Trends in Mycobacterium Tuberculosis and prevalence of Rifampicin Resistance in Eastern zone, Tigray Region, Northern Ethiopia

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Getachew Abay Kahsu
Adigrat University

getakahsu@yahoo.com
ORCiD: https://orcid.org/0000-0002-7444-9543

Bahlibi Hailay
Adigrat General Hospital

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Abstract

Background

Tuberculosis (TB) is an infectious disease usually caused by Mycobacterium tuberculosis (MTB) bacteria. The emergence of Mono or multidrug-resistant tuberculosis and extensively drug-resistant tuberculosis (XDR-TB), poses a considerable challenge to Mycobacterium tuberculosis control programs in the worldwide; however, there has been no reliable and organized data on trends and prevalence drug resistance of Mycobacterium tuberculosis in study area; Therefore, aim of this study to determine the trends of Mycobacterium tuberculosis and prevalence of Rifampicin resistance in eastern zone, Tigray, Northern Ethiopia.

Methods

Hospital based retrospective cross-sectional study was conducted at Adigrat General Hospital from June 01 to August 30, 2019. Data was collected retrospectively from the registration books using data extraction format commence January 01, 2015, December 30, 2018. Data was entered into Epi-Info 3.1 and exported and analyzed using SPSS Version 20. The results were summarized using descriptive statistics, tables, and figures. P values < 0.05 would be considered statistically significant.

Result

A total of 5,944 Mycobacterium tuberculosis presumptive patients were included in the study. The majority of the study participants were male (58.1%). The median age of the participants was 40.0 (IQR 57, 26) years, the majority age-group was 30-44 years. The overall prevalence of Mycobacterium tuberculosis was 1446 (24.3%). Of the total confirmed cases, 132 (9.1%) were resistant to rifampicin. From total Rifampicin resistant 129 (97.7%) new cases and the rest were previously treated tuberculosis patients. Age, reason for diagnosis, site of presumptive tuberculosis, being HIV infected was found a significant association with our dependent variable; however, only Age and being HIV infected associated with rifampicin resistance.

Conclusion

In our study, the overall trends of Mycobacterium tuberculosis and prevalence of rifampicin resistance were found high and increased; therefore, maximizing early detection of drug-resistant
Mycobacterium tuberculosis and strengthening TB infection control activities and proper implementation of directly observed treatment are recommended reducing the burden of this contagious disease.

Introduction
Tuberculosis (TB) is a contagious and airborne caused by the bacillus Mycobacterium tuberculosis (MTB). It typically affects the lungs (pulmonary TB) but can affect other sites as well (extra pulmonary TB). Relatively small proportion of people infected with Mycobacterium tuberculosis will go on to develop TB disease; however, the probability of developing TB is much higher among people with immune debilitated. TB affects mostly adults in the economically productive age groups; around two-thirds of cases are estimated to occur among people aged 15–59 years [1]. About one-quarter of the world's population has latent TB, which means people have been infected with TB bacteria but are not (yet) ill with the disease and cannot transmit the disease [2].

Tuberculosis (TB) have existed for millennia and remains a major global health problem. It causes ill-health of approximately 10 million people each year and is one of the top ten causes of death worldwide. According to the Global Tuberculosis Report 2017, 10.4 million people are estimated incidence to have all forms of TB in 2016 while an estimated number of death 1.3 million people excluding deaths attributed to TB/HIV. In addition, an estimated 4.1% of these new TB cases and 19% of the previously treated cases are believed to harbor Drug resistant-TB with an estimated 240,000 deaths annually due to MDR-TB [3]. World Health Organization (WHO) estimates that 4.5 million people are co-infected with Human Immunodeficiency Virus (HIV) and TB globally [4].

