Int J Biol Med Res.2022 ;13(2):7457-7462

Contents lists available at BioMedSciDirect Publications

International Journal of Biological & Medical Research

Journal homepage: www.biomedscidirect.com

# Original article

# Prevalence of M. tuberculosis and Associated Risk Factors Among Suspected Patients in Federal Medical Centre Birnin Kudu, Jigawa State.

**[a]Obadire Samuel Olalere*, [b]Misan Olley, [c]Oke Olakunle Clement, [d]Ige Ilesanmi Paul.**

[a]*Medical Laboratory Department, Federal Medical Centre Birnin Kudu, Jigawa State*
[b]*Department of Medical Laboratory Science, College of Medicine and Health Sciences, Igbinedion University Okada, Edo State, Nigeria*
[c]*Department of Microbiology, Ladoke Akintola University Ogbomosho, Oyo State.*
[d]*Medical Laboratory Department, General Hospital Ile Oluji, Ondo State.*

**ARTICLE INFO**

Keywords:
*M. tuberculosis*
*Rifampicin resistant tuberculosis*
*Sputum*

**ABSTRACT**

Background: Tuberculosis (TB) stands as a major global health problem, ranking as the second highest cause of death from an infectious disease globally, after the human immunodeficiency virus (HIV). Aim: To identify mycobacteria tuberculosis at the molecular level in symptomatic presumptive TB in Federal Medical Centre, Birnin Kudu Jigawa State, Nigeria. Methods: A cross-sectional study was conducted between April to December, 2019 at the Federal Medical Centre Birnin – Kudu (FMC, BKD), Jigawa state. Suspects presenting with any of the following symptoms was recruited: the presence of symptoms suggestive of TB like chronic cough for a period of ≥ 2 weeks, night sweats, fatigue, unexpected loss of weight, and fever. Each eligible patient (272) who signed written consent provided clinical specimens. From each patients presumptive of pulmonary TB, 4 ml of sputum sample was collected. In the case of presumptive extra-pulmonary TB, four ml of either pus, CSF samples was collected. Samples was immediately processed for Gene Xpert MTB/RIF assay. Testing for HIV was done according to the current national algorithm recommended by the Federal Ministry of Health of Nigeria. Results: Total number of 52 subjects were M. tuberculosis positive with a total prevalence of 19.1% and total prevalence of 1.1% rifampicin resistance. Most 157 (57.7%) were males. Age groups 20-29, 30-39, and 40-49 have TB positivity rate of 33.5%, 26.5%, and 12.9% respectively. Majority 194 (71.3%) of participants were rural dwellers. Prevalence of HIV was 50 (18.4%) among study participants. The measure of association showed that there was significant association ($p<0.05$) between TB positivity with Types of residence, History of previous Tb treatment and reason for diagnosis. With urban residence having 3.23 times likely of being TB positive than rural dwellers. Conclusion: Rifampicin-resistant M. tuberculosis prevalent is low in pulmonary tuberculosis cases in the study area.



## Introduction

Tuberculosis (TB) stands as a major global health problem, ranking as the second highest cause of death from an infectious disease globally, after the human immunodeficiency virus (HIV). The World Health Organization (WHO) estimates that 10.0 million people developed TB in 2019, of whom, 13% were HIV positive individuals. Among the incident cases, 44% were from the South-East Asian and Western Pacific Regions 18% and one quarter were from Africa. The African continent accounts for the highest rates of cases and deaths relative to population (WHO, 2019).

In 2019, WHO estimates that 1.2 million deaths occurred due to TB (251 000 of whom were HIV positive). Among these deaths 210 000 were from multidrug resistance (MDR) patients, representing 43.75% of the total incident cases of MDR-TB. TB is a major public health problem in Nigeria with about 407,000 people infected. New TB cases of 120,000 with 154,000 death from TB in 2019. (WHO, 2020. TB factsheet)

TB is a disease of poverty (Spence et al., 1993). A lack of basic health services, malnutrition, social disruption, tobacco consumption and inadequate living conditions all contribute to the dissemination of TB and its impact in the community. HIV infection and Acquired Immune Deficiency Syndrome (AIDS) amongst others are the strongest risk factor for TB (WHO, 2019). The observed increase in TB incidence in sub-Saharan Africa may have resulted from several of these factors. The ability of a bacterial cell to survive the presence of a drug at a concentration that normally kills or inhibits growth is called resistance. Drug resistant TB is a particular problem because of the prolonged therapy of at least six

* Corresponding Author : **Obadire Samuel Olalere**
Medical Laboratory Department,
Federal Medical Centre Birnin Kudu,
Jigawa State
obadire@gmail.com. 08036939559.

months that makes patient compliance very difficult, frequently creating drug resistant Mycobacterium tuberculosis complex strains. Other factors that contribute to the development of resistance are the inadequate use of antimicrobials, low compliance and completion of treatments, together with poor TB control programs and lack of access to drugs (Sharma and Mohan, 2006).

