

Prevalence of tuberculosis and rifampicin resistant *Mycobacterium tuberculosis* among patients receiving treatment in ercc medical center alushi, Nasarawa state, Nigeria

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Abstract

This study carried out a hospital based retrospective review of patients who had been screened for *Mycobacterium tuberculosis* (MTB) and Rifampicin resistant- Tuberculosis between January 2017 and July 2021 at the ERCC Medical Center, Alushi, a tuberculosis referral facility in Nasarawa state. The study included 3029 patients suspected of having TB, and the overall TB prevalence was 43.57% (1530 cases). Of the patients, 64.90% (933) were male, and 2.31% had rifampicin resistance. Meanwhile, 35.09% (537) were female, and 7.07% had rifampicin resistance. The highest TB prevalence was observed in the age groups 21-30 and 31-40, with 26.51% (350 cases) and 24.77% (327 cases), respectively. The study revealed that females and patients aged 21 to 40 were at a higher risk of developing rifampicin-resistant TB. Early identification of drug-resistant TB and prompt treatment is crucial to prevent its spread in the community. Community health education programs should be continuously implemented to raise awareness about TB and the risks of drug resistance, improving prevention and control efforts.

1. Introduction

The *Mycobacterium tuberculosis* Complex (MTC) is a bacterial family that causes the chronic infectious disease tuberculosis (TB) (Ukwamedua *et al.*, 2019). Tuberculosis remains a severe public health concern since one-third of the world's population has latent TB and 10% of this group gets active disease during their lifetime (Nhamoyebonde *et al.*, 2014). The spread of drug-resistant strains has aggravated tuberculosis prevention, diagnosis, and treatment, making it one of the main causes of morbidity and mortality among infectious diseases worldwide (WHO, 2018). Tuberculosis risk factors include childhood, old age, malnutrition,

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cigarette smoking, and alcohol intake (Olatunji *et al.*, 2022). Furthermore, those with immune-suppressive disorders (such as HIV/AIDS) or who take immune-suppressing medications (such as cancer patients, organ transplant recipients, and people with autoimmune diseases) are more prone to contract tuberculosis (WHO, 2019; Olatunji *et al.*, 2022).

Nigeria is one of 14 countries with a high prevalence of tuberculosis (TB), multi-drug resistant tuberculosis (MDR-TB), and tuberculosis-HIV co-infection (TB/HIV) (WHO, 2016). Nigeria is also one of five countries that contributed to a more than 60% discrepancy in the projected number of incident MDR/RR-TB patients and MDR-TB enrollment (WHO, 2016; Adejumo *et al.*, 2018). A meta-analysis of the prevalence of drug-resistant tuberculosis (DR-TB) in Nigeria found MDR-TB in 6% of newly diagnosed patients and 32% of those who had previously been treated (Adejumo *et al.*, 2018). Rifampicin is one of the most commonly used medications to treat tuberculosis (Reddy and Alvarez-Uria, 2017). It is less toxic and one of the two primary medicines used in short-term chemotherapy (0–6 months). As a result, patient compliance increases and, the need for protracted treatment, which normally lasts 18-24 months (Ikuabe and Ebuanyi, 2018), is eliminated. Mono-resistance to rifampin is uncommon. It is commonly seen in the presence of isoniazid resistance. As a result, MDR-TB accounts for over 90% of rifampicin-resistant TB (Jaleta *et al.*, 2017; Ukwamedua *et al.*, 2019).

The development or acquisition of DR-TB has been strongly correlated with prior TB treatment (Ukwamedua *et al.*, 2019). However, other factors such as the use of inferior drugs, past exposure to quinolones, poor adherence to anti-TB medications, restricted access to healthcare, long-term chemotherapy linked to rifampicin-resistant TB, and a high prevalence of HIV/AIDS are all thought to have a role (Oneydum *et al.*, 2017; Ukwamedua *et al.*, 2019). Limited literature and data are available for rifampicin resistant TB for the study region. This study aims to measure the prevalence of Tuberculosis and Rifampicin resistant *Mycobacterium tuberculosis* among patients receiving treatment at ERCC medical Center Alushi, Nasarawa State from 2017 to 2021.