Ethiopia is among the 30 High TB, HIV and multidrug resistance (MDR-TB) Burden Countries, that accounted for 80% of all estimated TB cases worldwide, with an annual estimated TB incidence of 207/100,000 populations and death rate of 33 per 100,000 populations in 2014 [5]. Among the notified TB cases in 2014, 1300 (1.6%) of new TB cases and 11.8% previously treated TB cases [3]. Besides, drug resistance (DR-TB) sentinel report in 2013 shows the MDR-TB prevalence of 2.3% among new and 17.8% among previously retreated TB cases. In the same year notified 119, 592 new TB cases and enrolled 597 drug-resistant TB cases [6]. And many studies showed the prevalence of
Mycobacterium tuberculosis with rifampicin resistance in Ethiopia ranged from 4.7-18.3%. Mutations region of 81 base pairs (bp) of rpoB gene has been found in about 96% of rifampicin (RMP) resistant M. Tuberculosis [7-8].

Ethiopia is implementing a comprehensive TB/Leprosy and TB/HIV control programs and has achieved a lot in the past decades and is on track to achieve the MDG (Millennium development goal) targets regarding TB and HIV. However, Tuberculosis (TB) still remain a major public health problem claiming the lives of thousands of Ethiopians every year [9]. The Case detection rate was very low using smear Microscopy. Now the Ethiopian government continued its commitment in the fight against TB by joining the new post-2015 Global TB Strategy called “END TB strategy” by increasing case detection & further reducing the burden of disease. To achieve the strategy Ethiopia endorsed many advanced technologies concordantly with WHO recommendations. One of the technologies is the geneXpert MTB/RIF assay. The assay detects MTB and rifampicin resistance; conferring mutations using three specific primers and five unique molecular probes. It provides results in less than two hours and has minimal bio-safety requirements and training [10].

Ethiopia is one of the high burden countries, reflected both in its TB incidence and the estimated rates of MDRTB. However, there has been no reliable and organized data on trends and prevalence rifampicin resistance of Mycobacterium tuberculosis in Ethiopia. As far as our knowledge, there are no studies conducted concerning document reviewing systematically trends in Mycobacterium tuberculosis and prevalence of rifampicin resistance using Gene expert in Adigrat area. Therefore, this study aimed to determine the trends in Mycobacterium tuberculosis and the prevalence of rifampicin resistance using Gene expert among TB-presumptive cases at Adigrat General Hospital, northern, Ethiopia.

Methods And Materials

Study Design, Area and Period

Retrospective cross-sectional study design was used to collect the secondary data from June 01-August 30, 2019 in Adigrat General Hospital. The Adigrat General Hospital is found in Tigay, northern Ethiopia and 560 miles far from capital city Addis Ababa. The Adigart General Hospital offers service
around one million people, including the catchment health facilities. It gives all service, including directly observed treatment clinic for TB patients.

**Inclusion criteria**

Those who had completed data in the registration book were included during the study period specified.

**Exclusion criteria**

Indeterminate and/or invalid GeneXpert results were excluded from the study.

**Dependent variable**

Mycobacterium Tuberculosis and Rifampicin resistance TB

**Independent variable**

Sex, residence, age, Co-infection, Previously treated, Tuberculosis treatment outcomes and year of diagnosis.

**Sample size**

Retrospectively all presumptive TB suspected patients from a TB registration book from January 01, 2015 to December 30, 2018 was being included.

**Data collection and laboratory methods**

The data were collected retrospectively from TB registration books in Adigart General Hospital at The Directly Observed Treatment, short course clinic (DOTS). Data was collected using developed checklist.

**Quality of data**

The quality of data was maintained by checking the completeness of necessary information, the obtained data were cross-checked and double entered and re-checked to assure the quality of data.

