



## Prevalence of *Mycobacterium tuberculosis* and Its Rifampicin Resistance among Patients Attending General Hospital Mararaba as a Case Study

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Author BAA designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors MMI and BAA managed the analyses of the study. Author OIK managed the literature searches. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Aims:** To determine the prevalence of *Mycobacterium tuberculosis* and its Rifampicin resistance among patients attending General Hospital, Mararaba.

**Study Design:** This was a descriptive health-based research that involved clinically suspected tuberculosis patients whose sputum samples were referred to General Hospital Mararaba for diagnosis.

**Place and Duration of Study:** Department of tuberculosis, General Hospital Mararaba Nasarawa state between May to July 2019.

**Methodology:** A total of 100 suspected TB patients of both male and female were included in the study. Two sputum samples from each patient were collected from these patients with sputum containers and samples were processed under level 3 biosafety cabinet by mixing with the reagent that was provided with the assay following manufacturer's manual and thereafter, the cartridge containing this mixture was placed in the Gene Xpert machine. The processing of the sample is fully automated and takes less than two hours.

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**Results:** An overall prevalence of 21.5% was recorded for *Mycobacterium tuberculosis* with a rifampicin resistance rate of 65.11% among positive patients. The highest prevalence of infection was observed among the age group of above 40 years (40.0%), males (23.9%), self-employed people (25.6%), those living in a rural environment (31.8%) and those with informal education (35.7%). There was no statistically significant relationship between the prevalence of MTB to sex, marital status, education, employment and ethnicity ( $P>0.05$ ). Environment factor was however significant ( $p<0.05$ ). Highest frequency for rifampicin resistance was recorded in the age group 20-29(39.2%), (64.28%) in males, rural areas (57.14%), self-employed persons (57.14%) and single people (50.0%). Age about rifampicin resistance was significant ( $p<0.05$ ) while sex, occupation, environment and rural areas were not significant ( $p>0.05$ ).

**Conclusion:** It was concluded that *Mycobacterium tuberculosis* and its Rif-resistance amongst patients attending General Hospital, Mararaba is comparatively high and indicative of the rate at which tuberculosis and drug resistance is still resilient despite various methods put in place to control it.

**Keywords:** Prevalence; *Mycobacterium tuberculosis*; rifampicin; resistance.

## 1. INTRODUCTION

Tuberculosis (TB) is an infectious bacterial disease caused by *Mycobacterium tuberculosis*, which most commonly affects the lungs [1]. It is transmitted from person to person via droplets from the throats and lungs of people with the active respiratory disease and occurs in every part of the world [2]. Tuberculosis has been causing great suffering to human beings throughout recorded history. Even two decades after the introduction of the directly observed treatment, short-course (DOTS) strategy, tuberculosis remains a major cause of morbidity and mortality worldwide [3]. One in three persons across the world representing 2–3 billion individuals are known to be infected with *Mycobacterium Tuberculosis* (*M. tuberculosis*) of which 5–15% are likely to develop active TB disease during their lifetime. In 2014, an estimated 9.6 million people became ill due to TB, around 1.5 million people died from the disease including 1.1 million HIV-negative persons and 400,000 HIV patients [4].

While TB is present in every country, the majority of TB sufferers live in low income and middle-income countries especially in regions such as Sub-Saharan Africa and South-East Asia [5]. Over the past decade, significant progress has been made towards TB control with most of the TB targets set as part of the Millennium Development Goals (MDGs) having been achieved. TB mortality, for instance, has declined by 47% since 1990, with nearly all of that happening in the era of the MDGs. In all, effective diagnosis and treatment of TB have been estimated to have saved over 40 million lives between 2000 and 2014 [6]. While these

achievements are remarkable, there are calls for intensified efforts to eradicate the disease. In 2014, the World Health Assembly (WHA) adopted the End TB strategy with targets linked to the newly adopted Sustainable Development Goals (SDGs). The End TB strategy serves as the key guide for countries to reduce TB deaths by 90% by 2030 as well as achieve an 80% reduction in TB incidence rate compared with 2015 [7]. However, TB still poses a huge threat to economic development as over 90% of TB-related deaths occur among adults in the most productive age groups [8].

