathy S, Thomas BE, Jawahar MS, Selvi KJ, Sivasubramaniam, Weiss M (2008). Perceptions of gender and tuberculosis in a south Indian urban community. The Indian Journal of Tuberculosis. 2008;55(1):9–14.

GBC Ghana 2012. News commentary on the increasing cases of TB among children (http://www.gbcghana.com/index.php?id=1.861346) Accessed April 2012

Ghana AIDS Commission (GAC) (2009). Annual Status Report 2009 page 14-51

Ghana Child Labour Survey (GCLS) (2003) (www.ilo.org/ipecinfo/product/download.do)

Ghana Health Service Tuberculosis Control Programme. Accessed 24 May 2011(http://www.ghanahealthservice.org/tb_news.php.)

Global TB Report, 2010. Accessed 24 May 2011 (http://www.ops-oms.org.pa/drupal/SCMDSS/4 Documents from WHO/WHO HQ Tuberculosis-TB/TB_Global Tuberculosis Report_2010/TB_Global)

Godreuil S, TorreaG, Terru D, Chivenet F, Diagbouga S, Supply P, Van de Perre P, Carriere C, Banuls AL (2007) .First molecular epidemiology study of *Mycobacterium tuberculosis* in Burkina Fasso J Clin Microbiol., 45(3):921-927

Golub JE, Mohan CI, Comstock GW, Chaisson RE (2005) Active case finding of tuberculosis: historical perspective and future prospects. Int J Tuberc Lung Dis 9: 1183–1203.

Gorstein J, Sullivan KM, Parvanta I, Begin F. Indicators and methods for cross-sectional surveys of vitamin and mineral status of populations. Micronutrient Initiative (Ottawa) and Centers for Disease Control and Prevention (Atlanta), May 2007, pg 29

Grange JM. (2009) The genus *Mycobacterium* and the *Mycobacterium* tuberculosis complex. In: Schaaf S, Zumla A, eds.Tuberculosis: a comprehensive clinical reference. Philadelphia,PA: Saunders, 44–59.
Guidelines for the Clinical Management of TB and HIV Co-Infection in Ghana, 2007 (http://www.who.int/hiv/ guidelines/ghana pub) Accessed February 2011

Hargreaves S, Carballo M, Friedland JS, (2009). Screening migrants for tuberculosis: where next? Lancet Infect Dis 2009 9: 139-140

Hoa NP, Thorson AE, Long NH, Diwan VK. (2003) Knowledge of tuberculosis and associated health-seeking behaviour among rural Vietnamese adults with a cough for at least three weeks. Scand J Public Health Suppl. 2003;62:59–65.

International Union against Tuberculosis and Lung Disease (UTALD, 2008). Recommendations to ensure the diagnosis and treatment of tuberculosis in undocumented migrants http://www.theunion.org

Jawula MD (2010). http://ghanaianchronicle.com/features-in-ghana-%E2%80%93-a-case-of-policy-failure/ retrieved December 2010 .Lifeline, July 22, 2005. Accra, Ghana.

Kent PT, Kubica GP (1985). Public health mycobacteriology: a guide for the level III laboratory. Atlanta: US Department of Health and Human Services, Public Health Service, Centers for Disease Control

Lai CC, Tan CK, Chou CH, Hsu HL, Liao CH, Huang YT, Increasing incidence of nontuberculous mycobacteria (2010). Taiwan, 2000–2008. *Emerg Infect Dis.* 2010;16:294–6.

Lawn SD, Churchyard G (2009). Epidemiology of HIV-associated tuberculosis. *Curr Opin HIV AIDS* 2009; 4: 325–33.

Lee MS-N, Leung CC, Kam KM, Wong MY, Leung MCM, Tam CM, Leung EC**,** (2008) Early and late tuberculosis risks among close contacts in Hong Kong. *Int J Tuberc Lung Dis* 40(11-12):888-93

Lonnroth K, Castro KG, Chakaya JM (2010).Tuberculosis control and elimination 2010–50: cure, care, and social development. *Lancet* 2010; 375: 1814–29

Lonnroth K, Jaramillo E, Williams BG, Dye C, Raviglione M (2009) .Drivers of tuberculosis epidemics: the role of risk factors and social determinants. *Soc Sci Med* 2009; 68: 2240–46.

Lonroth K, Williams BG, Stadlin S, Jaramillo E, Dye C (2008) .Alcohol use as a risk factor for tuberculosis: a systematic review**.** BMC Public Health 2008; 8***:289.)***

Losi M, Bossink A, Codecasa L, et al (2007) .Use of a T-cell interferon-gamma release assay for the diagnosis of tuberculous pleurisy. *Eur Respir J* 2007; 30: 1173–79.

Malhotra R, Taneja DK, Dhingra VD, Rajpal S, Mehra M (2002). Awareness regarding tuberculosis in a rural population in Delhi. *Indian Journal of Community Medicine*. 2002; 27(2):p. 62.

Malhotra R, Taneja DK, Dhingra VD, Rajpal S, Mehra M (2011). Awareness regarding tuberculosis in a rural population in Delhi. Indian Journal of Community Medicine. 2011; 27(2):p. 62.