2. Materials and Methods

2.1. Study Design and Area

Hospital based retrospective review of presumptive TB register of patients screened for *Mycobacterium tuberculosis* (MTB) and RR-TB using Xpert MTB/RIF assay between January, 2017 and July, 2021 in ERCC Medical Center, Alushi. A Tuberculosis referral center in Nasarawa state, Nigeria.

2.2. Data Collection

Data collected includes age and sex of the patients who attended ERCC Medical Center, Alushi from January 2017 to July 2021. Included were all cases who had all these variables. A case was excluded if one of the variables was absent. Therefore, out of 3,577 patients' records examined, only 3029 were considered.

2.3. Data Analysis

The information was collected into data sheets in Microsoft Excel Version 2013. Results were displayed in form of descriptive statistics, tables and charts.

3. Results

In the present study, the prevalence of *M. tuberculosis* infection was found to be 43.57%. Table 1, shows the prevalence of Tuberculosis and Rifampicin resistant *Mycobacterium tuberculosis* stratified by sex. The data obtained show that males had higher TB infection 993(64.90%) than females 537(34.09%) but Rifampicin resistant *Mycobacterium tuberculosis* were higher in females 38(7.07%) than males 23(2.31%).

Table 1. Prevalence of Tuberculosis and Rifampicin resistant *Mycobacterium tuberculosis* stratified by sex

	2017		2018		2019		2020		2021		Total	
	+	RR	+	RR	+	RR	+	RR	+	RR		RR
Male	264	14(5.3)	207	1(0.5)	195	3(1.5)	194	4(2.0)	132	1(0.8)	993(64.90)	23(2.31)
Female	117	8(6.8)	133	14(10.5)	123	8(6.5)	98	2(2.0)	66	6(9.1)	537(35.09)	38(7.07)
Total	381	22(5.8)	340	15(4.4)	318	11(3.4)	292	6(2.1)	198	7(3.5)	1530	7(3.5)

*values in bracket in percentage (%)

+: Positive RR: Rifampicin resistant

Figure 1 shows the prevalence rate of Tuberculosis from 2017 to 2021. As seen in the figure, it is shown that there is a downward trend in the prevalence of tuberculosis and Rifampicin resistant *Mycobacterium tuberculosis* from 2017 to 2021.