Emerging issues such as Multi-drug and extensively drug-resistant TB is seen as a major challenge in effective control of the disease in many regions. Treatment outcomes for drug-resistant TB are still poor, and inadequate reporting remains a growing challenge. Of the 480,000 cases of multidrug-resistant TB (MDR-TB) estimated to have occurred in 2014, only about 25% were detected and reported. Moreover, just around 30% of the over 7,000 MDR-TB patients from 13 countries were successfully treated in 2007. The evidence base around TB and its management is rapidly changing [9]. Several reasons have been adduced to the emergence of drug-resistant TB. These reasons include poor compliance with the first-line anti-TB drugs, unregulated access to anti-tuberculosis drugs associated with indiscriminate use of the medications, inappropriate combinations by practitioners not trained in the proper use of drug therapy in tuberculosis, irregular supply of recommended drugs, poor case detection rate and unguided discontinuation of therapy due to side-effects of drugs [10].

Globally, the estimated prevalence of MDR-TB was 3.3% in newly diagnosed patients in the WHO 2015 report. This was higher (20%) in patients with a history of anti-TB treatment. MDR-TB is largely a consequence of poor supply management and quality of anti-TB drugs and inadequate or improper treatment. This is further worsened by HIV. Recent studies have indicated that on average, new HIV-positive TB patients are at increased risk of MDR-TB compared with HIV-negative patients [11].

Rifampicin is an antibiotic used to treat several types of bacterial infections, including tuberculosis and it is part of the recommended treatment of active tuberculosis during pregnancy, though its safety in pregnancy is not known [12]. It is used in the treatment of *Mycobacterium avium* complex, leprosy, and Legionnaires' disease and almost always used together with other antibiotics, except when given to prevent *Haemophilus influenzae* type b and meningococcal disease in people who have been exposed to those bacteria. Rifampicin is of the rifampin group of antibiotics and works by stopping the production of RNA by bacteria. Rifampicin was discovered in 1965, marketed in Italy in 1968, and approved in the United States in 1971. It is on the World Health Organization's List of Essential Medicines, the most effective and safe medicines needed in a health system. It is available as a generic medication. The wholesale cost in the developing world is about US\$3.90 a month. Rifampicin is made by the soil bacterium *Amycolatopsis rifamycinica* and before treating a person for a long period, measurements of liver enzymes and blood counts are recommended. It is administered either by swallowing or intravenously and its common side effects include nausea, vomiting, diarrhoea, and loss of appetite [12,13].

## 2. METHODOLOGY

### 2.1 Study Location

This study was carried out in Mararaba town. Mararaba is a town in Nasarawa, central Nigeria. It is a district of Karu Local Government Area, Nasarawa State and is among the towns that make up the Karu urban area, a conurbation of towns stretching to Nigeria's Federal Capital Territory. Its neighboring towns are: Ado, New Nyana, Masaka, New Karu and Kurunduma and villages that grew, as a result of the rapid growth and expansion of administrative and economic activities of Abuja into neighboring towns, coupled with the evacuation of tens of

thousands of people from Abuja by the Federal Capital Territory (Nigeria) (FCT) administration. Mararaba is believed to be one of the most densely populated suburbs around the Nigerian capital city Abuja and this contributes to its reputation as having one of the busiest road channels with traffic jams stretching as much as 11 kilometres from the popular A.Y.A. junction during rush hours.

### 2.2 Study Population

A total of 200 sputum samples were collected from patients suspected of tuberculosis and were referred to Mararaba General Hospital for diagnosis during the study period. Each eligible patient who consented to the study and agreed to provide clinical specimens was included in the study.