Mangtani P,Jolley DJ,Watson JM,Rodrigues L.(1995) Socioeconomic Deprivation and notification Rates for tuberculosis in London during 1982-91. BMJ 1995;310:963-6.
Marais BJ, Gupta A, Starke JR, El Sony A.(2010) Tuberculosis in women and children. Lancet 2010; published online May 19. McNally, 2007).

Mase SR, Ramsay A, Ng V, et al (2007). Yield of serial sputum specimen examinations in the diagnosis ofpulmonary tuberculosis: a systematic review. Int J Tuberc Lung Dis 2007;11:485–95.
McNally LM, Jeena PM, Gajee K, et al (2007). *Tuberculosis in women and children Clin* Infect Dis *2007*; 45: 241–49. **...** 12

Mitruka K, (2005) .Tuberculosis outbreak investigations in the United States, 2002–2008. Emerg InfectDis.http://www.boe.moph.go.th/boedb/srrtnetwork/otoo/filen/a011303100110831.pdf (retrieved November 2010)

Mugisha B, Bock N, Mermin J, (2006) .Tuberculosis case finding and preventive therapy in an HIV voluntary counseling and testing center in Uganda. Int J Tuberc Lung Dis. 10:761–767

Munyati SS, Dhoba T, Makanza ED, (2005) .Chronic cough in primary health care attendees, Harare, Zimbabwe: diagnosis and impact of HIV infection. Clin Infect Dis. 40:1818

Murray C & Salomon J (1998) Expanding the WHO tuberculosis control strategy: rethinking the role of active case-finding. International Journal of Tuberculosis and Lung Diseases 2, S9–S15.

Mushtaq MU, Shahid U, Abdullah HM, Saeed A, Omer F, Shad MA, Siddiqui AM, Akram J (2011) Urban-rural inequities in knowledge, attitudes and practices regarding tuberculosis in two District of Pakistan's Punjab province. International Journal for Equity in Health 2011, 10:8.

National HIV& AIDS Strategic Plan 2011-2015 (2010) .Towards achieving universal access to comprehensive HIV services in Ghana page 30

Oeser C, Escombe A, Gilman R, Friedland J, Evans C, Moore D: Does traditional medicine use hamper efforts at tuberculosis control in urban Peru? Am J Trop Med Hyg 2005, 73(3):571-575.

Ofukwu (2008).Zoonotic Mycobacterium species in fresh cow milk and fresh skimmed, unpasteurised market milk (nono) in Makurdi, Nigeria: implications for public health. Journal of Animal & Plant Sciences, Vol. 1, Issue 1: 21 - 25.

Opare JA, (2003) .Kayayei: The women porters of Southern Ghana. *Journal of Social Development in Africa*, 18, 33-47.

Owusu G, (2010).Urban Development Trends in Ghana and Accra. Accessed February 2011 (http://uradapt.iwmi.org/Data/Sites/23/projectdocuments/owusu_urban_develpment_trends.pdf)

Pai M, Minion J, Sohn H, Zwerling A, Perkins MD. (2009) .Novel and improved technologies for tuberculosis diagnosis: progress and challenges. *Clin Chest Med* 30**:** 701–16.

Pardini, M., F. Varaine, E. Iona, E. Arzumanian, F. Checchi, M. R. Oggioni, G. Orefici, and Fattorini L. (2006). Cetyl-pyridinium chloride is useful for isolation of Mycobacterium tuberculosis from sputa subjected to long-term storage. J. Clin. Microbiol. 2006; 43:442-444.

Policy statement on same-day diagnosis of tuberculosis by microscopy. Geneva,World HealthOrganization, 2010 (http://www.who.int/tb/laboratory/whopolicy_same-day)

Pronyk PM, Joshi B, Hargreaves JR, (2001). Active case finding: understanding the burden of tuberculosis in rural South Africa. Int J Tuberc Lung Dis. 5:611–618

Sanchez-Perez HJ, Hernan MA, Hernandez-Diaz S, Jansa JM, Halperin D, Ascherio A. (2002) Detection of pulmonary tuberculosis in Chiapas, Mexico. Ann Epidemiol. 12:166

Siddiqi K, Lambert ML, Walley J.(2003) Clinical diagnosis of smear-negative pulmonary tuberculosis in low-income countries: the current evidence. Lancet Infect Dis 2003;3:288–296.

Somoskövi, Á., C. Ködmön, Á. Lantos, Z. Bártfai, L. Tamási, J. Füzy, and P. Magyar (2000). Comparison of recoveries of Mycobacterium tuberculosis using the automated BACTEC MGIT 960 system, the BACTEC 460 TB system, and Löwenstein-Jensen medium. J. Clin. Microbiol. 38:2395-2397

Steingart KR, Henry M, Ng V, Hopewell PC, Ramsay A, Cunningham J, et al (2006) . Fluorescence versus conventional sputum smear microscopy for tuberculosis: a systematic review. Lancet Infect Dis. 2006; 6(9):570–81.

Steingart KR, Ng V, Henry M (2006) .Sputum processing methods to improve the sensitivity of smear microscopy for tuberculosis: a systematic review. *Lancet Infect Dis* 6: 664–74.

Stevenson CR, Forouhi NG, Roglic G, (2007) .Diabetes and tuberculosis: the impact of the diabetes epidemic on tuberculosis incidence. *BMC Public Health* 7: 234.