This study was undertaken to identify and characterize mycobacteria tuberculosis at the molecular level in symptomatic presumptive TB in Federal Medical Centre, Birnin Kudu Jigawa State, Nigeria.

## MATERIALS AND METHODS

### Study design, area and period

A cross-sectional study was conducted from April, 2019 to December, 2019 at the Federal Medical Centre Birnin – Kudu (FMC, BKD), Jigawa state. Suspects presenting with any of the following symptoms was recruited: the presence of symptoms suggestive of TB like chronic cough for a period of ≥ 2 weeks, night sweats, fatigue, unexpected loss of weight, and fever.

FMC, BKD has more than 300 beds offering different specialized services. It receives patients from the catchment area and referred from different areas of Jigawa, Kano, Bauchi and Yobe state. The hospital has TB/HIV clinic as well as DOTS-TB clinics used for diagnosis and treatment of TB patients. The Gene Xpert MTB/RIF assay was conducted at FMC, BKD tuberculosis laboratory.

### Sample size

There are reports of 23.0% prevalence rates of pulmonary tuberculosis infections in Northern Nigeria (Aliyu et al., 2013). Considering 95% confidence level and marginal error of 5%, the sample size was determined using the formula described by Naing et al.,( 2006). Therefore, the total samples required is 272

### Inclusion criteria

All suspects aged 9 years and above attending clinic during the study period and informed consent from the patients were the inclusion criteria into the study.

### Exclusion criteria

Temporary residents like visitors, unwillingness to consent and patients who had been on TB treatment for more than one week were excluded from the study.

### Sample collection and laboratory procedures

Each eligible patient who signed written consent provided clinical specimens. From each patients presumptive of pulmonary TB, 4 ml of sputum sample was collected. In the case of presumptive extra-pulmonary TB, four ml of either pus, CSF samples was collected. Samples was immediately processed for Gene Xpert MTB/RIF assay. Clinical samples were diluted and decontaminated and Xpert MTB/RIF assay (Cepheid) was performed according to manufacturer's instruction. The Xpert® MTB/RIF purifies and concentrates M. tuberculosis bacilli from clinical samples. Genomic material isolated from the captured bacteria by sonication and subsequently amplifies the genomic DNA by polymerase chain reaction (PCR). Furthermore, the process identifies all the clinically relevant rifampicin resistance inducing mutations in the RNA polymerase beta (rpoB) gene in the M. tuberculosis genome in a real time format using fluorescent probes called molecular beacons.

### HIV testing

Testing for HIV was done according to the current national algorithm recommended by the Federal Ministry of Health of Nigeria. Two rapid HIV tests, HIV Determine rapid test strip and Stat-Pak was run sequentially. Samples was tested first with Determine. Positive samples was confirmed with Stat-Pak. Discordant results was resolved using a third confirmatory testing kit, HIV-1/2 Unigold Recombinant assay. Pre and post-test HIV counseling was provided for all consenting individuals. Using a structured questionnaire data was collected by both face to face patient interviews and patients' clinical record review. The main variables included in the study were age, sex, residence, reason for diagnosis, treatment history, and category of presumptive DR TB and site of tuberculosis.

### Ethical approval

Ethical approval was obtained from the ethical committee of Federal Medical Centre, Birnin Kudu Hospital management and informed consent from the patients before sample collection.

### Data analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS® 20, USA). Descriptive statistics was used to describe the study participants in relation to relevant variables. Chi-square and logistic regression analysis was computed to identify the associated factors of M. tuberculosis and rifampicin-resistance.

### Quality assurance

Both SPC and PCC internal controls used during Gene Xpert MTB/RIF assay. The specimen was excluded from the analysis if it was an invalid sample for Xpert assay or sample error according to Cepheid package insert. All procedures were done using standard operating methods.

