FACTORS ASSOCIATED WITH PREVALENCE OF TUBERCULOSIS INFECTION AMONG INMATES IN MASAKA DISTRICT

PRISONS

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DECLARATION

I hereby declare that the work presented here in this report is my own findings and it has never been presented to this university or any other institute of higher learning for award of a degree or any academic reward.

Signature: ………………………….

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APPROVAL

This research paper has been submitted with approval of my supervisor.

Signature: …………………………..

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Date: ………………………..

DEDICATION

I dedicate this work to my dear parents, Mr and Mrs Kikonyogo, thank you for the support you have accorded to me. I also dedicate this work to my dear wife, Lydia. Thank you for your patience and support through this course.

ACKNOWLEDGEMENT

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ABBREVIATIONS AND ACCRONYMS

AIDS   -   Acquired immuno-deficiency syndrome

BCG   -   Baccille calmatte Guerin

EPTB   -   Extra pulmonary Tuberculosis

E.G   -   For example

FGD   -   Focus Group Discussions

HBC   -   High Burden Countries

HIC   -   High Income Countries

HIV   -   Human immune virus

H/C   -   Health Center

H/O   -   History Of

HPP   -   Health pilot project

ICRC   -   International committee of Red Cross

LMIC   -   Low & medium income countries

MTB   -   Multi drug resistant Tuberculosis

MOU   -   Memorandum of understanding

NTLP   -   National Tuberculosis & leprosy program

TB   -   Tuberculosis

UPMS   -   Uganda Prisons Medical Services

UPS   -   Uganda Prisons Services

WHO   -   World Health Organization

ZN   -   Zeil Nielsen stain

ABSTRACT

Background

It has been, and is still one of the most deadly infectious diseases in the world. Roughly one third of the world's population is infected with mycobacteria tuberculosis, having the highest prevalence in Asia and Sub Saharan Africa, (Mapka et al, 2010).As of 2010, Uganda was ranked 16th of the 22 high TB burden countries in the world. (Guwatude et al, 2010). Most of the cases occur in poor areas with high population, poor housing and living conditions, prisons inclusive. Prisons have no reliable information about the true burden of TB prevalence that exists, however national strategies for control of TB infection need a sound knowledge on the magnitude of the disease.

Objective

To determine the factors associated with prevalence of PTB among inmates in Masaka District prisons. I focused on their socio-demographic, individual and environmental factors.

Study design and rationale

Analytical cross sectional methods were used employing quantitative data collection tools

Study site, Sample size and sampling technique

Masaka district prisons (06). Kish Leslie's method was used and a total of 323 inmates were interviewed. Consecutive random sampling technique was used to recruit inmates in the study.

Results

Masaka central prison (62.5%), compared to other prisons in a ratio of 2:1 was due to its size. TB prevalence (1.875% - Figure 2) was still a burden among inmates. The ratio of PTB positive clients to those without TB 1:53. Strongly associated factors like single & medium age; 20-39 years (58% - table 1), Men (82% - table 1) as compared to women, No BCG vaccination at birth (15% - table 3) increased the risk to rapid disease progression, Length of incarceration (2-5) years or more was strongly associated with high risk of TB infection. History of smoking tobacco and Alcohol consumption lowers body immunity thus enhancing incidences among inmates. High congestion within the prisons reported by respondents increased the rate of transmission of infection, especially to those inmates who were living in contact with TB clients.

Conclusion

The findings in the above research showed that prisons still have a burden of TB disease and unless strategies to sort this out are designed, many inmates are doomed to even more infections. The factors associated with this included socio – demographic, individual and environmental which were found to greatly enhance TB prevalence among inmates

CHAPTER ONE: INTRODUCTION

1.0 Background

Tuberculosis has been & still plaguing humans for years; it has been & still one of the most deadly infectious diseases in the world. (Mapka et al, 2010). Roughly one third of the world's population is infected with mycobacterium tuberculosis, having the highest prevalence in Asia and sub Saharan Africa. (Makpa et al 2010).

The world health organization (WHO report, 1997) reported that tuberculosis is a major global public health problem. Each year TB kills nearly 2 million people making it the 2nd leading cause of death amongst the communicable diseases worldwide. The highest rates of disease were found in African countries with nearly 9.2 million new cases in 2006. (Didero et al, 2009). On any day worldwide about 10 million people are incarcerated, in prisons, remand centers, police stations, jails, detention centers for asylum seekers, penal colonies, and prisoner of war camps. There is an increasing recognition that the high risk of tuberculosis in these settings poses a problem for those imprisoned and for the wider society. There are twenty million active tuberculosis cases, and a year eight million people develop the disease & three million die of it. Prisons are closed institutions for prisoners during their period of incarceration. They are not, however, closed to the tuberculosis bacillus, and prisoners are often highly mobile, circulating within the system inside the prison, between different prisons, between different institutions of the judiciary system, and between prisons and health centers. (Maher et al, 1998). The UNAIDS 2010 report estimates that worldwide, 39 million people are infected with HIV. Over 15 million of them are co-infected with mycobacterium tuberculosis. (UNAIDS 2010). One in three who dies with AIDS will be related to TB. More than 2-3 of this co-infection is in sub Saharan Africa. Cases of tuberculosis in prison are often not routinely reported as it is usually the ministry of justice or interior that is responsible for reporting prison health data. These data rarely find their way into the ministry of health statistics, which are used for international reporting and for policy decisions. For example, in Azerbaijan the estimated number of cases of tuberculosis in prison in 1995 was 1429 cases (excluding these 700) were reported to the World Health Organization. (Drobniewski et al, 1995).

In 2010, Uganda was ranked 16th on the list of 22 high burden tuberculosis countries in the world. Tuberculosis control authorities in Uganda believe that the prevalence of the disease is much higher than revealed by notification figures because of under reporting & due to poor access to health care (Guwatude et al, 2010). Most of the cases are believed to occur in poor areas of the country characterized by high population density, poor housing & living conditions (prison-like conditions). No reliable information about the true burden of tuberculosis in the area exists, however national strategies for control of tuberculosis need a sound knowledge of the magnitude of the burden of the disease (Guwatude et al, 2010). Therefore the aim of the study is to seek for prevalence of Tuberculosis among prisoners in Masaka district so as to create awareness and to also set a platform for further research in that area since no research has ever been carried out on Tuberculosis prevalence on prisoners.