STOP TB Partnership and World Health Organization (2006). Global Plan to Stop TB 2006-2015. WHO, Geneva WHO/HTM/STB/2006.35 (http://www.stoptb.org/) retrieved November 2010

Stop TB Partnership and World Health Organization (2006): The Stop TB Strategy: building on and enhancing DOTS to meet the TB-related Millennium Development Goals, Geneva, Switzerland, (WHO/HTM/TB/2006. 368), 2006.

Stopping tuberculosis in Ghana, (2003).The Global Fund to fight Aids, Tuberculosis and Malaria; Investing In Our Future; http://www.investing in our future.com/ghana/tb

Storla DG, Yimer S, Bjune GA, (2008). A systematic review of delay in the diagnosis and treatment of tuberculosis. BMC Public Health,2008; 8:15.

Sugata Mukhopadhyay, Ms Gita Biswas, Mr UC Pandey, Mr BP Pandey (2008). Scaling up of TB services in the Targeted HIV/AIDS Intervention Programs among the vulnerable groups–a pilot project

in Allahabad, Uttar Pradesh, India. Accessed 12 June 2010 (www.iasociety.org/abstractmaterial/AIDS2008/.../AbsDoc_1152_1.do)

The National Tuberculosis Health Sector Strategic Plan for 2009-2013.

Thomas A, Chandrasekaran V, Joseph P, Rao VB, Patil AB, Jain DK, Chowdhary D, Saibabu Mahapatra S, Devi S, Wares F, Narayanan PR. (2008) Increased yield of smear positive pulmonary TB cases by screening patients with > or =2 weeks cough, compared to > or =3 weeks and adequacy of 2 sputum smear examinations for diagnosis. Indian J Tuberc.2008;55(2):77-83.

UN High Commission for Refugees. 2008 global trends: refugees, asylum-seekers, returnees, internally displaced and stateless persons. http://www.unhcr.org/4a375c426.html.

Wallis RS. (2008) Tumour necrosis factor antagonists: structure, function, and tuberculosis risks. *Lancet Infect Dis* 2008;8: 601–11.

WHO (2007) Tuberculosis care and control in refugee and displaced populations. WHO/HTM/TB/2007.377. Geneva: World Health Organization, 2007.

WHO (2008), Stop TB Partnership. New laboratory diagnostic tools for tuberculosis control. In: Geneva (Switzerland): World Health Organization; 2008 WHO (http://whqlibdoc.who. int/publications/2008) Retrieved December 2010

WHO (2009) Report of the ninth meeting of the strategic and technical advisory group for tuberculosis. Geneva: World Health Organization, 2009. (http://www.who.int/tb/advisory_bodies

WHO (2010) Global Tuberculosis Control. Geneva: World Health Organization (http://whqlibdoc.who.int/publications/2010/). Accessed May, 2011
WHO (2011) Global TB Report. AccessedFebruary2011
(http://www.who.int/tb/publications/global_report/en/index.html)

WHO (2011) Fact Sheet 104 WHO; 2011 Accessed 24 June, 2011 (http: //www.who. int/media centre/factsheets/fs104/en/)

WHO (2011) Scoping meeting for the development of guidelines on screening for activeTB.Geneva: World Health Organization. Available: Accessed 31 August 2011 (http://www.who.int/tb/TBscreeningmeetingreport2011.pdf).

WHO Global tuberculosis control: a short update to the 2009 report. Geneva: World Health Organization, 2009. (http://www.who.int/tb/publications/global_report/2009/en/index.html).

WHO International TB Country Data Profiles (2011). Accessed 24 May, 2011 (http://www.who.int/tb/country/data/profiles/en/index.html)

WHO Multidrug and extensively drug-resistant TB (M/XDR-TB): 2010 global report on surveillance and response. Geneva: World Health Organization, 2010.

World Health Organisation Global Tuberculosis Control 2008: Surveillance, Planning, Financing.2008.

Yeboah M A (2010) Urban Poverty, Livelihood, and Gender: Perceptions and Experiences of Porters in Accra, Ghana Africa Today, Volume 56, Number 3, spring 2010, pp. 42-60

Yeboah, Muriel Adjubi and Kwame Appiah-Yeboah.(2009) An Examination of the Cultural and Socio-Economic Profiles of Porters in Accra, Ghana. Nordic Journal of African Studies 18(1): 1-21

Yimer S, Holm-Hansen C, Yimaldu T, Bjune G (2009). Evaluating an active case-finding strategy to identify smear-positive tuberculosis in rural Ethiopia. *Int J Tuberc Lung Dis*. Nov;13(11):1399-404.