## Results

### Patient characteristics

A total of 272 presumptive TB or DR-TB patients participated in the study. Total number of 52 subjects were M. tuberculosis positive with a total prevalence of 19.1% and total prevalence of 1.1% rifampicin resistance. Most 157 (57.7%) were males. The age range of participants was 9 to 80 years with mean age of 32.5 year. Age groups 20-29, 30-39, and 40-49 have TB positivity rate of 33.5%, 26.5%, and 12.9% respectively. Majority 194 (71.3%) of participants were rural dwellers. Of the total, 271 (99.6%) were presumptive for pulmonary TB while 1 (0.4%) were presumptive for extra-pulmonary TB. Prevalence of HIV was 50 (18.4%) among study participants (Table 1, Figure 1 and 2).

### Prevalence of M. tuberculosis and Rifampicin resistance TB

Total number of 52 subjects were M. tuberculosis positive with a total prevalence of 19.1% and total prevalence of 1.1% rifampicin resistance. The measure of association showed that there was significant association ($p<0.05$) between TB positivity with Types of residence, History of previous Tb treatment and reason for diagnosis. With urban residence having 3.23 times likely of being TB positive than rural dweller, preciously untreated subject have higher risk of TB positivity. TB\HIV infection positivity rate was 24 %. Of the 52 M. tuberculosis cases, 3 (5.8%) were resistant to rifampicin, of which all were previously treated, rural dwellers, pulmonary and presumptive DR-TB patients. Two rifampicin-resistant M. tuberculosis was noticed from all patients with MTB/HIV co-infection (16.7%). (Table 2 and 3, Figure3 and 4).

### Associated risk factors

Out of the total number of 52 TB positive only 3 (5.8%) was rifampicin resistant. In the multivariate analysis Type of residence of Urban settlement (AOR=4.58; 95%CI, 2.06 – 10.2) was independently associated with TB positivity. Only "reason for diagnosis" showed a significant ($p<0.05$) relationship with rifampicin resistance. Previous anti-TB drug treatment has a higher prevalence of rifampicin resistance, but the difference in the prevalence was statistically not significant ($p>0.05$). (Table 4)

**Table 1. Socio-demographic and Biological Characteristics distribution across the study population**

| Variables | Groups | Frequency | Percentage |
|---|---|---|---|
| **Age Group** | ≤9 | 21 | 7.7 |
| | 10-19 | 18 | 6.6 |
| | 20-29 | 91 | 33.5 |
| | 30-39 | 72 | 26.5 |
| | 40-49 | 35 | 12.9 |
| | 50-59 | 22 | 8.1 |
| | 60-80 | 13 | 4.8 |
| | Total | 272 | 100 |
| **Sex** | Female | 115 | 42.3 |
| | Male | 157 | 57.7 |
| **RESIDENCE** | Rural | 194 | 71.3 |
| | Urban | 78 | 28.7 |
| | Total | 272 | 100 |
| **HIV STATUS** | Negative | 222 | 81.6 |
| | Positive | 50 | 18.4 |
| **Treatment History** | Previously Untreated | 51 | 18.8 |
| | Previously Treated | 221 | 81.3 |
| **Tuberculosis status** | Negative | 220 | 80.9 |
| | Positive | 52 | 19.1 |
| **DIAGNOSIS** | Presumptive DR-TB | 6 | 2.2 |
| | Presumptive TB | 266 | 97.8 |
| **RIF** | Sensitive | 269 | 98.9 |
| | Resistant | 3 | 1.1 |
| **SITE** | Extra-pulmonary | 1 | 0.4 |
| | Pulmonary | 271 | 99.6 |

**Table 2. Prevalence of M. tuberculosis among presumptive TB patients referred to FMC, Brinin Kudu using Gene xpert MTB/RIF assay, 2019.**