### 2.3 Study Design

This was a descriptive health-based research that involved clinically suspected tuberculosis patients whose sputum samples were referred to General Hospital Mararaba for diagnosis.

### 2.4 Sample Collection

Each eligible patient who consented to the study and agreed to provide clinical specimens was included in the study. Two sputum samples were obtained from each patient for the Gene Xpert test. The first sample was collected at the spot while the second was collected very early in the morning. This was to ensure accurate results and to serve as a backup in case of uncertainties that might occur during the processing of samples. Sputum containers were given to the patients who were instructed to provide about 2-4 ml of sputum samples into the sputum specimen containers. Questionnaires were also administered to each patient that consented to the study to obtain socio-demographic data about the subject matter [1].

### 2.5 Samples Processing

The sputum samples were mixed with the reagent that was provided with the assay and thereafter, the cartridge containing this mixture was placed in the Gene Xpert machine. The processing of the sample is fully automated and takes less than two hours. The Gene Xpert MTB/Rif assay is a nucleic acid amplification test which simultaneously detects the DNA of *Mycobacterium tuberculosis* complex and resistance to rifampicin. The result indicates

whether or not MTB (*Mycobacterium tuberculosis*) Complex target DNA is detected in the sputum sample and if MTB is detected, whether resistance to rifampicin is present; a positive MTB result will be displayed as high, medium, low or very low. The result of the test is automatically generated and printed out by the computer attached to the Gene Xpert machine. Results were as such read directly from the printout and recorded in appropriate sheets for data analysis. This method was as described by Esther and Benson [1].

## 2.6 Statistical Analysis

The result was presented with the use of absolute numbers, tables and figures as appropriate. Statistical analysis was done using chi-square ( $\chi^2$ ) to determine the relationship between the prevalence of *Mycobacterium tuberculosis* and possible risk factors. A p-value of less than 0.05 ( $p < 0.05$ ) was considered statistically significant.

## 3. RESULTS

This study was carried out to examine the prevalence of *Mycobacterium tuberculosis* and its rifampicin resistance among patients attending General Hospital, Mararaba where an overall prevalence of 21.5% was recorded. Results obtained showed variation in prevalence rates among age groups with the highest prevalence recorded for the age group of above 50years (40.0%) while least prevalence was recorded for the age group of less than 20years (7.69%). Age group 20-29 however recorded prevalence rates of 22.03% while age groups of 30-39years and 40-49years recorded prevalent rates of 22.2% and 26.08% respectively. Statistical analysis showed that there was no significant association between age and prevalence of tuberculosis among patients since

$p > 0.05$  (Table 1). Considering sex, the prevalence of *Mycobacterium tuberculosis* was higher amongst males (23.9%) than females (18.7%) with no significant difference between prevalence and sex ( $p > 0.05$ ), (Table 1).

In terms of Marital status, those who were single recorded a prevalence of 16.1% for *Mycobacterium tuberculosis* while those who were married, widowed and divorced recorded prevalence of 32.8%, 18.2% and 25.0% respectively. There was also no significant relationship between marital status and the prevalence of infections. Prevalence rates differed between ethnic groups with Igbo people having a prevalence of 19.6% while the Yoruba and Hausa ethnic groups recorded prevalence rate of 18.8% and 23.5% respectively. Other ethnic groups, however, presented a prevalence rate of 23.6%. There was no significant difference between tuberculosis prevalence in the various ethnic groups ( $p > 0.05$ ). In terms of the level of education, those who had no form of education recorded a prevalence of 33.3%, while those with primary, secondary, tertiary and informal education recorded prevalence rates of 13.3%, 22.6%, 20.6% and 35.7% respectively. Employed patients also presented prevalence rates of 23.5%, self-employed had a prevalence rate of 25.6% while unemployed patients had prevalence rates of 16.7%. Urban residents had a lower prevalence rate of 13.9% while rural residents had prevalence rates of 31.8%. Also, patients with the previous history of *Mycobacterium* diagnosis had a higher prevalence (90.6%) for *Mycobacterium tuberculosis* while those with no history recorded a lower prevalence (8.3%). There was no significant relationship between prevalence rates and level of education as well as employment ( $p > 0.05$ ). The environment of residents and history of *Mycobacterium* infection was however statistically significant ( $p < 0.05$ ) (Table 2).