Yodi Mahendradhata, Bobby M Syahrizal and Adi Utarini (2008). Delayed treatment of tuberculosis patients in rural areas of Yogyakarta province, Indonesia. BMC Public Health 2008, 8:393

Ziem Joseph (2009). The fight against the "Kayayei" syndrome or menace in Ghana over the years has not been so easy a task for any government and other stakeholders, particularly non-governmental organizations. **(**www.northernghana.com/?n=2325) Accessed on March 2010

APPENDICES

APPENDIX A

INFORMED CONSENT

Participant /Questionnaire No: **Interviewer No:**

STUDY TITLE	Active Case Finding of Pulmonary Tuberculosis among Female Porters (Kayayei) in Gt Accra
INVESTIGATOR	Worlanyo Brain Pida School of Public Health University of Ghana
SUPERVISORS	Professor Andrews A Adjei Department of Pathology, Medical School, University of Ghana, Legon Professor Edwin Afari Department of Epidemiology, School of Public Health University of Ghana

Tuberculosis is a major and neglected cause of death and disability. The disease is treatable and preventable but if not detected and treated early, an infected person is likely to infect about 15 individuals in her lifetime. The purpose of this study is to detect, treat, and understand your needs as well as barriers to seeking medical care. This study amongst Kayayei will afford us to know how to bring TB care and information to you in future. The information you give will be treated as confidential and used for the purposes of this study only. However, the research team may share your information with ethics committees and your health authorities for appropriate action. The general outcome of the study will be shared with scientific communities via publication. Your participation is voluntary and you may choose to stop being part of this study at any time. Your samples will be collected and analyzed by trained personnel. There may be minimal discomfort during the sample collection. You will not receive any compensation for participating in this study. The benefit of this study goes to the Kayayei community as a whole. Information emanating from this research will help the health authorities to adopt appropriate action to prevent and control the spread of TB in Ghana. **Contact:** You have the right to ask any question concerning the study at any time and you will be given the appropriate answer. You may pose any

question you have to the principal investigator **Worlanyo Brain Pida (**0208175140) or Ghana **Health Service Ethical Review Committee** (233-0302-681109).

PARTICIPANT
Name_____ Signature /thumbprint[1]_____
INVESTIGATOR
_____ _____ _____
Name Signature Date
TRANSLATOR
_____ _____ _____
Name Signature Date If the participant is not literate[1]

APPENDIX B

Questionnaire

<u>SI. SYMPTOM SCREEN</u> (Health information)

Do you have any of the following symptoms? (Please circle grade for response)

Do you have a cough?		No		Yes
How long?	(< 2 weeks)	0	(>2 weeks)	2
Coughing up blood		0		2
Sputum production		0		2
Loss of weight in last 3 months		0		1
Drenching night sweats		0		1
Fever		0		1
Chest pain		0		1

	If client has:	Interpretation	
	Cough for 2 weeks or more	Suspect	not suspect
	Score of 7 or more on symptom screen	Suspect	not suspect
	SPT1: Spot sputum	Lab No:	
	SPT2: Spot sputum (1 hourly interval	Lab No:	
DEMOGRAPHY			
1	Which market do you stay and work?	1:Malata 2:Agbogbloshie 3:Kaneshie 4:Makola	**Loc**
2	Which religion do you belong to?	**1:** Muslim **2:**Christian **3:** Traditionalist **5:** Spiritual Church **6:** Other :	**Rel**
3	What is your tribe	**1**:Grusi **2 :**Mole Dagbani **3:** Mande **4 :**Gruma **5:Guan 6: State:**	**Tribe**
4	Where is your region of birth?	1 Northern 2 Upper West 3 Upper East 4 Other:	**RgBirth**
5	How many children have you given birth to?	**1:** none **2 :**1 **3 :**2 to 3 **4 :-** >4children	**Parity**

6	What is your marital status?	**1 :**Married **2 :**Single **3:** Divorce **4 :**Cohabiting **5:** Attached to one person **6:** attached to many	**MStatus**
7	How old are you now?	**1**:Under 8yrs **2** : 8 to 10yrs **3** : 11 to 15yrs **4** :16 > yrs	**Age**
8	What is the highest level of education you have completed?	**1:**None **2:**Basic **3:** Secondary **4:**Tertiary **5:**Religious Schooling only **6:**Literacy classes only	**Educ Level**
ANTHROPOMETRY			
9	Height(m):	**BMI**	
10	Weight(kg:		
RISK FACTORS			
11	Where do you sleep?	**1 :**Room **2:**Store **3:**Kiosk **4:**Under a shed **5:The open 6:Other:**	**Sleeplace**
12	If room, store or kiosk, how many of you sleep in a room?	**1:**1 to 3 **2:** 4 to **3:** 6 or more	**No in room**
13	How many windows are there on your room?	**1:** 1 **2:**2 **3:** 3 **4:** >4 5: none	**Ventilation**
14	Do you often sleep closer than arms length?	**1** :Yes **2:**No	**Sleep arm slengh**
15	Do you drink alcohol?	**1:** Sometimes **2:**Not at all	**Alcohol**
16	Do you smoke or live with someone who smokes?	**1**:Yes **2** :No	**Smoke**
17	How many times have you been here for this work?	**1:**first **2:**Many	**migration**
18	How many sexual partners do you have?	**1:**One **2:**More than one **3:**Don't know **4:**Refused **5:**None	**Sexpartners**
19	Do you sleep under polythene when it rains?	**1** :No **2** :Yes	**Sex Abused**
20	Have you ever lived with anyone with TB?	**1 :**Yes **2 :**No	**Close TB Contact**
21	Have you ever been told by health worker you had TB?	**1**:Yes **2:**No	**Case TB**