| Variables | *M. tuberculosis* Detected N (%) | *M. tuberculosis* Not detected N (%) | Total N (%) | P. Value | OR (95%CI) |
|---|---|---|---|---|---|
| **Age (years)** | | | | | |
| ≤ 9 | 0(0.0) | 21 (100) | 21 (7.7) | 0.11 | 0 |
| 10 – 19 | 2 (11.1) | 16 (88.9) | 18 (6.6) | | 1 |
| 20 – 29 | 21 (23.1) | 70 (76.9) | 91 (33.5) | | 2.40 (0.5-11.3) |
| 30 – 39 | 18 (25.0) | 54 (75.0) | 72 (26.5) | | 2.67 (0.6-12.7) |
| 40 – 49 | 5 (14.3) | 30 (85.7) | 35 (12.9) | | 1.33 (0.23-7.7) |
| 50 – 59 | 3 (13.6) | 19 (86.4) | 22 (8.1) | | 1.26 (0.19-8.5) |
| 60 – 80 | 3 (23.1) | 10 (76.9) | 13 (4.8) | | 2.40 (0.3-17.0) |
| **SEX** | | | | | |
| Female | 18 (15.7) | 97 (84.3) | 115 (42.3) | 0.21 | 1 |
| Male | 34 (12.5) | 123 (73.3) | 157 (57.7) | | 1.49 (0.8-2.8) |
| **RESIDENCE** | | | | | |
| Urban | 26 (33.3) | 52 (66.7) | 79 (28.7) | <0.001 | 3.23 (1.7-6.0) |
| Rural | 26 (13.4) | 168 (86.6) | 194 (71.3) | | 1 |
| **HIV INFECTION** | | | | | |
| Positive | 12 (24.0) | 38 (76.0) | 50 (18.4) | 0.33 | 1.43 (0.7-3.0) |
| Negative | 40 (18.0) | 182 (82.0) | 222(81.6) | | 1 |
| **TREATMENT HISTORY WITH ANTI- TB DRUGS** | | | | | |
| Previously treated | 37 (16.7) | 184 (83.3) | 221(81.2) | 0.04 | 0.48 (0.2-0.97) |
| Previously untreated | 15 (29.4) | 36 (70.6) | 51 (18.8) | | 1 |
| **REASON FOR DIAGNOSIS** | | | | | |
| Presumptive TB | 46 (16.9) | 220 (82.7) | 266(97.9) | <0.001 | |
| Presumptive DR-TB | 06 (100) | 0 (0) | 6 (2.2) | | |
| **SITE OF PRESUMPTIVE TB** | | | | | |
| Pulmonary | 51 (18.8) | 220 (81.2) | 271(99.6) | 0.19 | |
| Extra – pulmonary | 01(100) | 0 (0) | 1(0.4) | | |
| **Total** | **52(19)** | **220(81)** | **272(100)** | | |

**Table 3. Prevalence of Rifampicin-resistant M. tuberculosis in each variables among the total M. tuberculosis cases using gene**

| Characters | No. of Sensitive (%) | Resistant No. (%) | Total N0. (%) | P- Value | OR (95%CI) |
|---|---|---|---|---|---|
| **Age (years)** | | | | | |
| ≤ 7 | 0 (0) | 0 (0) | 0 (0) | 1 | - |
| 10 – 19 | 2 (100) | 0 (0) | 2 (3.8) | | |
| 20 – 29 | 19 (90.5 | 2 (9.5) | 21 (40.4) | | |
| 30 – 39 | 17 (94.4) | 1 (5.6) | 18 (34.6) | | |
| 40 – 49 | 5 (100) | 0 (0) | 5 (9.6) | | |
| 50 – 59 | 3 (100) | 0 (0) | 3 (5.8) | | |
| 60 – 80 | 3 (100) | 0 (0) | 3 (5.8) | | |
| **SEX** | | | | | |
| Male | 32(94.1) | 2(5.9) | 34 (65.4) | 0.96 | 1 |
| Female | 17(94.4) | 1(5.6) | 18 (34.6) | | 1.06 (0.09-12.6) |
| **RESIDENCE** | | | | | |
| Urban | 26(100) | 0(0) | 26 (50.0) | 0.24 | |
| Rural | 23 (88.5) | 3(11.5) | 26 (50.0) | | |
| **HIV INFECTION** | | | | | |
| Positive | 10(83.3) | 2(16.7) | 12 (23.1) | 0.11 | 7.80 (0.64-94.9) |
| Negative | 39(97.5) | 1(2.5) | 40 (76.9) | | 1 |
| **TREATMENT HISTORY WITH ANTI – TB DRUGS** | | | | | |
| Previously treated | 34(91.9) | 3(8.1) | 37 (71.2 ) | 0.55 | |
| Previously untreated | 15(100) | 0(0) | 15 (28.8) | | |
| **REASON FOR DIAGNOSIS** | | | | | |
| Presumptive TB | 46(100) | 0(0) | 46 (88.5) | <0.001 | |
| Presumptive DR – TB | 3(50.0) | 3(50.0) | 6 (11.5) | | |
| **SITE OF PRESUMPTIVE TB** | | | | | |
| Pulmonary | 48 (94.1) | 3 (5.9) | 51 (98.1) | 1 | |
| Extra – pulmonary | 1 (100) | 0 (0) | 1 (1.9) | | |
| Total | 49(94.2) | 3 (5.8) | 52 (100) | | |