**Table 1. Prevalence of *M. tuberculosis* based on age and sex**

Age	Number examined	Number positive	Prevalence %	$\chi^2$	P-value
≤20	52	4	7.69	11.36	0.07
20-29	59	13	22.03		
30-39	36	8	22.2		
40-49	23	6	26.08		
≥50	30	12	40.00		
<b>Sex</b>					
Male	109	26	23.9	0.78	0.37
Female	91	17	18.7		
Total	200	43	21.5		

**Table 2. Prevalence of *M. tuberculosis* in relation to demographic characteristics**

Variable	Number examined	Number positive	Prevalence%	$\chi^2$	P-value
<b>Age</b>					
<20	52	4	7.69	11.36	0.07
20-29	59	13	22.03		
30-39	36	8	22.2		
40-49	23	6	26.08		
≥50	30	12	40.00		
<b>Sex</b>					
Male	109	26	23.9	0.78	0.37
Female	91	17	18.7		
<b>Marital status</b>					
Single	124	20	16.1	0.07	0.07
Married	61	20	32.8		
Widowed	11	2	18.2		
Divorced	4	1	25.0		
<b>Ethnicity</b>					
Igbo	46	9	19.6	0.59	0.89
Yoruba	48	9	18.8		
Hausa	51	12	23.5		
Others	55	13	23.6		
<b>Education</b>					
None	6	2	33.3	0.49	0.49
Primary	30	4	13.3		
Secondary	53	12	22.6		
Tertiary	97	20	20.6		
Informal	14	5	35.7		
<b>Employment</b>					
Employed	34	8	23.5	2.06	0.36
Self-employed	82	21	25.6		
Unemployed	84	14	16.7		
<b>Environment</b>					
Urban	115	16	13.9	9.22	0.002
Rural	85	27	31.8		
Total	200	43	21.5		

In this study, possible risk factors associated with *Mycobacterium tuberculosis* were examined. Table 3 shows that those who smoke recorded a higher prevalence of infection (25.6%) than those who do not (20.5%). Also, those who injected hard drugs recorded a higher prevalence of infection (25.0%) than those who do not (21.0%). Also, those who had a history of immunization recorded lower prevalence (1.6%) than those with no history of immunization (56.9%) while those who consume alcohol had a higher prevalence (29.2%) than those who do not consume (12.8%). Risk factors of smoking and injecting of hard drugs were not statistically significant. However, immunization and alcoholism were statistically significant as  $p < 0.05$ .

Table 4 showed that out of the 43 patients positive for Tuberculosis, 28 (65.11%) of them

were resistant to rifampicin while 23.88% of them were not resistant. Rifampicin resistance of Tuberculosis patients in this study differed within age groups with age group of above 40 years having highest rifampicin resistance (39.2%) while those within the age group of below 20 years had least rifampicin resistance. Sex prevalence also shows that males positive for tuberculosis had higher rifampicin resistance (64.28%) than positive females (35.71%). Rifampicin resistance of *Mycobacterium tuberculosis* patients was statistically significant concerning age ( $p < 0.05$ ) but sex was not ( $p > 0.05$ ). In terms of occupation, those who were self-employed recorded highest rifampicin resistance (57.14%) while those who were unemployed recorded least resistance to rifampicin but this was not significant ( $p > 0.05$ ). Also, those from the rural areas recorded higher prevalence of rifampicin resistance (42.8%) than

those from the urban area (42.85%) while single patients had higher prevalence of rifampicin resistance (50.0%) than the married (42.85%), divorced (3.57%) and widowed patients (3.57%).