22	Have you been drinking fresh milk and or any of its products eg burkina?	**1**:Yes **2** :No	**Unpasteurized milk**
23	Have you ever lived close to cattle?	**1**:Yes **4** No	**Lived with cattle**
TB KNOWLEDGE AND AWARENESS			
24	Have you heard about TB?	**1**:Yes **2**:No	**Heard TB**
25	If yes, where did you first learn about TB?	1 Radio/TV 2: Family and friends 3: Health workers 4: Posters and other printed Mat. 5:Religious leaders 6: Never heard of TB	**Where first**
26	What are the signs and symptoms of TB?	**1:** Cough that lasts longer than 3 weeks 2: Coughing up blood 3: Weight loss 4: chest pain 5: Shortness of breath 6: Ongoing fatigue 7: Severe headache 8: Nausea 9: Fever without clear cause that lasts more than seven days 10:Do not know 11:Other:	**Signs symptoms**
27	How can a person get TB? (Please check all that are mentioned.)	**1:** Through the air when a person with TB coughs or sneezes2: Through touching items in public places (doorknobs, lorry door handles etc.) 3: Through eating from the same plate 4: Through handshakes 5: Do not know6: Other:	**TB contraction**
TB PERCEPTION			
28	In your opinion, how serious is TB disease?	**1:** Very serious **2:** Not serious	**How serious**
29	In your opinion, who can be infected with TB? (Please check all that are mentioned.)	**1:** Anybody **2:** Only poor people3: Only homeless people4:Only people living with HIV/AIDS5: Only drug users 6: Only alcoholics7:Only people who have been in prison8:Other	**Who infected**
30	Can TB be cured?	**1:** Yes **2:** No	**Can TB cured**
31	How common is TB among your Kayayei folks?	**1:** Common **2:** Not common	**How common TB**
TB CARE SEEKING PRACTICES			

32	How do you prevent yourself from getting PTB? (Please check all that are mentioned.)	1: Covering mouth and nose when coughing or sneezing 2: Sleeping in airy room 3: Through good nutrition 4: Washing hands after touching items in public 5: 7: Do not know 8:Other :By praying 6:Avoid shaking hands places	**TB prevention**
33	How do you treat cough?	1: Herbal remedies 2: Home rest without medicine3: Praying 4: Drugs from hospitals 5: Do not know 6:Other	**Treatment**

APPENDIX C

BINCHIKAWA HAUSA

Baraya kanun	mai kuzari abu iske da fukar tiba mace porters, a cikin (kayayei) a gt accra
Mai Binchika	Worlanyo Brain Pida
Ma'aikatar	Furofesa Andrews A. Adjei: Ma'aikatar patholog, babansa makaranta, na Jami'ar kasar Ghana, legon. Farfesa Edwin Afari.: Ma'aikatar epidemiology, makarantar da lafiyar jama'a na Jami'ar kasar Ghana.

Chutan TB, baban ciwo ne da ake wase dashi kuma yana sanadin mutuwa koo nakafa. Ciwon yana da magani, kuma ana iya tsare shi, to ama idan ba lura dashi maza, a nemi maganin shi ba, mai chiwon zai iya raba ma mutani 15 a lokacin rayuwansa. Dalilin wannan bincike ne a lura da ciwon a nemi magani da rigakafinsa. Dalilin wannan bincike ne a lura da ciwon a nemi magani da rigakafinsa har da inda za'a kula dashi. Wannan bincike da akeyi tsakanin kayayei zai taimaka asan yadda za'a bada labarin TB da kulawa dashi nan gaba. Fira da zaa yi da meshin kain, zai sura tsakanin ka da mai bincikain. Abinda zaa samu chikin wanan binchie an raraba ma yan kimiyan lafia kan radio da sauransu: Idan kaso zaka saa kanka cikin wanan bincika, kuma ka bari ko wani lokaci ka so. A lokacin binciken za'a nemi nazarinka a samu wani abu a gareka. Samun wannan kuma zaiyi wuya kadan. Ba zaa baka wani abu a lokacin binciken ba. Amaa anfanin duka zai je wurin kayayei. Labarai da zaa samu zai taimake yan kulawa da lafia, don su san yadda zasu ba maguguna kuma su tare ciwon TB. Kada ya bazu a Ghana.

Kana da hanyar yin kowani tambaya, zaa baaka amsa mai anfani. Zaka iya aika tambayanka zuwa wa baban yan binciken.

Walanyo Brain Pida (0208175140) kookuwa Health Service Ethical Review Committee na Ghana (233-0302-681109)

PARTICIPANT

Suna_____ Sinye /Thumbprint _____

MEIBINCHIKA

_____ _____ _____

Suna / Sinye Date

MAI FASSARA

_____ _____ _____

Name Signature Date If the participant is Not literate[1]

ABINDA BINCHIKAN ZAI NUNA ½

Bada deidei Amsan akan tembayoyin nga (Don Allah dairar giredi gushewa)

A1.	Kana Twari?	1. A'a	2. Ei
A2.	Tun Yaushe?	0 - (<Bokwai 2)	2. – (> Bokwai 2)
A3.	Akwai jinni cikin twarin?	0	2
A4.	Hitowa da Majina	0	2
A5.	Ramewa watani 3 da ta wuche?	0	2
A6.	Zufa chikin dare?	0	2
A7.	Masasshara (Iba)	0	2
A8.	Chiwon Kirji	0	2