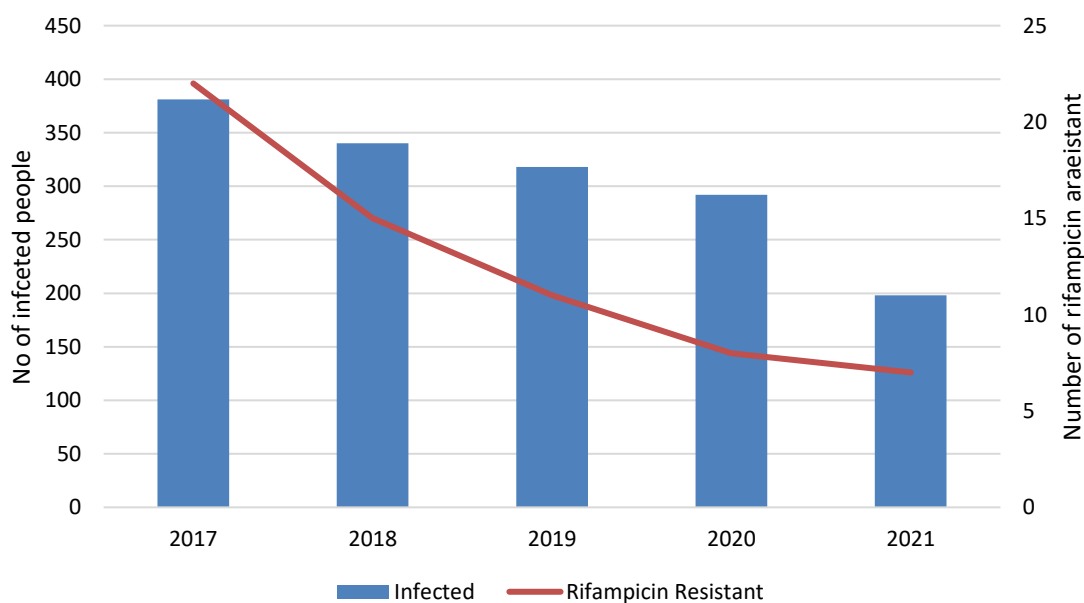


Figure 1: Chart showing the prevalence rate of Tuberculosis and Rifampicin Resistance from 2017 to 2021

Figure 2 shows the prevalence of Tuberculosis stratified by age from 2017 to 2021. The data presented shows that TB infection was higher within the age range 21-40 and least within the age range 70 and above.