**Statistical Analysis and interpretation**

Data obtained through the checklist and laboratory test results were double entered into the Epi-info 3.1 software. Data analysis was performed using SPSS 20. Descriptive analysis, frequencies, and Figures were used to explain the findings. Chi-square analysis was used to correlate categorical variables. In all cases, the p-value less than 0.05 were considered statistically significant.
Results
A total of 5944 presumptive TB patients eligible for GeneXpert Mycobacterium Tuberculosis / rifampicin resistance assay were retrospectively included in this study. Among these the majority was male 3455 (58.1%). The median age of the participants was 40.0 (IQC-57, 26), the majority were in the age group 30–44 Years. Of the total participants 513 (8.6%) were HIV positive. Among the presumptive TB patients preponderantly by new case 5733 (96.5%). Diagnoses of Mycobacterium Tuberculosis using the GeneXpert have increased since 2015 to December 30, 2018. (Table 1)

Table-1-Socio-demographic and clinical characteristics of the study subjects in Adigrat General Hospital, Eastern Zone, Tigray, Ethiopia 2020

| Variables                | Frequency | Percentage |
|--------------------------|-----------|------------|
| Sex                      |           |            |
| Female                   | 2489      | 41.9       |
| Male                     | 3455      | 58.1       |
| Residence                |           |            |
| Urban                    | 5121      | 86.2       |
| Rural                    | 823       | 13.8       |
| Age (Years)              |           |            |
| =<14                     | 236       | 4.0        |
| 15-29                    | 1568      | 26.4       |
| 30-44                    | 1620      | 27.3       |
| 45-59                    | 1107      | 18.6       |
| 60-74                    | 1039      | 17.5       |
| 75-89                    | 362       | 6.1        |
| >=90                     | 12        | .2         |
| Total                    | 5944      | 100.0      |
| Reason for diagnosis     |           |            |
| Presumptive TB           | 5027      | 84.6       |
| Presumptive DR TB        | 917       | 15.4       |
| Presumptive DRTB         |           |            |
| New                      | 5733      | 96.5       |
| Relapse                  | 105       | 1.8        |
| Failure                  | 87        | 1.5        |
| Lost to follow-up        | 19        | 0.3        |
| Site of presumptive TB   |           |            |
| Pulmonary                | 5819      | 97.9       |
| Extra-pulmonary          | 125       | 2.1        |
| HIV status               |           |            |
| Negative                 | 4761      | 80.1       |
| Positive                 | 513       | 8.6        |
| Unknown                  | 670       | 11.3       |
| Year of Diagnosis        |           |            |
| 2015                     | 604       | 10.2       |
| 2016                     | 1479      | 24.9       |
| 2017                     | 1872      | 31.5       |
| 2018                     | 1989      | 33.5       |

The overall prevalence of Mycobacterium tuberculosis among all forms of presumptive TB patient was 1446/5944 (24.3%). The Mycobacterium tuberculosis positivity rate was observed in the productive age group 30-44years, in 420 (7.1%). Of the total, Mycobacterium Tuberculosis detected 1188/1446 (82.2%) & 258/1446 (17.8%) were presumptive of TB and drug resistance TB respectively. The proportion of MTB detected among Presumptive of TB and drug resistance of TB were found 1188/5027 (23.6%) & 258/917 (28.1%) respectively. MTB/HIV Co-infection was observed in 171/513 (33.3%) of the patients. From the total previously treated TB cases 60/211 (28.4%) were MTB
detected. The trends of the prevalence of Mycobacterium Tuberculosis relatively increased gradually but higher in 2018. Correlation analysis of MTB strongly associated with age, reason for diagnosis, site of sample collected and being HIV infected. (Table 2)