**Table 4. Multivariate analysis showing the associated predictors of M. tuberculosis in FMC, Brinin Kudu, 2019.**

| Characters | *M. tuberculosis* Detected N (%) | *M. tuberculosis* Not detected N (%) | Total N (%) | P. Value | AOR (95%CI) |
|---|---|---|---|---|---|
| **AGE (years)** | | | | | |
| ≤ 7 | 0(0.0) | 21 (100) | 21 (7.7) | 0.25 | 0 |
| 10 – 19 | 2 (11.1) | 16 (88.9) | 18 (6.6) | | 1 |
| 20 – 29 | 21 (23.1) | 70 (76.9) | 91 (33.5) | | 2.79 (0.5-15.2) |
| 30 – 39 | 18 (25.0) | 54 (75.0) | 72 (26.5) | | 4.04 (0.7-22.8) |
| 40 – 49 | 5 (14.3) | 30 (85.7) | 35 (12.9) | | 1.15 (0.2-7.6) |
| 50 – 59 | 3 (13.6) | 19 (86.4) | 22 (8.1) | | 0.99 (0.11-8.9) |
| 60 – 80 | 3 (23.1) | 10 (76.9) | 13 (4.8) | | 2.26 (0.28-18.4) |
| **SEX** | | | | | |
| Female | 18 (15.7) | 97 (84.3) | 115 (42.3) | 0.15 | 1 |
| Male | 34 (12.5) | 123 (73.3) | 157 (57.7) | | 1.75 (0.82-3.7) |
| **RESIDENCE** | | | | | |
| Urban | 26 (33.3) | 52 (66.7) | 79 (28.7) | <0.001 | 4.58 (2.06-10.2) |
| Rural | 26 (13.4) | 168 (86.6) | 194 (71.3) | | 1 |
| **HIV INFECTION** | | | | | |
| Positive | 12 (24.0) | 38 (76.0) | 50 (18.4) | 0.81 | 0.89 (0.36-2.2) |
| Negative | 40 (18.0) | 182 (82.0) | 222(81.6) | | 1 |
| **TREATMENT HISTORY WITH ANTI- TB DRUGS** | | | | | |
| Previously treated | 37 (16.7) | 184 (83.3) | 221(81.2) | 0.09 | 0.50 (0.2-1.13) |
| Previously untreated | 15 (29.4) | 36 (70.6) | 51 (18.8) | | 1 |
| | | 11 | | | |
| **REASON FOR DIAGNOSIS** | | | | | |
| Presumptive TB | 46 (16.9) | 220 (82.7) | 266(97.9) | <0.001 | |
| Presumptive DR-TB | 06 (100) | 0 (0) | 6 (2.2) | | |
| **SITE OF PRESUMPTIVE TB** | | | | | |
| Pulmonary | 51 (18.8) | 220 (81.2) | 271(99.6) | 0.19 | |
| Extra – pulmonary | 01(100) | 0 (0) | 1(0.4) | | |
| Total | 52(19) | 220(81) | 272(100) | | |

## Discussion

In this study, 19.1% prevalence of M. tuberculosis infection was similar with reports of Cox et al., (2014) from South Africa (26%), Aliyu et al., (2013) from Northern Nigeria (23%) and Alvarex-uria et al., (2012) from India (27.6%). However, it was lower compared to reports on Multi-drug-resistant tuberculosis in Northern Pakistan by Adeniyi et al., (2004) of (37%). The lower proportion rate of confirmed M. tuberculosis in the present study compared to other studies could be due to the fact that we included presumptive cases to identify M. tuberculosis while other studies included identified cases of M. tuberculosis to check gene Xpert technique. In contrast, it is higher than studies conducted by Deribew, et al., (2011) in Ethiopia (10.4%) and Sharma et al., (2014) in India (12.0%). The discrepancy might be due to difference in methods of detection of M. tuberculosis, community, study design and geographical area.