1.1 Research Problems

A memorandum of understanding between Uganda Prisons Services (UPS) and the International Committee of the Red Cross (ICRC) was signed for a joint health pilot project on HIV, TB and Malaria for pilot in 03 prison units for 03 years. (M.O.U, UPS & ICRC May, 2007). This was latter made a policy to be rolled out to all the regional health units with specific emphasis on on-entry screening of prisoners with various communicable diseases including tuberculosis. Structural and technical insufficiencies of the health system in prisons impact negatively on prevention, prompt identification of diseases and proper management of sick detainees. Healthcare delivery remains below standards. Infectious diseases, including HIV/AIDS, sexually transmitted diseases, tuberculosis, acute respiratory infections and malaria, represent a high burden, of public health importance, in prisons, compared to the general population. The prevalence of tuberculosis in prisons in Uganda might be at least 30 times that of the civilians and that of HIV 2times more. The DOTS strategy to manage TB cases is improperly implemented in prisons and access to antiretroviral treatment (ART) for prisoners is extremely limited. (Concept paper on ICRC/UPS HPP, Jan 2007)

There is still one prison TB treatment center in the whole greater Masaka region at Masaka main prison H/C III at the moment. The health center reported between 18-23 TB cases from 2011-2014 (average 20 TB cases annually, Masaka Prison H/C III TB register). The prevalence of 2.5% is 20 times higher than the national prevalence of 0.125%. In 2013 and 2014, there were

07(28%) deaths that were attributed to TB/HIV co-infection out of the 25 total deaths reported (Masaka prison death register).

There is no proper isolation room for TB suspects and no treatment room for TB clients. The accommodation space for inmates at Masaka main prisons was meant for 204 prisoners by design but it currently houses 819 inmates as of 17th/07/2015. The congestion rate of 401.5% creates a good breeding ground for the transmission. There is no proper documented data on the prevalence of TB among prisoners in Masaka district in particular and in Uganda Prisons Service in general. The high congestion of prisoners makes it easier for transmission of TB amongst them. The space per person is not commensurate to the ventilation versus recommended space for inmates to stay in prisons.

1.2 Objectives of the study

1.2.1 General Objective

To determine the factors associated with prevalence of pulmonary tuberculosis among inmates in Masaka district prisons in August 2015.

1.2.2 Specific Objectives

1. To establish the prevalence of pulmonary tuberculosis among inmates in Masaka district prisons in August 2015.
2. To identify social demographic factors associated with the prevalence of pulmonary tuberculosis among Masaka district inmates in August 2015.
3. To determine individual factors associated with the prevalence of pulmonary tuberculosis among Masaka district inmates in August 2015.
4. To identify environmental factors associated with the prevalence of pulmonary tuberculosis among Masaka district inmates in August 2015.

1.3 Research Questions

1. What is the prevalence of pulmonary tuberculosis among inmates in Masaka district prisons?
2. Which social demographic factors are associated with the prevalence of pulmonary tuberculosis among Masaka district inmates?

3. What individual factors are associated with the prevalence of pulmonary tuberculosis among Masaka district inmates?

4. What environmental factors are associated with the prevalence of pulmonary tuberculosis among Masaka district inmates?

1.4 Justification of the Study

The results of this study will be used to inform first Health workers in the various prisons with data of the research in particular and secondly inform Uganda Prisons Medical Services (UPMS) in general on the burden of the disease. This information needs to be recorded, reported correctly and accurately to the Uganda Prisons Medical Service data base & later be incorporated in the Ministry of health database for proper planning and effective control of tuberculosis in Uganda as a whole. This study will create more awareness of the transmission of tuberculosis in the prisons setup which will also tempt or provide baseline information that will lay a platform for further research on tuberculosis related studies in prisons setups.

1.5 Conceptual Frame Work

There is an interrelation between social demographic, individual and environmental factors showed here making a relationship between independent variables and dependent variables that are explained in this frame work. The interrelated factors may lead to increase in the prevalence of Pulmonary Tuberculosis in prisons.

Figure 1: Conceptual frame work showing factors associated with prevalence of Pulmonary Tuberculosis infection

Social demographic

Factor

Individual factors

1. Age 2. Sex 3. Marital status **4.** Education level.	1. HIV status 2. Knowledge about tuberculosis 3. BCG scar 4. H/O smoking 5. H/O alcohol use **6.** Duration in prison

Prevalence of tuberculosis infection

Environmental factors

1. Housing condition
2. Contact with TB patients
3. Ventilation quality
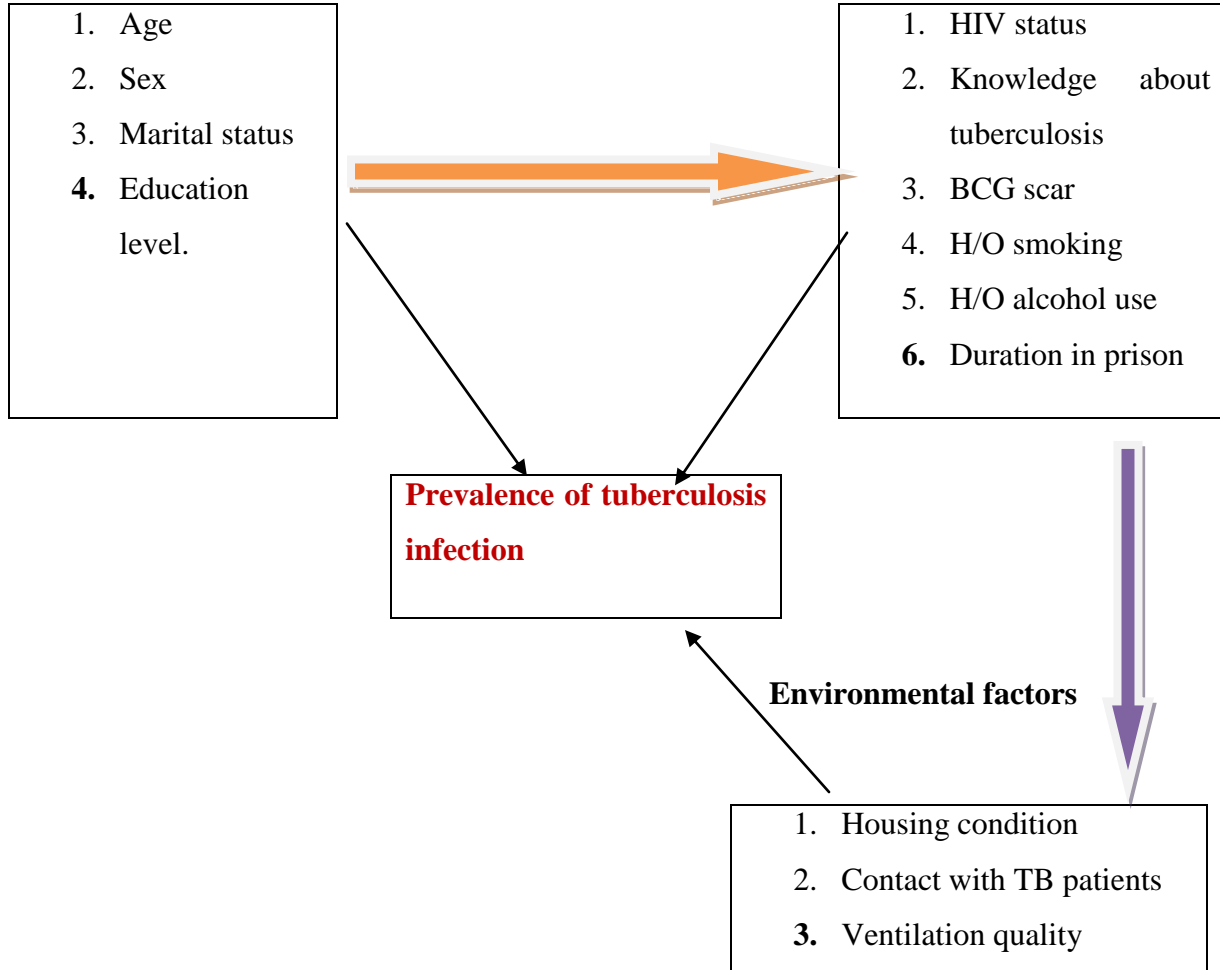
CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter shows the summarized Literature review on factors associated with prevalence TB infection.