**Table 2-Prevalence of *M. Tuberculosis* among presumptive TB patients diagnosed in Adigrat General Hospital using Gene Xpert MTB/RIF assay, 2020**

| Variables                    | M. Tuberculosis result by xpert | Total (%) | P-Value |
|------------------------------|---------------------------------|-----------|---------|
|                              | Detected (%)                   | Not-Detected (%)  |
| Sex                          |                                 |            |         |
| Female                       | 596 (10.0)                     | 1893 (31.9) | 2489 (41.9) | 0.401 |
| Male                         | 850 (14.3)                     | 2605 (43.8) | 3455 (58.1) |      |
| Total                        | 1446 (24.3)                    | 4498 (75.7) | 5944 (100) |      |
| Residence                    |                                 |            |         |
| Urban                        | 1266 (21.3)                    | 3855 (64.9) | 5121 (86.2) | 0.207 |
| Rural                        | 180 (3.0)                      | 643 (10.8)  | 823 (13.8)  |      |
| Total                        | 1446 (24.3)                    | 4498 (75.7) | 5944 (100) |      |
| Age (Years)                  |                                 |            |         |
| =<14                         | 44 (0.7)                       | 192 (3.2)   | 236 (3.9)   | 0.000 |
| 15-29                        | 393 (6.6)                      | 1175 (19.8) | 1568 (26.4) |      |
| 30-44                        | 420 (7.1)                      | 1200 (20.2) | 1620 (27.3) |      |
| 45-59                        | 258 (4.3)                      | 849 (14.3)  | 1107 (18.6) |      |
| 60-74                        | 235 (3.9)                      | 804 (13.5)  | 1039 (17.4) |      |
| 75-89                        | 93 (1.6)                       | 269 (4.5)   | 362 (6.1)   |      |
| >=90                         | 3 (0.1)                        | 9 (0.2)     | 12 (0.3)    |      |
| Total                        | 1446 (24.3)                    | 4498 (75.7) | 5944 (100) |      |
| Reason for diagnosis         |                                 |            |         |
| Presumptive TB               | 1188 (20.0)                    | 3839 (64.6) | 5027 (84.6) | 0.007 |
| Presumptive DR TB            | 258 (4.3)                      | 659 (11.1)  | 917 (15.4)  |      |
| Total                        | 1446 (24.3)                    | 4498 (75.7) | 5944 (100) |      |
| Presumptive DRTB             |                                 |            |         |
| New                          | 1385 (23.3)                    | 4348 (73.1) | 5733 (96.4) | 0.189 |
| Relapse                      | 31 (0.5)                       | 74 (1.2)    | 105 (1.8)   |      |
| Failure                      | 27 (0.4)                       | 60 (1.0)    | 87 (1.4)    |      |
| Lost to follow-up            | 3 (0.1)                        | 16 (0.3)    | 19 (0.4)    |      |
| Total                        | 1446 (24.3)                    | 4498 (75.7) | 5944 (100) |      |
| Site of presumptive TB       |                                 |            |         |
| Pulmonary                    | 1414 (23.8)                    | 4405 (74.1) | 5819 (97.9) | 0.007 |
| Extra-pulmonary              | 32 (0.5)                       | 92 (1.6)    | 125 (2.1)   |      |
| Total                        | 1446 (24.3)                    | 4498 (75.7) | 5944 (100) |      |
| HIV status                   |                                 |            |         |
| Negative                     | 1128 (18.9)                    | 3633 (61.1) | 4761 (80.0) | 0.000 |
| Positive                     | 171 (2.9)                      | 342 (5.8)   | 513 (8.7)   |      |
| Unknown                      | 147 (2.5)                      | 523 (8.8)   | 670 (11.3)  |      |
| Total                        | 1446 (24.3)                    | 4498 (75.7) | 5944 (100) |      |
| Year of Diagnosis            |                                 |            |         |
| 2015                         | 142 (2.4)                      | 462 (7.8)   | 604 (10.2)  | 0.011 |
| 2016                         | 339 (5.7)                      | 1140 (19.2) | 1479 (24.9) |      |
| 2017                         | 425 (7.2)                      | 1447 (24.3) | 1872 (31.5) |      |
| 2018                         | 540 (9.0)                      | 1449 (24.4) | 1989 (33.4) |      |
| Total                        | 1446 (24.3)                    | 4498 (75.7) | 5944 (100) |      |