In this study, the detection rate of M. tuberculosis was significantly higher in males than females. Reports from WHO (2019), Mekonnen, et al., (2014) in Ethiopia and Yang et al., (2014) from Northeast China supports this findings. Also reports by Abdallah and others at Kasala State in Sudan, aiming to investigate the sero-prevalence of HIV among TB patients were reported in Kassala Teaching Hospital, during January 2008– through December 2010 (Abdallah, et. al., 2012) showed high detection rates in males than females. The reason for this might be due to social and health seeking behavior difference and higher exposure of males to outer environment, smoking and alcoholism (WHO, 2019).

The highest proportion of Gene Xpert positive M. tuberculosis cases were seen in the age group of 20–29 years. This is consistent with previous reports by Deribew, et. al., (2011) on investigation outcomes of tuberculosis suspects in the health centers of Addis Ababa, Ethiopia. This might be due to more exposure to the outer environment, high work load and wide range of mobility of young people to acquire the TB bacilli. In the present study, the proportion of M. tuberculosis was significantly higher in presumptive TB compared to presumptive DR-TB patients ($P < 0.05$). Previous anti-TB drug treatment has a higher prevalence of rifampicin resistance, but the difference in the prevalence was statistically not significant ($p>0.05$). This might be due to treatment failure and acquiring of resistant bacilli from drug resistant TB contacts. Moreover, significantly higher proportion of M. tuberculosis was found among patients treated with anti-TB drugs compared to treatment naïve patients in the present study. This finding was comparable to a study conducted by Makamure, et. al., (2013) in Zimbabwe.

18.4% HIV/TB co- infection observed in this study was in consonant with reports of many studies around the world. In a study conducted in Nigeria during 2013 intended to find the current factors affecting treatment outcomes of tuberculosis in a Tertiary Health Center in South Western Nigeria, the rate of pulmonary tuberculosis among HIV-infected patients was 20.0% (Babatunde, et. al., 2013). Previous study conducted in India (49.2%) prevalence of TB among HIV-positive subjects in Gujarat –India (Ghiya, et. al., 2009) which reflect a very high TB prevalence among PLWHA in Gujarat region in India. Rural Cambodia found by Cain and others with prevalence rate of (38.0 %) TB in HIV infected patients (Cain, et. al., 2007) and with that carried out by Mihir and his collogues among HIV Sero-positives attending a Counseling Center in Kolkata-India (33.0%) prevalence (Mihir, et. al., 2011). However, the prevalence rate observed in this study was to a significant extent higher compared to a study conducted in Accra city – Ghana of (3.6%) prevalence of TB among HIV Sero-positive patients (Essiam, 2013). The prevalence rate of TB in this study was higher than the results of a study carried out in Uganda to evaluate the Prevalence, incidence and mortality associated with tuberculosis in HIV- infected patients initiating antiretroviral therapy in Rural Uganda of (7.2 %) TB prevalence (Moore, et. al., 2007). The variations in this study results and the above mentioned study findings could be multifactorial, may be according to the different methodologies used in the study ,or the diagnostic techniques used whether they are conventional or advanced beside the different study populations factors which have important roles.

Although, Rifampicin-resistant M. tuberculosis is a serious health problem in the treatment and control of tuberculosis, the low prevalence of rifampicin-resistant M. tuberculosis of in this study was in keeping with previous studies by Nwadioha, et. al., (2014) in Nigeria and Gupta et al., (2011) North India. In contrast, the proportion of rifampicin-resistant M. tuberculosis was lower than reports in Ethiopia by Mekonnen, et. al., (2014) and Araya, et. al., (2011) from Chile. The variation could be due to difference in risk for HIV acquisition, exposure to anti-TB drugs and national TB control program. In the present study, the proportion of rifampicin resistant M. tuberculosis was significantly higher among previously treated patients compared to treatment naïve patients which might be due to failure from previous treatment and contact with drug resistant TB patients (FMOH, 2019).

In this study, high prevalence of rifampicin-resistant M. tuberculosis was detected among HIV positive cases which are in accordance with a study done by Abdella, et. al., (2015) in Ethiopia and Walls, et. al., (2015) in Cambodia. However, in the present study, there was a lack of association between HIV infection and development of active tuberculosis as well as rifampicin resistance. This was consistent with the results of studies by Mulu, et. al., (2014) in Ethiopia and Mboowa, et. al., (2014) in Calabar, Nigeria.