2.1 Prevalence of TB

Tuberculosis has been & still plaguing humans for years; it is one of the most deadly infectious diseases in the world. Roughly one third of the world's population is infected with mycobacterium tuberculosis, having the highest prevalence in Asia and sub Saharan Africa. (Makpa et al 2010). The world health organization reported that tuberculosis is a major global public health problem. Each year it kills nearly 2 million people making it the 2nd leading cause death amongst the communicable diseases worldwide. The highest rates of disease were found in African countries with nearly 9.2 million new cases in 2006. (Didero et al, 2009).

In 2007, Swaziland had the highest estimated incidence rates of TB, with 1200 cases per 100,000 people. The largest total incidence was in India with roughly 2 million new cases. TB is less common and is rarely a disease in urban countries, the national average of Great Britain was 15 per 100,000 in 2007 while incident in Western Europe was 30 per 100,000 in Spain and Portugal. The reports compared with 98 per 100,000 in China and 48 per 100,000 in Canada, but it is still endemic in rural areas (WHO 2009). Some authors found out significant factors associated with LTBI as older age (42 years), length of incarceration (2 years), and size of prison accommodation(60 ft2) (Hussain H et al 2003). Evidence seems to suggest that women of reproductive age have a lower progression than men. Thus lower notification rate for women appear not to be due to lower disease progression. Such differences would form a source of gender inequality (Hausler et al, 1998)

However, prisoners who are at higher risk of TB than the general population, are documented to come from marginalized sub groups, including the poor, substance abusers, ethnic minorities, and the mentally ill. Therefore the prevalence of 48% in a setting that houses those at increased risk of TB is not surprising, given the 40% estimated prevalence in the overall population. The authors compare their results with those found by (Martin Sanchez et al, 1995) who reported

prevalence of 55% in a Spanish prison, and with (Koo et al, 1991) who reported 30% prevalence from a California prison. In both comparison settings the relatively high prevalence of LTBI among prisoners in countries with low population incidence of TB can be explained in part by co-infection with HIV. Then their relevance comes with the comparison with the work of (Adib et al, 1999) whose survey of all jails in Lebanon demonstrated LTBI prevalence of 45%. Uganda is the 16th of the 22 high burden countries (HBC) of TB. The TB burden continues to increase, NTLP notification increased in 2003 with 3.4% and 6.0% in 2006 when 44,605 cases were detected. 60% of HIV prevalence was estimated among TB patients. (Mudiope et al, 2011)

2.2 Factors associated with prevalence of Tuberculosis infection

In relation to gender and age, a Malawian research of 598 cases, 54% were females. More females participated than males in a younger age group (ratio 2.6:1), those aged below 25yrs and less females than males in the older age group (ratio 0.57:1 in those aged 40years and above) this was explained by more progression from infection to disease in young women than men which has been confirmed in several studies (Hausler et al, 1998). The excess of HIV in young woman than that in young men was increased in young female having TB (D Maher et al, 1998). The reactivation of latent infections in pregnancy could suggest the female excess with TB or due to reproductive age related immunological changes. (Hausler et al, 1998)

TB/HIV co-infection is a major world health problem according to the world health organization. 456,000 deaths among incident TB cases, a third of all deaths were HIV positive (WHO 2009). HIV reduces the effectiveness of the immune system and making them susceptible to opportunistic infections. HIV is transmitted through direct contact of the blood stream & mucous membrane with a bodily fluid containing HIV. The transmission can involve all forms of sex, exchange between mother and baby during pregnancy or child birth & contaminated needles, (Didero et al, 2013). The commonest opportunistic infection in HIV is TB and this co-infection with both organisms, "cursed duet", is an increasing global threat.

Retrospective & prospective cross sectional HIV and TB disease survey showed HIV prevalence among 1,773 systematically recruited miners to be 27%. TB incidence rate ratio of 5:5, 96% confidence interval (CI), is 3.5-8.6 than the point prevalence if undiagnosed TB disease (odds ratio 1.7, 95% CI, 0.9-3.3). For smear positive TB, 7 of 9 (78%) prevalent cases were HIV negative, and point prevalence was none significantly lower in miners who were HIV positive

(odds ratio 0.8, 95% CI, 0.1 -4.2). The calculated mean duration of smear positivity before diagnosis (point prevalence/incidence) was substantially shorter for HIV positive than HIV negative TB patients (0.17 and 1.15 years respectively) or (0.15, 95% CI, 0.00-0.73). Over 42 million people are infected with HIV & over 15 million of them are co-infected with MTB. More than two-thirds of this co-infection is in sub Saharan African, with most of the remaining one third occurring in India (G Khatri et al 2002).