Demographic factors of environment, marital status and occupation were however not statistically significant concerning rifampicin resistance ( $p>0.05$ ).

**Table 3. Prevalence of *M. tuberculosis* by possible risk factors**

Risk factor	Total number tested	Number positive (%)	P-value
<b>Smoking</b>			
Yes	39	10(25.6)	0.483
No	161	33(20.5)	
<b>Inject hard drugs</b>			
Yes	24	6(25.0)	0.656
No	176	37(21.0)	
<b>Immunization</b>			
Yes	128	2(1.6)	0.000
No	72	41(56.9)	
<b>Alcoholism</b>			
Yes	106	31(29.2)	0.005
No	94	12(12.8)	
<b>Previous diagnosis</b>			
Yes	32	29 (%)	0.00
No	168	14 (%)	
Total	200	43(21.5)	

**Table 4. Rifampicin resistance among confirmed tuberculosis patients attending general hospital, nassarawa about demographic characteristics**

Demographic characteristics	Number positive (%)	Rifampicin resistance (%)	P-value
<b>Age</b>			
10-15	3 ( 6.97)	0(0.00)	0.03
16-20	1(2.33)	0(0.00)	
21-25	6(13.95)	4(14.28)	
26-30	7(16.27)	7(25.00)	
31-35	4(9.30)	3(21.42)	
36-40	4(9.30)	3(21.42)	
Above 40	18(41.86)	11(39.28)	
<b>Sex</b>			
Male	26(60.46)	18(64.28)	0.26
Female	17(39.53)	10(35.71)	
<b>Occupation</b>			
Employed	8(18.60)	5(27.77)	0.12
Self-employed	21(48.83)	16(57.14)	
Unemployed	14(32.55)	7(25.00)	
<b>Environment</b>			
Urban	16(37.01)	12(42.85)	0.09
Rural	27(62.79)	16(57.14)	
<b>Marital status</b>			
Single	20(46.51)	14(50.00)	0.39
Married	20(46.51)	12(42.85)	
Divorced	1(2.33)	1(3.57)	
Widowed	2(4.65)	1(3.57)	
Rifampicin resistance	43	28(65.11)	
Total	43		

#### 4. DISCUSSION

This study examined the prevalence of *Mycobacterium tuberculosis* and its rifampicin resistance amongst patients attending General Hospital, Mararaba. Results obtained in this study showed that out of the two hundred (200) patients examined, forty-three (43) of them were positive for *Mycobacterium tuberculosis* giving an overall prevalence of 21.5% for MTB. In terms of age prevalence, age group of above  $\geq 50$  years had the highest prevalence of *Mycobacterium tuberculosis* (40.0%) in this study while the least prevalence of 7.69% was observed amongst the age group of less than 20 years. This finding is not in agreement with Daniel et al., (2018) who reported the highest prevalence in ages above 35 years. There are however differences between the findings of this study and that of Esther [1], where the age group of 21-30 were reported to have the highest prevalence of *Mycobacterium tuberculosis*. Least prevalence of 7.69% was recorded by age group of  $\leq 20$  years as presented in this study which also differs from the report of Esther [1], where age group of 71-80 were reported to have the lowest prevalence of MTB. Chi-square analysis showed that there was no significant relationship between age and MTB at P-value  $> 0.05$ .

The prevalence of *Mycobacterium tuberculosis* about sex differed between genders, having 23.9% positive for males while 18.7% of the females were recorded. This finding agrees with Daniel [14], who reported the highest prevalence of 59.4% in males as against 40.6% in females. It also agrees with the findings of Egbe [15], where a higher prevalence of MTB was recorded among males than females. The findings of this study, however, differ from the report of Esther [1], where a higher prevalence of *Mycobacterium tuberculosis* was reported in females than males. The high prevalence of MTB among males in this study could probably be attributed in part to the active nature of males that most times prevent them from seeking for health care especially from ailments like tuberculosis which have symptoms like that of the common "coughing". This usually leads to the progression of latent tuberculosis to active tuberculosis and resistance to drugs are developed due to poor drug usage and lack of adherence to dosage. According to Esther [1], the high association of rifampicin resistance with the male gender could be due to factors such as the high risk and poor health-seeking behaviour of males compared to females which are also in

agreement with the findings of this study. Despite differences in gender susceptibility to *Mycobacterium tuberculosis*, statistical analysis showed that there was no significant difference between tuberculosis and gender ( $P > 0.05$ ).