This study was able to detect M. tuberculosis and rifampicin resistance using Gene Xpert MTB/RIF assay from sputum and non-respiratory specimens. However, this study could not do the level of resistance to other anti-TB drugs and the finding of Gene Xpert was not compared to acid fast bacilli microscopy.

**Conclusions**

Rifampicin-resistant M. tuberculosis prevalent is low in pulmonary tuberculosis cases in the study area. Previous treatment with anti-TB drugs was significantly associated with rifampicin resistance. The strong association of rifampicin resistance with previous treatment suggests that improved monitoring of treatment to limit the emergence of drug resistant M. tuberculosis. Hence, the use of Gene Xpert is advocated for diagnosis, management and expanded surveillance of drug-resistant M. tuberculosis across the country.

**REFERENCES**

1. Abdallah, T.M, Siddig M.F & Ali A.A. (2012), Seroprevalence of HIV Infection among Tuberculosis Patients in Kassala, Eastern Sudan, Journal of AIDS and HIV Research. 3(8), pp. 161-163.
2. Abdella, K, Abdissa K, Kebede W & Abebe G (2015). Drug resistance patterns of Mycobacterium tuberculosis complex and associated factors among retreatment cases around Jimma, Southwest Ethiopia. Biomedical central Public Health.;15:599.p.127- 130
3. Adeniyi, B, Wahab M & Lekuk C (2004). Multi-drug-resistant tuberculosis in Northern Pakistan. Journal of Pakistan medical association. ;54: pp.469-479.
4. Aliyu, G, El-Kamary S.S, Abimiku A, Ezati N, Mosunmola I & Hungerford L (2013). Mycobacterial etiology of pulmonary tuberculosis and association with HIV infection and multidrug resistance in Northern Nigeria. Tuberculosis Research and Treatment. ;ID 650561:p.1–9.
5. Alvarez-Uria, G, Azcona J.M, Midde M, Naik P.K, Reddy S & Reddy R (2012). Rapid diagnosis of pulmonary and extra-pulmonary tuberculosis in HIV infected patients.
6. Araya, P, Velasco M, Tognarelli J, Arias F, Leiva T & Sccapatticio A (2011). Detection of genes associated with drug resistance in Mycobacterium tuberculosis strains isolated in Chile. Revista Medica de Chile.;139: pp467–473.
7. Babatunde, O.A, Elegbede O.E, Majekodunmi A, Fadare J.O, Ayodeji Olusola Isinjaye A.O, Ibirongbe D.O, & Akinyandenu, J (2013). Factors Affecting Treatment Outcomes of Tuberculosis in a Tertiary Health Center in Southwestern Nigeria. International Review of Social Sciences and Humanities. 4 (2): pp.209-218.
8. Cain, K.P, Kanara N, Laserson K.F, Vannarith C, Sameourn K, Samnang K, Qualls M.L, Wells .D & Varma J.K(2007), The Epidemiology of HIV-Associated Tuberculosis in Rural Cambodia., International Journal Tuberculosis and Lung Diseases., 11(9):1008-1013.
9. Cox, H.S, Mbhele S, Mohess N, Whitelaw A, Muller O & Zemanay Z (2014). Impact of Xpert MTB/RIF for TB diagnosis in a primary care clinic with high TB and HIV prevalence in South Africa: a pragmatic randomised trial. PLOS Medicine. Public Library of Science; 11(11):e1001760.111-116
10. Deribew, A, Negussu N, Melaku Z & Deribe K (2011). Investigation outcomes of tuberculosis suspects in the health centers of Addis Ababa, Ethiopia. PLoS ONE.;6(4):e18614.p.213- 221
11. Essiam, J.O (2013), Clinical Outcomes and Immunohaematological Markers of People Living with HIV and AIDS with or without Mycobacterium Tuberculosis in Selected Anti- Retroviral Clinics in the Greater Accra Region of Ghana, Kwame Nkrumah University of Science and Technology , Dep. Of Theoretical and Applied Biology.
12. Federal Ministry of Health (2019). Department of public health guidelines for community tuberculosis care Stop TB national Tuberculosis and Leprosy control programme Nigeria. Pp. 6-9.
13. Ghiya, R, Naik E, Casanas B, Izurieta R, & Marfatia Y( 2009) ,Clinico-Epidemiological Profile of HIV/TB Co-Infected Patients in Vadodara, Gujarat, Volume : 30 , Issue (1) : Page : 10- 15.