Dukaduka (Yawanchi 10) Idan meshi nada haka:	Yana nuna cewa
Twari bakwai biyu (2) koo fiye da haka	Yanada Ciwon
Izan yasamu bakwai > Bakwai (7) zuwa gaba	Yanada Ciwon

An samu wanan daga: NTP Ghana

TAMBAYOYI

Zaka so ka tufa majina a bincika TB? A. Eii B. A'a			
	SPT 1. Magina na farko	Lab No:	
	SPT 2. Magina bayab hour daya	Lab No:	
INDA KAKE BATA LOKACH (DEMOGRAPHY)			
1	Wani kasua kake aiki	1. Malata 2. Agbogbloshie 3. Kaneshie 3. Makola	Loc.
2	Chikin wani bauta kake	1.Muslim 2.Christian 3.Wadansu	Addini(Religion)
3	Kai wani iri ne?	1. Grushi 2. Mole Dagbani 3. Mande, 4. Gruma 5. Guan 6. State	Kabila (Tribe)
4	A wani wuri aka haife ka	1.Arewa (North) 2. Bisa yamma (Upper West) 3. Bisa gabas (Upper East) 4. Wadansu	Yankin Haihuwa (Reg.of Birth)
5	Hafuwan ki nawa	1. Ba wani 2.Daya (1) 3.Biyu/Uku (2/3) 4.> 4	Parity
6	Kinyi Aure?	1. Nayi aure 2.Bande miji 3.Mun rabu 4. Ina yawo 5.Nna tare da mutun daya 6. Nna tare da mutane dayawa	M. Status

7	Shekaraunki nawa yanzu	1. Bai kai takwas (8) ba 2. Shekaru Takwas zuwa goma (8-10) 3. Shekeru goma sha daya zuwa goma sha biyar (11 – 15) 4. Shekeru goma sha shida zuwa gaba 16 >	Shekaru (Age)
8	What is the highest level of education you have.	1. Bawani 2. JSS 3.SSS 4.Ina cikin koyo 4. Karatu (Makaranta) 5. Zuwa Makarantan manya Kadai	Ilimi baje (Educ.level)
ANTROPOMETRY			
9	Height (m)	BMI	BMI
10	Weight (KG)		
DAMUA DA AKWAI (RISK FACTORS)			
11	Ina kake kwana?	1. Daki 2. Shago 3. Kiyas 4. A ƙarƙashin kakkaɓe 5. Fage	Wajen kwana (Sleeplace)
12	Idan daki, Shago ko kiyas, ku nawa kuke kwana wurin?	1. Daya zuwa uku (1-3) 2. Hudu zuwa shida (4-6) 3. Fiyar da haka	Yawan a ɗaki (No. in room)
13	Takoro nawa dakin ke dashi?	1. Daya (1) 2. Biyu (2) 3. Uku (3) 4. Hudu(4) 5. Babu Takoro	Ventilation
14	Kun masu daakin?	1. Eii (Yes) 2. Aa'a (No)	Kwaana da masua (Sleep arms length)
15	Kina shan giya?	1. Wani lokachi 2. Bani sha kwataa	Giya (Alcohol)
16	Kina shan sigari ko kina tare da mai shan sigari?	1. Eii (Yes) 2. Aa'a (No)	Shan sigari (smoke)
17	So nawa ki ka zo nan, ma wannan aikin	1. Daya 2. So Dayawa	Migration
18	Mutani nawa ka Tarawa da ki	1. Daya(1) 2. Mafi da daya 3. Ban sani ba 4. Naaki 5. Ban da shi	Sex partners
19	Iden ana ruwa, kina rufe kan kid a roba?	1. Eii (Yes) 2. Aa'a (No)	Barci a ƙarƙashin polythene
20	Kin taba zama da mai ciwon TB?	1. Eii (Yes) 2. Aa'a (No)	Close TB contact
21	Wani likita ya tab ace miki kina ciwon TB?	1. Eii (Yes) 2. Aa'a (No)	Case TB
22	Kin taba shan sabon nono ko kina tsaran sha wasu kamar burkina	1. Eii (Yes) 2. Aa'a (No)	Nono dab a dafa ba (Unpasteurized milk)