People who live or work in poor homes are all at risk of TB. That's' because the risk of the disease is higher anywhere where there is overcrowding and poor ventilation (Nakakeeto et al, 2003). In overcrowded areas, low income per capita or in remote areas where there is lack of access to medical care generally (including TB treatment). The prevalence of TB in Soweto (South Africa) stands at 20% per 100,000 people. (Nakakeeto et al, 2003). Substance abuse in slum areas e.g. Drugs or alcohol use weakens them and makes them more vulnerable. (Rook et al, 2005)

Two matched case control studies were conducted to explore BCG's protective factor & how HIV modifies that effect. One study compared TB cases and controls that were HIV positive & the second compared to TB cases and controls that were HIV negative. The study population of 88 TB cases and 88 controls among HIV positive individuals and 314 TB cases and 310 controls among HIV negative individuals. Cases were newly diagnosed by bacteriology, radiology or clinical response to treatment. Controls were selected from people without TB symptoms and who sought medical attention in the same institution where a case was enrolled. BCG was assessed by the presence of a typical scar. The level of protection against all clinical forms of TB was 22% among HIV positive individuals (OR =0.78, 95% CI 0.48-1.26 and 26% among HIV negative (OR =0.74, 95% CI: 0.52-1.05). There was a significant difference (P=0.002) in the level of protection against extra pulmonary TB (EPTB) between HIV negative (OR =0.54, 95% CI: 0.32-0.93) and HIV positive individuals (OR =1.36, 95% CI 0.72-2.57). BCG has a modest protective effect against all forms of TB independent of HIV status, and BCG confers protection against extra pulmonary TB among HIV negative individuals. However, HIV infection seems to abrogate the protective effect of BCG against extra pulmonary TB. Our data support the public health importance of BCG vaccine in the prevention of extra PTB among immune competent individuals (Gerberry, 2009).

Randomly selected 818 healthy individuals in a community based cross-sectional questionnaire survey conducted in pastoral communities of Malawi between March & May 2009 with two focus group discussions (FGDS) one with men and one with women. The findings indicate that they had basic awareness about the disease. Therefore health education to transform their traditional beliefs and perceptions about the disease was crucial (Banda et al, 1998)

Association of cigarette smoking with TB incidence, recurrence and mortality in a 14 year prospective cohort study (1992 -2006) was carried out in 1,294,504 South Koreans. This study provided longitudinal evidence that smoking increases risk of incident TB, mortality from TB and TB recurrence. There is also evidence that smoking is a risk factor for TB (Davies et al, 2005).

Duration of incarceration may represent primary infection within the correctional setting, but those with longer prison time may be members of the cohort of people who spend time in other high-risk areas, such as hospitals or homeless shelters, have substance use, or other cumulative TB risk factors outside prison. However, in Botswana incarceration >6 months was found to be a risk factor for active TB in prisoners. About 19% of prisoners in this sample had been in prison more than 2 years suggests that prison terms are rather short, in a similar one-time survey in a prison system without regular screening at entry. (Hanau-Bercot et al 2000)

The prevalence of pulmonary TB among household contacts of patients recently diagnosed as pulmonary TB cases in 2006 were used as index cases for searching more active TB cases. All the household contacts were identified and examined with purified protein derivative, chest x-ray and sputum smear for three times. A study of 1386 newly diagnosed active TB cases were reported and their 5392 household contacts were screened. The overall prevalence of active PTB among household contacts was 3.76% higher in other age groups of <15years or > or=55years than the other age groups (Chi 2=15.381, P<0.01). The rate of active PTB in household contacts was significantly associated with the amount of bacteria discharged from index cases (r=0.998, P<0.01) (Davies et al 2005). Through contacts tracing, every 100 index cases could contribute in finding 15 more new active TB cases among households' contacts.

Among the factors found by the authors to be significantly associated with LTBI were older age (42 years), length of incarceration (2 years), and size of prison accommodation (<60 ft^2). With the exception of the apparent categorization of age into quartiles, there is no explanation for the

groups selected for incarceration length or size of prison accommodation; it would have been helpful to understand why, for example, 60 ft^2 was selected as the cut-off to indicate higher risk rather than examining this as a continuous variable (Hanau-Bercot et al 2000)

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter examined the study design, site, sampling procedure, population, data tools, variables & data management.

3.1 Study design and rationale

I used an analytical - cross sectional study method, employing quantitative data collection tools. The study was aimed at collecting data from correspondents on the factors contributing to the research problem. It was a cross sectional type of design because of a number of variables like age, gender, marital status. The instruments that were used in the survey were picked from health center records, interviewing prisoners, medical workers and prison officers of Masaka district.

3.2 Study site/area and rationale

The study was carried out in Masaka district located in the southern part of central Uganda. The district headquarters are located approximately 130 km by road in the southwest of Kampala on the Mbarara highway. It's bordered by Kalungu district in the north, kalangala in the east & south, Rakai in the south west, Lwengo district in the west and Bukomansimbi district to the northwest. It had an estimated population of 289,000 people with an estimated population of 1,232 prisoners (massage report of unlock, 16/1/2015.Southern region). The natives were dominantly Baganda, Banyankole, Banyarwanda, Bakiga & Banyoro. The major language was Luganda. Economic activities were food crop: Matooke, sweat banana, Pineapples & tomatoes. A cash crop was coffee. Animals reared were cattle, goats & kitchen with fishing on L. Victoria. The rationale was that no study has been done on Tuberculosis among prisoners especially in the district, the area was familiar to the researcher and respondents were easy to get.

3.3 Population

3.3.1 Target population

The study targeted all inmates 18yrs & older in Masaka district.

3.3.2 Accessible population

These inmates were met in Masaka district prisons.

3.3.3 Study population

All prisoners who consented and satisfied the eligibility criteria

3.4 Sample size

The sample size was estimated using a standard formula of Kish Leslie method of estimating sample size for cross sectional studies (Kish, 1965).

$N = Z\alpha^2 pq/d^2$

Where N= sample size

P= Assumed true prevalence of TB in inmates in California jails (Koo et al 1991) p=30%

Q=1-P = the probability of not having Tuberculosis, so 1-P = 0.7

Zα = Standard normal deviate at 95% confidence interval corresponding to 1.96

d= Absolute error between the estimated and true population prevalence of 5%.

$$N = \frac{(1.96)^2 \times (0.3 \times 0.7)}{(0.05)^2} \qquad N = 323$$

A sample size of 323 will be required.