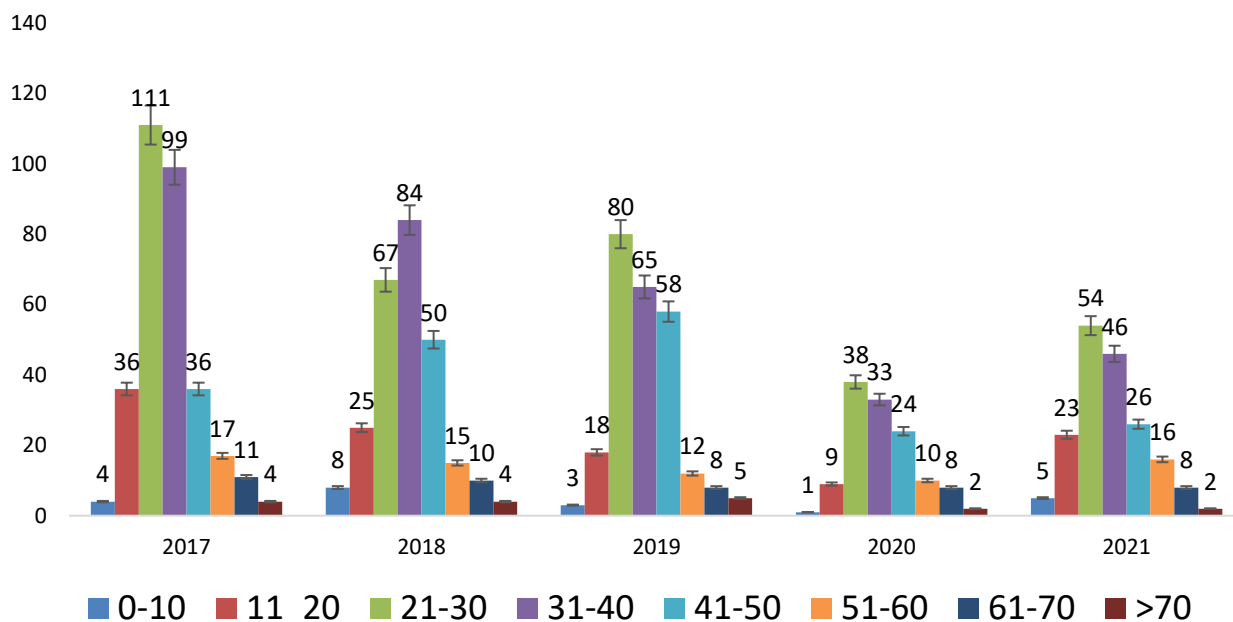


Figure 2: Chart showing the prevalence rate of Tuberculosis stratified by age

4. Discussion

In the current study, the prevalence of *M. tuberculosis* infection was found to be 43.57%. This finding outperforms studies from Ethiopia (Adane *et al.*, 2015), Burundi (Sanders *et al.*, 2006), and Nigeria's southern (Kuyinu *et al.*, 2018) and northern regions (Audu *et al.*, 2017). However, studies from a different Southern Nigerian state revealed a higher prevalence than that seen in this study (Osman *et al.*, 2016). A systematic evaluation of the prevalence of DR-TB in Nigeria found that the disease varied across geographical regions, settings, and treatment approaches (Onyedum *et al.*, 2017). The higher incidence found in this study could be related to the study location. ERCC Medical Center, Alushi, is a tuberculosis referral hospital in Nasarawa State. Patients with suspected DR-TB are usually referred from other hospitals in the state and beyond to Xpert MTB/RIF. In addition, as shown in figure 1, there is a downward trend in the prevalence of tuberculosis and Rifampicin resistant *Mycobacterium tuberculosis* from 2017 to 2021. The reducing trend in the prevalence of DR-TB in this study may be due to the increase in the number of Xpert MTB/RIF sites in the state (Audu *et al.*, 2017).

In contrast to previous Nigerian research (Daniel and Osman, 2011; Kuyinu *et al.*, 2018) that claimed there was no gender difference in tuberculosis and Rifampicin resistant tuberculosis prevalence, there was a gender difference in tuberculosis and Rifampicin resistant tuberculosis prevalence in this study. From 2017 to 2021, the study found a rise in tuberculosis infection among men compared to women, but a rise in RRTB among women compared to men (Table 1). However, research from the Northern and Southern regions of Nigeria revealed that males had a much greater prevalence of DR-TB (Tilako *et al.*, 2013; Uzoewulu *et al.*, 2014; Audu *et al.*, 2017). The increased prevalence of tuberculosis among men was attributed to poor health seeking behavior in men, social stigma, and cultural practices (Uzoewulu *et al.*, 2014). According to other research conducted in the country, lack of control over finances, low tuberculosis knowledge, delay in seeking medical attention, and poor health seeking behavior in females are all socioeconomic factors that may contribute to the prevalence of RR-TB in females (Wondimu *et al.*, 2007; Storla *et al.*, 2008).

Numerous studies have shown that prior TB treatment history is a significant risk factor for MDR-TB (Daniel and Osman, 2011; Chuchottaworn *et al.* 2015; Gunther *et al.*, 2015; Fregona *et al.*, 2017). This could be due to the use of substandard anti-TB drugs, frequent and inappropriate medication usage and, poor management of drug-sensitive TB.

Patients aged 21 to 40 years old had a higher risk of developing tuberculosis and Rifampicin-resistant TB than patients of any other age group in this study. This could be because this is the age range in which people are most likely to engage in social activities including sex on a regular basis. This age group is more social and outgoing, and they regularly engage in small conversations. This is similar to the findings from a study conducted in North East Nigeria (Tilako *et al.*, 2013). According to surveillance data from Central and Eastern Europe, young adulthood is the peak age for MDR-TB prevalence (Workicho *et al.*, 2017), which is in line with the findings of this study (Table 2).

Due to the retrospective nature of this study, the author could not control for potential confounding factors that may influence the development of rifampicin-resistant tuberculosis, such as comorbidities, socioeconomic status, and previous treatment.

5. Conclusion

According to this data analysis, tuberculosis and Rifampicin-resistant tuberculosis are common in persons of all sexes and ages. Rifampicin resistance was found to be significantly

associated with female gender. The fact that women are the majority of children's primary caregivers in our country may render children more vulnerable to RR-TB. This study's findings are incredibly significant and instructive, and they may aid health professionals and policymakers in understanding the problem and developing solutions regardless of its limitations. The study highlights the urgent need for early identification and prompt initiation of DR-TB medication to prevent the spread of the disease in the community. Community health education programs on tuberculosis and the risks of drug resistance should also be continuously implemented to improve prevention and control efforts. However, the study's limitations must be taken into consideration when interpreting its findings and developing future interventions. Further research is necessary to validate these findings and assess the effectiveness of current treatment strategies.

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