In terms of marital status, married people had the highest prevalence of MTB (32.8%) while those who were divorced recorded the least prevalence of 25.0%, however, this was not statistically significant ( $P > 0.05$ ). A high prevalence of MTB among married people in this study is like that of Singh [16], who reported a similar trend in India, this might probably be due to proximity transmission between spouse and partners who are already infected with tuberculosis. Between ethnic groups, people belonging to other ethnic groups besides the three major ethnic groups in Nigeria recorded the highest prevalence of MTB (23.6%), but this was not statistically significant ( $P > 0.05$ ). Level of Education was also not statistically significant ( $P > 0.05$ ), though there were variations in prevalence rates between the different educational levels with those with the informal form of education recording the highest prevalence of MTB (35.7%). High prevalence of MTB in the none educated group could be as a result of the inability of this group of people to comprehend or gain access to vital information relating to tuberculosis spread and as such prevent contracting the infection.

Environmental setting greatly influenced the prevalence of tuberculosis in this study with those from the urban setting recording the least prevalence of 13.9% while those from the rural areas had a higher prevalence of infections (31.8%). A high prevalence of tuberculosis among rural dwellers is in agreement with Praveen [16], who reported the highest prevalence of 64.8% among rural dwellers in Pradesh. The high prevalence among the rural dwellers could be as a result of lack of awareness of the spread of tuberculosis in the population, and lack of equipped or good hospital to diagnose or treat other ailments like HIV which might lower their immune system and predisposes them to tuberculosis infections. Chi-square analysis also showed that there was a significant relationship between the prevalence of MTB and environmental setting ( $P < 0.05$ ).

The prevalence of rifampicin resistance in this study was 65.11% amongst patients positive for *Mycobacterium tuberculosis* in General Hospital, Mararaba. Based on age group, ages above 40 yrs had the highest rate of rifampicin

resistance of 39.28% this is not in agreement with a study by Egbe [15], where a prevalence of Rif-resistance was recorded among patients within the age group of 21-30 yrs. This can probably be because this age range corresponds with the age most are at high risk for HIV infection. However, the prevalence from this study could probably be because patients within this age groups are more incline in earning a living and as such their focus is earning a living hence their day to day activities poses strong adherence to drug intake after being diagnosed of tuberculosis. The males in this study had the highest Rif-resistance of 64.28% while females had 35.71%, this is probably because males are breadwinners in the family, busy and move from one place to another, they engage in sexual activities or extramarital activities that predispose them to contract tuberculosis. They are also found in recreational centres e.g. beer parlours that are densely populated which encourage the spread of tuberculosis. Some of them engage in jobs that affect their health e.g. mining, painting etc. that predisposes their lungs to drugs interaction while on treatment. This high Rif-resistance rate in males agree with the report of Praven [17], where the prevalence of Rif-resistance to tuberculosis was 26.1% and also higher in male than in the female. Considering occupation, the self-employed had the highest rate of Rif-resistance which was 57.14%. This is probably because the self-employed interact more with different people who are probably coughing out active resistance strain TB in the process of advertising their business and this predisposes them to tuberculosis, The findings of this study, however, differ from the report of Esther [1], where higher prevalence of Rif-resistance was reported in employed than self-employed.