3.5 Sampling procedure

Consecutive random sampling technique was used to recruit inmates in the study. All adult inmates in Masaka district who were present with clinical features suggestive of PTB consecutively enrolled into this study until the sample size was achieved.

3.6 Eligibility criteria
3.6.1 Inclusion criteria

1. Prisoners aged 18years and above who were presenting with clinical signs of pulmonary TB. The prisoner should have been in Masaka prisons by the time of the study.
2. Prisoners who must have consented.

3.6.2 Exclusion criteria
Prisoners with communication problems, very ill ones & the deaf

3.7. Source of data
Primary source of information was provided by prisoners and the results got from the laboratory for TB testing or chest X-ray films.

3.8 Variables

3.8.1 Dependent variable
Tuberculosis infection among inmates in Masaka district

3.8.2 Independant variables
Factors associated with prevalence of TB

- **Social demographic factors** (Education level, Age, Sex, Marital status)
- **Individual factors** (HIV status, Knowledge about TB, BCG scar, History of smoking, History of alcohol intake, Duration in prison)
- **Environmental factors** (Contact with TB patient, Housing condition, Ventilation quality)

3.9 Data collection method
Semi structured questionnaires were administered to participants and results from the laboratory and chest X-rays. Each questionnaire was assigned a unique code and the coded data was latter entered in the computer via prepared data excel sheets.

3.9.1 Sample collection
The clinical officer sent patients with clinical signs of PTB to the lab for ZN sputum analysis and told how to collect the 2 samples needed for microscopy. The first sample was collected on spot from the patient (if the patient could not cough spontaneously, he/she was instructed to take a light exercise then have deep breaths), then the next would be the early morning sample collected before drinking, brushing your teeth or putting any thing in the mouth to avoid false readings. Sputum container was marked with patient bio data & lab No then given to him/her to cough while avoiding soiling it. 323 sputum samples were collected from all patients.

3.9.2 Chest x-ray

For patients whose sputum test results were negative and yet clinical symptoms suggest PTB, a chest X-ray would be required. A medical officer (from Masaka Regional Referral Hospital) interpreted the readings.

3.10 Data collection tools

3.10.1 Pre- testing of the instrument

Administration of questionnaires to 10% (32) respondents in Masaka prison was first done by research assistants.

3.10.2 Quantitative data management

Questionnaires were received from the research assistants on a daily basis to be checked for completeness. Corrections were made immediately as the data collectors submitted the questionnaires to the researcher. Data was coded, edited & entered into data analysis tools (excel sheets)

3.10.3 Data analysis plan

Descriptive statistics will be used to summarize continuous variables into mean, median and standard deviations. Categorical variables will be summarized and presented as proportions, pie charts and bar graphs. Chi-square test will be used to determine significant relationship between prevalence of PTB & individual factors at bi variate analysis plan. Factors with $P<0.2$ at $\alpha = 0.05$ at bi variate analysis will be considered for multivariate analysis using logistic regression analysis method. At multi variate analysis, interaction and confounding will be assisted or will be generated to determine strength of association and 95% confidence interval around the OR will also be generated to determine the precision. Factors with $p < 0.05$ will be considered to have significant association with prevalence of TB while keeping other factors constant.

3.11 Ethics

The study was approved by International Health Sciences University, (School of Nursing). Permission was sought from school of nursing to study the factors associated with prevalence of TB among prisoners in Masaka district. Permission was obtained from the commissioner in charge of training on behalf of the Prisons department. Informed consent was obtained from prisoners & to maintain confidentiality at all levels. The research team showed respect to

respondents especially their opinions including termination of interviews whenever they felt uncomfortable to continue, transfer away from the prison or any other issues leading to change of location.

3.12 Quality control methods

Senior six leavers or those trained in any medical field were picked as research assistants. Before the study commenced, data tools were tested for clarity. Questionnaire were checked for completeness &data encoded for analysis.

CHAPTER FOUR: ANALYSIS

4.0 Introduction

This chapter presents the analysis of findings. These findings are presented in figures and tables.

A description of the findings on each figure or table is stated below.

4.1 Demographic Characteristics of respondents

Table 1 Uni-variate analysis for Socio-demographic characteristic of respondents

Characteristic	**Frequency (N=323)**	**Percentage (%)**
Sex		
Male	266	82.35
Female	57	17.65
Age (years)		
10-19	5	1.55
20-29	97	30.03
30-39	96	29.72
40-49	90	27.86
50+	35	10.84
Education Level		
No formal schooling	60	18.58
Primary School	191	59.13
Secondary School	62	19.20
Tertiary	10	3.10
Marital Status		
Married	201	62.23
Single	100	30.96
Divorced/Separated	22	6.81
Widow/Widower	0	0

Table 1 above reveals that majority (30.03%) of the respondents were aged 20-29 years. The age bracket of (10-19) years gave the minority contribution of 1.5%. It is noted that majority (82.35%) of the respondents were male.

Majority (59.13%) of the respondents had attained only up to primary level of education while the least (3.1%) had attained education up to tertiary level.

The table also shows that majority 62.23% of the respondents were married no respondent reported to be a widow /widower in the study.

4.2 TB prevalence in prison

Figure 2: Showing the TB prevalence in these prison units.
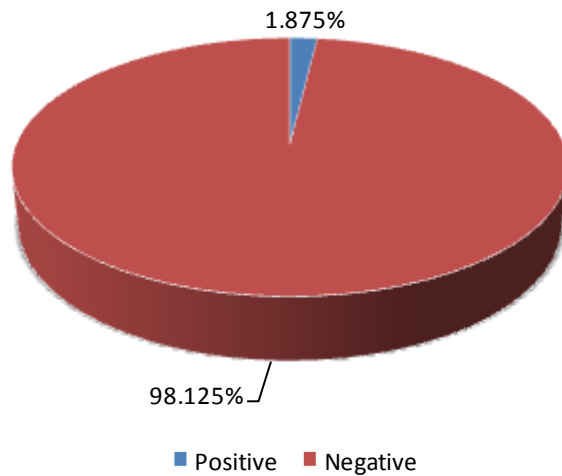
From the figure above 98.125% of the respondents were tested and confirmed to be free of TB infection. Only 1.875% of the respondents had TB infection.