23	Kin taba zama kusa da shanaye?	1. Eii (Yes) 2. Aa'a (No)	Zama da shanaye (Lived with cattle)
24	Kinji Batun TB?	1. Eii (Yes) 2. Aa'a (No)	Jin Batun TB (Heard TB)
LURAWA DA TB DA GANE SHI (TB Knowledge and Awareness)			
25	Ina kike fara jin batun TB	1.Radio/TV 2. Dannyi da abokani 3. Ma'aikata lafiya 4. Masalaci. 5. Bantaba jin ba	Farko A ina? (Where first?)
26	Abin da suke alamu da alamar kamuwa da TB	1.Twari fiyar da bakwai uku (3) 2. Twarin jinni 3. Ramewa 4. Ciwon kirji 5.Fuci bisabisa 6. Gajiya 7. Iba mai dadewa 8. Chiwon Kai 9. Ban Sani ba. Wadansu	Alamu da alamar kamuwa (Signs and symptons)
27	Yaya mutum za iya samun TB?	1. Chikin iska idan mai TB ya yi twari ko ya yi atashawa 2. Ta Kaman Kamen kayen waje (Kofofi na gida da lore) 3. Ta chin abinchi cikin kwano daya 4. Ta masafaha 5. Ban sani ba 6. Wadansu	Samun TB (TB Contraction)
RAYIN TB (TB PERCEPTION)			
28	A ra'yin ka Tb na da ban tsoro?	1. Yana da bansoro kwarai 2. Bayade ban soro	Yaya yake de tsanani? (How Serious?)
29	A ra'ayin ki wa zai iya kamun ciwon TB	1. Kowa 2. Taalakoki 3. Wadande basu da gidaje 4. Masu ciwon HIV/AIDS 5. Masu shan kwaya kadai 6 Mashayai giya 7. Wadanda suke je sarka kadai 8. Wadansu	Wanda ya kamu (Who infected)
30	Za'a iya jinyan TB?	1. Yes, with hospital drugs 2. A'a Ban sani ba 3. Bakin magani 4. Adu'a	Za iya jinyan TB (Can TB be cured)?
31	TB na da yawa tsakanin Kayayei?	1. Dayawa 2. Babu yawa	How common
NEMAR KULAWA DA RIGAKAFIN TB			
32	Yaya zaka tsare kanda da kamun TB (dubi duka da aka fadi)	1. Rufe baki da hanci idan kana twari koo Atashawa 2. kwantawa daki da akwai iska 3. Ta abinci mai lafiya 4. Wanke hannu bayan taba	Rigakafi TB

		kayayyakin da suke a bainar jama'a 5. Ban sani ba 6. Adu'a 7. Daina gama hanu	
33	Ta yaya ka ke jinyan twari?	1. Bakin magani 2. Hutu gida ba tare da magani ba 3. Adu'a 4. Maganin Asbiti 5. . Ban sani ba 6. Wadansu	Magani (Treatment)

APPENDIX D

Media and Reagents Used

MGIT tube contains 7mls of:

110µg fluorescent indicator (tris 4, 7-diphenyl-1, 10-phenanthroline ruthenium chloride pentahydrate in a silicone base) and broth contain the following:

Modified Middlebrook 7H9 broth base	5.9g
Casein peptone	1.25g
Purified water	1.0L

BACTEC MGIT Growth Supplement contains 15mls Middlebrook 7H9 OADC enrichment with the following constituents:

Bovine albumen	50.0gm
Polyoxyethylene stearate (POES)	1.10g
Dextrose	20.0gm
Purified water	1.0L
Catalase	0.03gm
Oleic Acid	0.10gm
Catalase	0.03g

Source: Becton Dickinson and Company www.bd.com/ds

BBL™ MGIT PANTA

Each vial of PANTA contains a lyophilized mixture of antimicrobials with the following concentration;

Polymyxin B	6,000 units
Nalidixic Acid	2,400 µg
Amphotericin B	600 µg
Trimethoprim	600 µg
Azlocillin	600 µg

Reconstitution of PANTA

One vial of PANTA was reconstitution with 15.0 ml of MGIT growth supplement. Before inoculation of the specimen, 0.8 ml of the reconstituted enrichment/PANTA medium was added per 7mls MGIT tube.

Source: Becton Dickinson and Company www.bd.com/ds

Alcohol disinfectant

Absolute methanol	70 mls
Sterile water	30 mls

Sterile water was added to the alcohol well mixed and labeled.

Phenol Disinfectant

Stock	10%
Phenol	500g
Distilled water	5L

The distilled water was added in bits to the phenol. As the water becomes saturated, it was poured out into a 5L capacity flask. More of the distilled water was added until all the phenol crystals dissolve. The resultant stock was stored in Winchester bottles until ready for use.

Working Phenol Solution (5%)

Stock phenol solution	IL
Distilled water	IL
Total volume working solution	2L

Phosphate Buffer (PH 6.8)

Disodium hydrogen phosphate ($Na_2HPO_{4)}$	2.37g
Potassium dihydrogen Phosphate (KH_2 PO4)	2.27g
Distilled water	500mls

The salts were added to the distilled water in a heat resistant bottle. The bottle was swirled gently to dissolve the salt and autoclaved at 121^0C for 15 minute at 15 lbs pressure.

BBL™ Mycoprep™ Reagent (for decontamination)

N-acetyl cysteine (NALC)	0.375 per ampoule
Sodium hydroxide (NaOH)	20.0g
Trisodium Citrate ($Na_3 C_6 H_5 NO_3 S$)	14.5g
Distilled water	IL

The Mycoprep reagent bottle contains 150 mls of sodium hydroxide, trisodium citrate and 2 ampoules of NALC that must be broken to release their contents.

The screw cup of the Mycoprep reagent was first loosened cautiously. The ampoule of NALC inside the reagent bottle was then located and excess air was squeeze out of the bottle and the bottle retightened.

The ampoule was squeezed until it breaks to release its content. The resultant solution was mixed gently and used immediately. The working mycoprep solution was stable for 2-8 hours at 2^0C - 8^0C.