In this study a total 5944 study subject enrolled from registration book were the sample processed by GeneXpert MTB/RIF from January 01,2015 to december 30,2018, 1446/5944 (24.3%) were positive for Mycobacterium Tuberculosis, From the total confirmed all forms of presumptive TB case, 132 (9.1 %) were resistant to rifampicin, of which 29/132 (21.9 %) presumptive drug resistance of TB. The magnitude of rifampicin resistant was relatively higher in productive age groups 30-44 years. Of the total TB-HIV Co-infected patients 26/171 (15.2 %) where RIF resistance. The trends of TB and rifampicin resistant were increased from year to year, the minimum observed in 2015 and the
The sensitivity and resistance of rifampicin results showed a statistical significant difference with different age groups (p<=0.000), & HIV status (p<=0.001). (Table 3)

**Table-3 Prevalence of rifampicin-resistant M. Tuberculosis in each variable among the total M. Tuberculosis cases using Gene Xpert MTB/RIF assay, in Adigrat General Hospital, 2020**

| Variables                  | Pattern of RIF |                  |                  |                |                  |
|----------------------------|----------------|------------------|------------------|----------------|------------------|
|                            | Sensitive N (%)| Resistant N (%)  | Total N (%)      | P-Value        |
| **Sex**                    |                |                  |                  |                |
| Female                     | 535 (37.0)     | 61 (4.2)         | 596 (41.2)       | 0.229          |
| Male                       | 779 (53.9)     | 71 (4.9)         | 850 (58.8)       |                |
| Total                      | 1314 (90.9)    | 132 (9.1)        | 1446 (100)       |                |
| **Residence**              |                |                  |                  |                |
| Urban                      | 1151 (79.6)    | 115 (7.9)        | 1266 (87.5)      | 0.876          |
| Rural                      | 163 (11.3)     | 17 (1.2)         | 180 (12.5)       |                |
| Total                      | 1314 (90.9)    | 132 (9.1)        | 1446 (100)       |                |
| **Age (Years)**            |                |                  |                  |                |
| <=14                       | 41 (2.8)       | 3 (0.2)          | 44 (3.0)         | 0.000          |
| 15-29                      | 376 (26.0)     | 17 (1.2)         | 393 (27.2)       |                |
| 30-44                      | 386 (26.7)     | 34 (2.4)         | 420 (29.1)       |                |
| 45-59                      | 225 (15.6)     | 33 (2.3)         | 258 (17.8)       |                |
| 60-74                      | 205 (11.4)     | 30 (6.5)         | 235 (16.3)       |                |
| 75-89                      | 78 (5.4)       | 15 (1.0)         | 93 (6.4)         |                |
| >=90                       | 3 (0.2)        | 0                | 3 (0.2)          |                |
| Total                      | 1314 (90.9)    | 132 (9.1)        | 1446 (100)       |                |
| **Reason for diagnosis**   |                |                  |                  |                |
| Presumptive TB             | 1085 (75.0)    | 103 (7.1)        | 1188 (82.1)      | 0.101          |
| Presumptive DR TB          | 229 (15.9)     | 29 (2.0)         | 258 (17.9)       |                |
| Total                      | 1314 (90.9)    | 132 (9.1)        | 1446 (100)       |                |
| **Presumptive DRTB**       |                |                  |                  |                |
| New                        | 1256 (86.9)    | 129 (8.8)        | 1385 (95.7)      | 0.229          |
| Relapse                    | 30 (2.1)       | 1 (0.1)          | 31 (2.2)         |                |
| Failure                    | 26 (1.8)       | 1 (0.1)          | 27 (1.9)         |                |
| Lost to follow-up          | 2 (0.1)        | 1 (0.1)          | 3 (0.2)          |                |
| Total                      | 1314 (90.9)    | 132 (9.1)        | 1446 (100)       |                |
| **Site of presumptive TB** |                |                  |                  |                |
| Pulmonary                  | 1283 (88.7)    | 131 (9.0)        | 1414 (97.8)      | 0.092          |
| Extra-pulmonary            | 31 (2.2)       | 1 (0.1)          | 32 (2.2)         |                |
| Total                      | 1314 (90.9)    | 132 (9.1)        | 1446 (100)       |                |
| **HIV status**             |                |                  |                  |                |
| Negative                   | 1036 (71.7)    | 92 (6.4)         | 1128 (78.1)      | 0.012          |
| Positive                   | 145 (10.0)     | 26 (1.8)         | 171 (11.8)       |                |
| Unknown                    | 133 (9.2)      | 14 (0.9)         | 147 (10.1)       |                |
| Total                      | 1314 (90.9)    | 132 (9.1)        | 1446 (100)       |                |
| **Year of Diagnosis**      |                |                  |                  |                |
| 2015                       | 123 (8.5)      | 19 (1.3)         | 142 (9.8)        | 0.303          |
| 2016                       | 310 (21.5)     | 29 (2.0)         | 339 (23.5)       |                |
| 2017                       | 386 (26.7)     | 39 (2.7)         | 425 (29.4)       |                |
| 2018                       | 495 (34.2)     | 45 (3.1)         | 540 (37.3)       |                |
| Total                      | 1314 (90.9)    | 132 (9.1)        | 5944 (100)       |                |