4.1 The relationship between TB prevalence and Socio-demographic factors.

Table 2 Bi-variate analysis for socio-demographic factors and TB Prevalence

Characteristic	TB Prevalence		X^2	P-Value
	Yes N=6(%)	No N=314(%)		
Gender				
Male	6 (100)	257 (81.85)	1.325	0.025
Female	0 (0.00)	57 (18.15)		
Age				
10-19	0 (0)	5 (1.59)		
20-29	6 (100)	90 (28.66)	24.459	<0.001
30-39	0 (0)	95 (30.25)		
40-49	0 (0)	89 (28.34)		
50+	0 (0)	35 (11.15)		
Educational level				
No formal schooling	0 (0)	58 (18.1)		
Primary School	6 (100)	184 (59.4)	4.184	0.242
Secondary School	0 (0)	62 (19.4)		
Tertiary	0 (0)	10 (3.1)		
Marital status				
Married	0 (0)	201 (64)		
Single	6 (100)	91 (29)	14.057	0.003
Divorced/Separated	0 (0)	17 (5.4)		
Widow/Widower	0	5 (1.6)		

The age (X^2 =24.459, P= <0.001) and marital status (X^2 = 14.057, P=0.003) were the socio-demographic factor found to be associated with prevalence of tuberculosis as indicated in table 2.

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4.3 Individual factors associated with TB prevalence

Table 3: Bi-variate analysis for Individual Factors and TB Prevalence

Characteristic	TB Prevalence		X^2	P-Value
	Yes N=6(%)	No N=314(%)		
Heard about TB				
Yes	6 (2.45)	250 (79.6)	1.529	0.216
No	0 (0)	64 (20.4)		
Is treatable				
Yes	6 (2.81)	233 (95.5)	0.283	0.863
No	0 (0)	6 (2.5)		
I do not know	0 (0)	5 (2)		
Knowledge about TB (transmission)				
Kissing	0(0)	15 (6.3)		
Open air when one Coughs	6 (2.97)	196 (82)	1.309	0.727
Drinking in Water	0 (0)	10 (4.2)		
Sharing Utensils	0 (0)	18 (7.5)		
Knowledge about TB (symptoms)				
Yes	(0)	218 (93.2)		
No	6 (7.79)	11 (4.7)	80.724	<0.001
I do not know	0 (0)	5 (2.1)		
History of BCG vaccination				
Yes	0 (0)	266 (84.7)		
No	6 (11.11)	48 (15.3)	30.120	<0.001
History of smoking				
Yes	6 (3.68)	157 (50)	5.890	0.053
No	0 (0)	157 (50)		
History of alcohol consumption				
Yes	6 (3.75)	154 (49.8)	5.925	0.015
No	0 (0)	155 (50.2)		
Duration in prison				
Less than 6 months	0 (0)	106 (33.1)		
6 months – 2 years	0 (0)	125 (39.1)		
2 – 5 years	6 (7.14)	78 (24.8)	17.179	<0.001
More than 5 years	0 (0)	5 (3)		

This study found out that knowledge about TB symptoms (X^2=80.724, P<0.001), History of BCG vaccination(X^2= 30.120, P<0.001), History of alcohol consumption (X^2= 5.925, P<0.015) and duration in prison (X^2=17.179, P<0.001) were found to be associated with prevalence of TB as shown table 3.

4.4 Environmental factors and TB prevalence

Table 4 Bi-variate analysis for Environmental Factors and TB Prevalence

Characteristic	**Yes** **N=6 (%)**	**No** **N=314 (%)**	**X^2**	**P-Value**
Housing condition				
Excellent	0 (0)	20 (6.4)		
Good	6 (3.23)	180 (57.3)	4.405	0.221
Fair	0 (0)	37 (11.8)		
Poor	0 (0)	77 (24.5)		
Contact with TB person				
Yes	6 (2.61)	224 (86.2)	0.961	0.327
No	0 (0)	36 (13.8)		
Ventilation quality				
Excellent	0 (0)	15 (4.8)		
Good	6 (3.61)	160 (51)	5.673	0.129
Fair	0 (0)	35 (11)		
Poor	0 (0)	104 (33)		
Over crowding				
Yes	6(8.21)	283(90)	13.656	0.418
No	0(0)	31(10)		

None of the environmental factors studied was found to be associated with TB prevalence as indicated in table 4.

CHAPTER FIVE: DISCUSSION

5.0 Introduction

The management and control of spread of the disease is a challenge among prison settings in Uganda especially in our limited financial budget. The purpose of this study was to find out factors associated with TB prevalence among inmates in prisons of Masaka district.Data was collected from six prison units in Masaka district. Masaka Central, Masaka Ssaza, Kyanamukaaka, Mukungwe, Buwunga and Kabonera prisons. In comparison of size and capacity of each prison, it is noted that Masaka central prison had higher percentages and more improved than others with lower scores, hence has more inmates. Besides being the largest, Masaka central prison is the major referral for TB suspects, TB clients and other diseases.

5.1 Prevalence of PTB among inmates of Masaka District prisons

According to Figure 2, it was noted that clients who were found to be with PTB contributed 2%. Simple computation gives a ratio of TB infected to TB negative inmates to be 1:53. The congestion of PTB positive clients sharing housing with other inmates makes the spread of the disease very easy; thus TB negative inmates may be termed as fertile breeding grounds for Mycobacteria TB. The researcher feels that this also concurs with the findings reported in a Concept paper on ICRC/UPS HPP in Jan, 2007 which revealed that the TB prevalence in prisons was 30 times that of the general public. It is also noted that the above findings are not much different from those of Masaka Prison H/C III, according to the $2011 - 2014$ report that indicated a TB prevalence of approximately 2.5% as compared to the National report of around 0.125%, over the same period. If the prevalence is not tackled with a strategic control method, these high rates will increase the cost of treatment or burden of care to the prisons authorities. However, Masaka central prison was designed to accommodate 204 prisoners yet at present it has a capacity of 805 inmates (unlock report of 9/11/2015) i.e. 394.6% congestion which is in line Nakaketo et al, 2003. This means that there is congestion with most of the wards accommodating over 100 inmates. Yet standard guidelines provide $3.6m^2$ as the space for each prisoner, (*Prison standing Order 1*). The findings above show that this standard is not met due to the large numbers of prisoners.

5.2 Social demographic factors associated with PTB prevalence among inmates

Hussain H et al, 2003, found out that old age above 40years makes one easily prone to TB infection. The findings of this study on the contrary show the age group between 20-29 years is associated with TB infection. Basing on the findings by Hussain H et al 2003, the researcher has a feeling that a big share of about 29% of inmates in Masaka district prisons are at a high risk of TB infection. This can be explained basing on the fact that like any other prison system, men constitute the largest number of prison capacity, thus within the six prisons visited men were more than women. It was also found out that there was a significant association between TB infection & single inmates. There are no other findings related to this point from previous researches published earlier since no similar research has ever been done in prisons.