Source: Becton Dickinson and Company www.bd.com/ds

SOLID MEDIA PREPARATION

Preparation of L-J medium

Homogenized whole eggs	IL
L-J base	600 mls

Whole egg homogenization

Fresh eggs of less than one week shelf life were used. The shells were scrubbed with soap and kept in the soap solution for about 15minutes. They were rinsed under running tap water tap for 15 minutes and soaked in 70% ethanol for45- 60 minutes. The eggs were broken into 70% alcohol washed blender container and homogenized by blending.

The blended egg was filtered through 4 layers of sterilized gauze into a sterile graduated cylinder. One liter (1.0L) blended egg was added to 600 mls of the L-J base to make 1.6L of working media.

Preparation of Glycerol L-J base

Lowenstein-Jensen Medium	37.3g
Glycerol	12.0mls
Distilled water	up to 600mls

The dehydrated powder was dissolved in a distilled water containing 12mls of glycerol.The resultant suspension was heated to boil with constant agitation into homogenized solution and autoclaved at 121^0 C at 15lbs pressure for 15 minutes.The autoclaved media was left to cool to 45-60^0 C and liter (1.0L) blended egg fresh eggs added with thorough gentle mixing whilst avoiding bubble creation. The medium was dispersed into a sterile screw cupped tubes, and put at slant position on a coagulator for 45 minutes to 1 hour at 85^0C.Stored at 2^{0C}- 8^{oC} and used within a month.

Preparation of Pyvurate base

Lowenstein-Jensen Medium	37.3g
Pyvurate	12.0g
Distilled water	up to 600mls

The dehydrated powder was dissolved in a distilled water containing 12mls of pyvurate and treated as glycerol based L-J.

Source of chemicals: Becton Dickinson and Company www.bd.com/ds

APPENDIX E

GHANA HEALTH SERVICE ETHICAL REVIEW COMMITTEE

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

My Ref. : ERC-
Your Ref. No.

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October 2nd, 2011

Pida Brain Worlanyo,
School of Public Health
University of Ghana

GHS-ERC
Review Summary

Protocol ID NO: GHS-ERC: 16/09/11
Country: Ghana
Protocol Title: **"Active case finding of Pulmonary Tuberculosis Among Female Porters in Accra"**

Dear Anita Osei Tutu,

Please find the review summary of the Protocol titled**: "Active case finding of Pulmonary Tuberculosis Among Female Porters in Accra"** that was submitted to the ERC Secretariat for review. This proposal underwent full general meeting review. In a cover letter please address your responses to each of the sections **A** and submit a revised, amended protocol accordingly. All changes should be marked in bold.

Issues of Concern to be addressed
A. What happens to those whose sputum smear is positive?

Decision
Based on the above comment, the Committee has made the following decision for this protocol. The proposal is approved conditionally, subject to the Amendments requested above being incorporated into the proposal to the satisfaction of the Responsible officer and ERC. Also submit four (4) copies of the revised protocol to the ERC.

Ag. Administrative Secretary, Ghana Health Service Ethical Review CommitteeFor: Chairman
Name: Abena Kwaa Addai-Donkoh

APPENDIX F

Comparism of yield by methods among Kayayei at Mallam Atta market, 2011

Age category	No. Subjects	Microscopy(ZN)/10^3	L&J /10^3	MGIT/10^3	TBc Id/10^3
<15 yrs	33	0	0	0	0
≥15 yrs	127	1(7.87)	3(8.6)	4(31.5)	2(15.8)
Total	**160**	**1(6.25)**	**3(18.75)**	**4(25.0)**	**2(12.5)**

Table 4.4: Evaluation of Ziehl-Neelsen (ZN) staining direct microscopy to BACTEC MGIT 960 results of PTB among Kayayei at the Mallam Atta market, 2012.

	BACTEC MGIT 960 (TBcID)		
SSM Result	Positive	Negative	**Total**
Positive	1	0	**1**
Negative	1	143	**144**
Total	**2**	**143**	**145**

Sensitivity:	1/2×100	50%
Specificity:	143/143×100	100%
Predictive value positive:	1/1×100	100%
Predictive value negative:	143/144×100	99.3%
SSM accuracy	(1+143)/145	99.3%

Note: Fifteen (9.4%) of the inoculums were contaminated.

Using BACTEC MIGIT as gold standard, the validity of SSM found in this study shows sensitivity of 50%, specificity of100% and overall accuracy of SSM was 99.3%.

Evaluation of Lowenstein-Jensen (L&J) solid culture to BACTEC MGIT 960 results of PTB among Kayayei at Mallam Atta market, 2011.

	BACTEC MGIT 960(TBcID)		
L&J	Positive	Negative	**Total**
Positive	2	1	**3**
Negative	0	142	**142**
Total	**2**	**143**	**145**

Sensitivity:	2/2×100	=100%
Specificity:	142/143×100	=99.3%
Predictive value positive:	2/3×100	=75%
Predictive value negative:	142/142×100	=100%
L&J accuracy	144/145×100	=99.3%

Note: Fifteen (9.4%) of the inoculums were contaminated

Using BACTEC MIGIT as gold standard, the validity of L&J found in this study shows sensitivity of 100%, specificity of 99.3% and overall accuracy of L&J was 99.3%.