Looking at the environmental factor those in the rural environment had high Rif-resistance of 57.14%. This is probably because they have poorly equipped hospital which cannot provide the mono resistance drug at the right time for the dwellers in the rural environment, high prevalence of Rif-resistance among rural dwellers agrees with Praveen [17], who reported the highest prevalence of 54.6% among rural dwellers in Livingstone. Considering marital status, those single had a higher rate of Rif-resistant of 50.0%. This high rifampicin resistance rate differs from the report of Daniel [14], where a prevalence of 10.11% was reported in Ogun State. It also differs from the report of Esther [1], where a 12.1% rifampicin resistance

was reported amongst *Mycobacterium tuberculosis* positive patients and Egbe [15], where a prevalence of rifampicin resistance of 6.6% was reported in Nasarawa State, Nigeria. This high prevalence of rifampicin resistance amongst this age group is a pointer to the high drug resistance developed by *Mycobacterium tuberculosis* in this study area and the danger that the residents of this region stand if the patients are not well managed since Tuberculosis is known to be a communicable disease with the high rate of infectivity.

Possible risk factors to rifampicin resistance among tuberculosis positive patients in this study (Table 3) showed the highest prevalence in those that smoke (25.6%), while rifampicin resistance for those that do not smoke was 20.5%, this may be due to the fact that intake of smoke easily damage the cell lining of the lungs and the activities of macrophages may interfere with drug interaction. This finding is in agreement with Audu [18], who reported the highest prevalence of smokers. Injectable hard drugs users had more Rif-resistance of 25.0%, this could probably be because they are already on tuberculosis treatment and are used to injecting themselves with drugs that weaken their immune system and these findings is in agreement with Lee [19], who reported highest Rif-resistance prevalence of 31.4% in patients that inject hard drugs. High prevalence of rifampicin resistance of 56.9% was also recorded for patients that were not immunized with BC-G vaccine when they were infants than those immunized this could probably be that perhaps there is residual immunity for those who had once be immunized during infancy, however, this cannot be justified by any published work but the prevalence from this study is in agreement with Liem [20], who reported Rif-resistance of 44.7% among patients that were not immunized. High prevalence of rifampicin resistance 29.2% was recorded among patients that take alcohol than those that don't take alcohol 12.8%, this could probably be because most contents of alcohol are fermented and don't blend well with the TB drugs. This study is not in agreement with Audu [18], who reported a lower prevalence of Rif-resistance 6.9% among patients that consume alcohol and 12.9% prevalence among those that don't take alcohol. Even though, alcohol has been reported as a risk factor to TB. Previously diagnosed patients of tuberculosis infection recorded a higher prevalence of rifampicin resistance of 90.6% than those that have are new cases (8.3%). The reason could probably be that

adequate follow up was not done in line with standard treatment strategy guideline. This study was also in agreement with Daniel [14], who reported the highest prevalence of rifampicin resistance among patients who were previously diagnosed than those who had not been previously diagnosed.

A significant association between the prevalence of tuberculosis and rifampicin resistance indicates that as one transcends between locations, susceptibility or resistance to rifampin is enhanced. According to Juan-Pablo [21,13], different locations have different settings with immigration policies, important social inequalities, HIV infection and drug or alcohol abuse may coexist for all factors to be strongly associated with TB infection and its rifampicin resistance.

## 5. CONCLUSION

This study has established that there is a high prevalence to both the *Mycobacterium tuberculosis* and the mono resistance drug rifampicin, this is indicative of the rate at which tuberculosis is still resilient in the state despite spread awareness and efforts made by the government and international bodies. The high rate of rifampicin resistance is a pointer to the danger that lies ahead for the general populace in Mararaba and Demographic factor are probable factors that can predispose one to infection with tuberculosis and rifampicin resistance if adequate control measures are not taken.

## CONSENT AND ETHICAL APPROVAL

Ethical approval to research with human subjects was obtained from the Nasarawa State Ministry of Health in line with the guidelines required. Clearance was also sought from the Nasarawa State Hospital Management Boards for compliance. Individual consent was also sought from the patients involved in the study and their information was kept confidential.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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