5.3 Individual factors associated with TB prevalence among inmates

The majority had a protective effect of BCG vaccine. This is in line with Gerberry, 2009 who deduced that BCG vaccine confers a modest protection against all forms of TB independent of your sero status. The need for BCG vaccination should be encouraged since the research shows that all the TB clients identified were found not to be vaccinated with BCG vaccine. It is worth noting that the longer one stays in prison; it exposes one to the risk of acquiring TB infection. Hanau Bercot et al, 2000, reported that the period of incarceration for more than 6 months is a risk factor to active TB in prisoners. They also found out that those who have stayed in prison much longer, that is, 2 years and above, have even an increased risk.

The findings are in line with the above because the highest TB incidences are seen in those who had been in prison for a period of 2-5 years. Alcohol consumption weakens and makes one's body vulnerable to TB infection according to Rook et al, 2005. All the TB positives were found in only the half that were alcoholic (X^2 =5.925, P=0.015) & the remaining half are potentially at a low risk of TB infection. Smoking increases the risk of incident TB, mortality from TB and TB recurrence according to Davies et al, 2005. In prisons smoking tobacco or marijuana is an offence. However, findings reveal that half of the inmates were smokers of tobacco before imprisonment. However, the researcher has a feeling that much as these inmates were not currently smoking or taking alcohol in prison, the findings thus indicate that these prisoners had already had an increased risk to TB disease.

It was shown that primary level of education had an association on the prevalence of TB amongst prisoners. These findings are attributed to the sensitization existing in prisons during TB/HIV counseling & testing coupled with the quick flow of information amongst prisoner concerning existence of TB clients and the stigma one has when is a TB suspect. This is contrary to the findings presented by Banda et al, 1998, from a research carried out on 818 randomly selected individuals outside prison. They found out that these individuals needed basic awareness about the disease and health education to transform their beliefs and perceptions about the disease. If the sensitization in prisons is not done thoroughly, it would increase the rate of stigma that already exists when someone is a suspect and not encouraged to go for testing & treatment which in turn affects the whole prison population.

5.4 Environmental factors about associated with PTB prevalence

High population density, poor housing and living conditions are believed to have high prevalence of TB disease. (Guwatude et al, 2010). This is in line with Hussain H et al, 2003 who found out that a congestion rate of 41.5% creates a good breeding ground for transmission of the disease. In the same line, about 90% of the inmates said their wards were over crowded. This exposes the risk of TB infection to the inmates and is in line with the above findings by Guwatude and Hussain H.

According to Hussain H et al, 2003, the size of a prison accommodation should be $60ft^2$. This implies that any size below that is substandard and puts prisoners at risk of various infections, TB inclusive. Poor housing conditions and ventilations also have higher risk to disease cross infection among inmates, according to Nakakeeto et al, 2003. It should be noted that during data collection, the ratio of Masaka Central prison's participation to other prison stations was approximately 2:1. Wards in Masaka central prison, unlike other prisons are well ventilated, self contained and always kept clean, hence the above findings.
However, Masaka central prison was designed to accommodate 204 prisoners yet at present it has a capacity of 805 inmates (unlock report of 9/11/2015) i.e. 394.6% congestion which is in line Nakaketo et al, 2003. This means that there is congestion with most of the wards accommodating over 100 inmates. Yet standard guidelines provide $3.6m^2$ as the space for each prisoner, (*Prison standing Order 1*). The findings above show that this standard is not met due to the large numbers of prisoners. The prison has no isolation ward for TB clients but the cubical

that was supposedly improvised is also used to accommodate mentally ill and other aged inmates. Thus the infection rate for Mycobacteria TB is even higher than in other prisons.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The above findings reveal that TB disease exists in prisons and prisoners were at a high risk of cross infection due to social, individual and environmental factors.

1. The prevalence of TB was high among Masaka district prison inmates.
2. Age of inmates and their marital status were the only socio-demographic factors associated with TB prevalence.
3. Among individual factors, history of BCG vaccination, knowledge of TB symptoms, history of alcohol consumption and duration prison were also found to be associated with TB prevalence.
4. No environmental factors were to influence TB prevalence among inmates in Masaka district prisons.

6.2 Recommendations

6.2.1 To the health workers in prisons
1) Ensure continuous intensive on entry screening of inmates, TB suspects screening & isolation, monitor weight loss and BMI routinely to rule out underlying TB disease, monitor adherence on anti – TB drugs, keep good track of the statistics of TB prevalence and report where necessary.
2) Ensure CME's for staffs to ensure that they are up to date with TB identification , management & to continuously Health educate the inmates on symptoms and signs of TB disease

6.2.2 To Uganda Prison Medical Service
3) The medical team should develop a TB infection control plan and support lower units in order to address the problem.
4) On job training, mentorship & support supervision should be enhanced by UPMS to effectively monitor lower level Health workers.
5) The medical team should work hand in hand with MOH to incorporate the TB burden management strategies in prison settings so as it is managed.

6.2.3 To Uganda Prisons Service

6) Ensure decongestion of prisons by advocating to the judiciary body to both release prisoners with simple civil cases and make quick jurisdiction to those with criminal cases, other than remanding them for a long time.

7) The Prison department and the government should collaborate & ensure that the prison wards are improved upon & expanded. This will improve the housing condition and ventilation.

6.2.4 To Ministry of Health Uganda

8) MOH TB department should gazette and disseminate specifically designed strategies targeting the burden of TB to prison medical team & ensure support supervision of the activities.

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Information sheet for the study: Factors associated with prevalence of tuberculosis infection among inmates in Masaka district prisons.

Hello, my name is **KAMYA JOSHUA,** a Bachelors student at International University of Health Sciences.

What is the study about?

This study will look at the lives of inmates who are at risk of contracting Tuberculosis infection in prisons around Masaka district. The researcher will ask them about events and changes in their lives that happened earlier as a result of their practices (e.g. H/O smoking & alcohol use), and also about their lives since they were imprisoned. The study will also explore their adjustments to living standards and support systems in relation to their current living conditions.

I will ask you about the housing status, social activities (interaction with TB clients) in their current living conditions. I will also ask about other risks and exposures to your lives at the moment. The study aims at understanding the prevalence of Tuberculosis infection among prisoners.