14. Gupta, A, Mathuria J.P, Singh S.K, Gulati A.K & Anupurba S (2011). Anti tubercular drug resistance in four healthcare facilities in North India. Journal of Health Population and Nutrition.;29(6):583–592.
15. Mboowa, G, Namaganda C & Ssengooba W (2014). Rifampicin resistance mutations in the 81 bp RRDR of rpoB gene in Mycobacterium tuberculosis clinical isolates using Xpert® MTB/RIF in Kampala, Uganda: a retrospective study. (BMC) Biomedical central, Infectious Diseases.14: pp.481-495.
16. Makamure, B, Mhaka J, Makumbirofa S, Mutetwa R, Mupfumi L & Mason P (2013). Microscopic-observation drug-susceptibility assay for the diagnosis of drug- resistant tuberculosis in Harare Zimbabwe. PLoS ONE. Public Library of Science.;8(2):e55872.180-197
17. Mekonnen, D, Admassu A, Mulu W, Amor A, Benito A & Gelaye W (2015). Multidrug and heteroresistant Mycobacterium tuberculosis and associated gene mutations in Ethiopia. International Journal of Infectious Diseases.;39:34–38.
18. Mihir, K. B, Trailokya N. N, Mrinmoy G, Sarojit J & Phalguni D (2011). Pulmonary Tuberculosis among HIV Seropositives Attending a Counseling Center in Kolkata, Indian Journal of Public Health, Volume 55, Issue. 212-218
19. Mulu, M, Mekonnen D, Yimer M, Admassu A & Abera B (2015). Risk factors for multidrug resistant tuberculosis patients in Amhara National Regional State. African Health Sciences.;15(2):368–377.
20. Moore, D, Liechty C, Ekwaru P, Were W, Mwima G, Solberg P, RutherfordG & Mermin .J.(2007). Prevalence, Incidence and Mortality Associated with Tuberculosis in HIV- Infected Patients Initiating Antiretroviral Therapy in Rural Uganda.AIDS,21:6.
21. Naing, L, Winn T & Rusli BN (2006). Sample Size Calculator for Prevalence Studies. Available at: http://www.kck.usm.my/ppsg/stats_resources.htm
22. Nwadioha, S.I, Nwokedi E.O.P, Ezema G.C, Eronini N.C, Anikwe A & Audu F (2014). Drug resistant Mycobacterium tuberculosis in Benue, Nigeria. British Microbiology Research Journal;4(9):988–995.
23. Selwyn, P.A., Sckell B.M., Alcabes P., Friedland G.H., Klein R.S. & Schoenbaum E.E. (1992). High risk of active tuberculosis in HIV-infected drug users with cutaneous anergy. JAMA. Journal of American medical association. 22; 268(4):504–509.
24. Sharma, S.K. & Mohan A. (2006). Multidrug-resistant tuberculosis: a menace that threatens to destabilize tuberculosis control .Journal of Chest infections. 130(1):261–272.
25. Sharma, S, Madan M, Agrawal C & Asthana A.K (2014). Genotype MTBDR plus assay for molecular detection of rifampicin and isoniazid resistance in Mycobacterium tuberculosis. Indian Journal Pathology Microbiology. 57(3):423–426.
26. Spence, D.P., Hotchkiss J., Williams C.S. & Davies P.D. (1993). Tuberculosis and poverty. BMJ. American journal of public health 25;307 (6907):759–761.

27. Walls, G, Bulifon S, Breysse S, Daneth T, Bonnet M, Hurtado N & Molfino L (2015). Drug- resistant tuberculosis in HIV-infected patients in a national referral hospital, Phnom Penh, Cambodia. Global Health Action. 8: 25964.pp.321-332

28. World Health Organization, (2019). Global tuberculosis report 2019, WHO/HTM/TB/2019.6.

29. WHO. (2019): Global Tuberculosis Programme: Global tuberculosis report. Geneva:

30. World Health Organization.10; 1123-1128 WHO, (2019) Multidrug and extensively drug-resistant TB (M/XDR-TB). Global Report onSurveillance and Response.

31. WHO, (2020). Global tuberculosis report 2020. Geneva: World Health Organization.

32. World Health organization. Global Tuberculosis Report. WHO/HTM/TB 2019. Geneva.

33. Yang, Y, Zhou C, Shi L & Meng H. (2014). Prevalence and characterization of drug resistant tuberculosis in a local hospital of Northeast China. Int J Infect Dis.22: pp.83–6.