The trends of positivity in Mycobacterium tuberculosis and rifampicin resistance were increased from 2015 to 2018. In 2015 Mycobacterium tuberculosis were found in 142/604 (23.5 %) of whom 19/145 (13.4 %) were rifampicin resistant and in 2018 Mycobacterium tuberculosis prevalence were 540/1989 (27.1 %) of whom 45/540 (8.3%) rifampicin resistant. In general rifampicin resistant in January 2015, 2016, 2017 and till December 30, 2018 were shown 13.4 %, 8.6 %, 9.2 % & 8.3 % respectively. Figure 1

**Discussion**
The World Health Organization continued for search innovative technologies for the accurate and reliable laboratory diagnosis of TB to curb Mycobacterium tuberculosis and drug resistance worldwide. However, the emerging of drug-resistant forms of TB, which needs more resources to detect, to successfully treat and effectively reduce the burden is among the top challenges. Gene Xpert MTB/RIF assay is a new automated real-time Nucleic Acid Amplification Technology that overcomes many of the current operational difficulties in TB diagnosis [11].

The present study, the overall prevalence of all forms of presumptive Mycobacterium tuberculosis was 24.3%. Our finding was similar to studies conducted in the Debremarkos Hospital (23.2%) [12], Gondar Referral Hospital (24.6%) [13], India (27.6%) [4], South Africa (26%) [14] & Nigeria (22.9%) [15] and WHO report in Africa (25%) [2]. However, it was lower compared to reports in Jigjiga (65.5%) [16], Kenya (32.25%) [17] & in eastern Uttar Pradesh (32.9%) [18]. The main difference due to the fact that in our study, we included all forms of presumptive tuberculosis while other studies included identified cases of M. Tuberculosis. In contrast, our finding was higher when compared with other studies conducted in Metema and Armacho (5.7%) [6] & Felege Hiwot Referral Hospital and Debretabor Hospital (14.6%) [19], other parts of Ethiopia (4.7%-10.8%) [20–22], Nigeria (10.3%) [23] and India (2.31%) [24]. The variation might be due to the difference in study design and type & number of participant and environmental condition.