Why do we need to include you in the study?

You have been asked to participate in this study because you are a prisoner in one of the prison units in Masaka District.

What is involved in taking part in this study?

Your participation in this study is voluntary; you can decide freely whether to participate or not. If you agree to take part, you can still decide to withdraw at any stage of the study. I am requesting you to take part in this study which will run for two months.

What are the risks and benefits of your participation?

There is little if any risk to you when taking part in this study. We will not give you any drugs, not withdraw blood or conduct any medical procedures. We will also ask you question about

your life and different exposures to certain risks. If you may find some questions sensitive or embarrassing, you can refuse to answer them.

There are no direct benefits to you from participating in this study. However, I hope that this study will improve and provide information to stake holders to improve care, support services and quality of life of prisoners in prison units in Masaka District.

What will happen to the information that you will give?

Your answers will be written down by the interviewer during the interview. Afterwards, they will be added together with all the information from the other inmates taking part in the study. The results will be written up, given to people responsible for health services (UPMS), the University research council and they may be published in research journals.

Will the information you give me be kept confidential?

Yes, all information collected from you (and other participants) will be kept with confidentiality. Your name and any details by which you could be identified will not be used on the interview sheets or the account of the publications.

What happens now?

You are free to ask me any question or issue that requires clarification. If you feel you have understood the information, we can proceed with the consent statement & interview.

APPENDIX: II CONSENT STATEMENT

I have understood the explanation offered about the study of **factors associated with prevalence of Tuberculosis infection among inmates in Masaka district.** I have understood the information sheet that describes this study, am informed that I do not need to respond to questions if I do not want to, so i agree to take part in the study but can withdraw from the study at any time without penalty.

Name of study participant …………………………………………..

Signature / thumb print of participant ………………………………………

Name & signature of interviewer ………………………………………

Factors associated with the prevalence of Tuberculosis infection among inmates in Masaka district prisons.

Name of interviewer: ………………………. Questionnaire number: ………………………

Circle where appropriate and fill in the blanks.

Social demographic data.

1. **Age. …………….**
2. **Gender.**
a) Male.
b) Female
3. **What is your Level of education?**
a) No formal education
b) Primary
c) Secondary
d) Tertiary
4. **What is your marital status?**
a) Married
b) Single
c) divorced/separated
d) Widow /widower
5. **Which prison unit are you in?**

………………………………………………………………

Prevalence of TB

6. **TB test results (Sputum analysis / chest X-ray results).**
a) Negative.

b) Positive

Individual factors

7. Duration in prison.

a) Less than 6 months

b) 6 months – 2 years

c) 2 years – 5 years

d) More than 5 years

8. Have you ever smoked any form of Tobacco?

a) Yes

b) No

9. Do you smoke now?

a) Yes

b) No

10. History of alcohol intake.

a) Yes

b) No

11. Were you immunized for Tuberculosis?

a) Yes (scar present)

b) No (scar absent)

12. Have you ever had about Tuberculosis?

a) Yes

b) No

13. If yes, what is pulmonary Tuberculosis?

a) Is it a disease of the heart?

b) Is it a disease of the lungs?

c) Is it a disease of stomach?

d) Is it a disease of the brain?

14. If yes in 12 above, do you know how TB is transmitted?

a) Through kissing

b) Through open air when one coughs

c) Through drinking it in water

d) Through sharing utensils

15. Do know any symptoms of tuberculosis?

a) Yes

b) No

16. If yes, tick any below.

a) Any cough

b) Abdominal discomfort

c) Cough for > 02 weeks

d) Headache

17. Is TB treatable?

a) Yes

b) No

c) I do not know.

Environmental factors

18. Have you had any contact with a person having tuberculosis?

a) Yes

b) No

19. What is the state of the wards or housing condition?

a) Excellent.

b) Good.

c) Fair.

d) Poor.

20. What is the ventilation quality of wards/ halls of residence?

a) Excellent.

b) Good.

c) Fair.

d) Poor.

21. Are you over crowded in the rooms of residence (cubical)?

a) Yes

b) No

APPENDIX IV: INTRODUCTORY LETTER

IHSU INTERNATIONAL HEALTH SCIENCES UNIVERSITY
sanitas per scientiam

making a difference in health care

Office of the Dean, School of Nursing

Kampala, 30th October 2015

To: Comm Gen Prisons.
Attn: Commissioner Training
P.O Box 7182 K'la
Thru: Director Prisons Health Services
P.O Box 7182, K'la

Dear Sir/Madam,

RE: ASSISTANCE FOR RESEARCH

Greetings from International Health Sciences University.

This is to introduce to you **Kamya Joshua**, Reg. No. **2012-BNS-TU-048** who is a student of our University. As part of the requirements for the award of a Bachelors degree in Nursing of our University, the student is required to carry out research in partial fulfillment of his award.

His topic of research is: **Factors associated with prevalence of tuberculosis infection among inmates in Masaka District Prisons**

This therefore is to kindly request you to render the student assistance as may be necessary for his research.

I, and indeed the entire University are grateful in advance for all assistance that will be accorded to our student.

Sincerely Yours.

Mrs. Wafula Elizabeth
Dean

APPENDIX V: CORRESPONDANCE LETTER

WEBSITE   www.prisons.go.ug
TELEPHONE: 256-414-256751
FAX: 256-414-344104
E-MAIL: comparisons@utlonline.co.ug
            info@prisons.go.ug

UGANDA PRISONS SERVICE
PRISONS HEADQUARTERS
P.O.BOX 7182,
KAMPALA, UGANDA

A REPLY TO THIS LETTER SHOULD BE ADDRESSED TO THE
COMMISIONER GENERAL OF PRISONS AND THE FOLLOWING
REFERENCE NO. QUOTED **PHQ   ADM/143/219/01**

24TH/NOVEMBER/2015

Officer-in-charge
Masaka prison
P.O.BOX 580
MASAKA

MR KAMYA JOSHUA

Permission is hereby granted to Mr kamya Joshua, a Nursing Officer in Masaka Prison Health
Centre III and 3rd year student at International Health Sciences University Namuwongo to
conduct research in prisons department based on Tuberculosis among prisoners in Southern
region Masaka district.

You are requested to accord him all the necessary assistance.

D.A. Ahimbisibwe
FOR: COMMISSIONER GENERAL OF PRISONS

Copied to: Regional Prisons Commander
            Southern Region
            MASAKA