The co-infection, TB-HIV in this study was found high 171 (33.3%). This finding was supported by the study conducted in Amhara (27.7%) [25], in Ethiopia (29.4%) [26], & in Central Nigeria (36.3%) [27]. However, much higher than studies conducted in the Debremarkos referral Hospital (16.6%) [12], different studies in Ethiopia (20.3–24.2%) [13, 28–31], estimated report from WHO in Ethiopia in 2016 14% (9.6%-19%) [2], and much lower than studies conducted in the FelegeHiwot referral Hospital and Debretabor Hospital (41.9%) [19], Zambia (98.3%) [32] & South Africa (> 70%) [33]. The possible explanation for this difference could be due to the fact that HIV infected patients are one of the eligible groups recommended being tested by the Xpert and most likely they have a higher prevalence of HIV.

In this study, Mycobacterium tuberculosis common prevalent in all ages, but has seriously hit the
productive age group (30–44 years) 29.0%, of whom 34/420 (8.1%) Rifampicin resistance. The Positivity finding was in line with the study conducted in previous reports in Gonder (29.8%) [13], different studies in Ethiopia [20–22, 34], WHO reports 2017 [2] & Agaro Teaching Health Center in southwestern Ethiopia [35]. This contrasts with several studies in different part of Nigeria and Zambia [17, 23, 32], and higher in eastern Uttar Pradesh (40%) [18].

In the present study, the percentage Mycobacterium tuberculosis were significantly higher in presumptive drug resistance (27.8%) compared to presumptive TB patients (23.7%) with (P < 0.003). This finding was comparable to a study conducted in Debremarkos Referral Hospital [12], FelegeHiwot referral Hospital and Debretabor Hospital [19], in Gonder [13], & eastern Uttar Pradesh [18]. However, it's much lower than studies conducted in Debremarkos referral Hospital (38% ) [12] & Zimbabwe (37.1%) [36].The discrepancies might be due to in our study we included all presumptive TB and a high number of participants.

According to our study, we found 132 (9.1%) of rifampicin resistance among confirmed TB cases on average. This is comparable with a study conducted in Debremarkos Referral Hospital (10.3%) [12], FelegeHiwot referral Hospital and Debretabor Hospital (9.3%)[19],India (10.5%) [37].In the other hand, it is higher than the studies conducted in different part of Ethiopia (2.9%-5.7%) [6, 18, 30–32], Nigeria (2.9%) [23] and Zambia (5.9%) [32].The possible explanation for these variation could be due to the fact that this study was included retrospectively four years and difference in study design .However, it lower than study conduct in Gonder 15.8% [13], other part of Ethiopia [41] and China (26.3%) [42].

Conclusion
The overall prevalence of Mycobacterium Tuberculosis and Rifampicin resistant was found high, especially HIV positive patients. Therefore, maximizing early detection of drug-resistant Mycobacterium Tuberculosis and strengthening TB infection control activities and proper implementation of Directly Observed Treatment, short course is recommended to reduce the burden of this infectious disease as well as further study is needed to detect multi drug resistance Mycobacterium Tuberculosis in the area.
List Of Abbreviations
ADU: Adigrat University; AGHL: Adigrat General Hospital Laboratory; DNA: Deoxyribonucleic Acid; DOTS: Directly Observed Treatment, short course; HIV: Human Immunodeficiency Virus; MDR TB: Multidrug Resistance Tuberculosis; RIF: Rifampicin; RNA: Ribonucleic Acid; TB: Tuberculosis; WHO: World Health Organization; XDR TB: Extensively Drug Resistant Tuberculosis

Declarations

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Authors' contributions
GK conceived and designed the study, performed the analysis, interpreted data, and drafted the manuscript. BH assisted with the design, proposal preparation, performed analysis and interpretation of data, and critically prepared and reviewed the manuscript. All authors read and approved the submitted version of the manuscript.

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Availability of data
The finding of this study is generated from the data collected and analyzed based on the stated methods and materials. All the data are already found in the manuscript and there are no supplementary files. The original data supporting this finding will be available at any time upon request.

Ethics approval and consent to participate
This study was reviewed and approved by research and community service Ethical Review Board (RERB) of Adigart University, College of medicine and Health Sciences and after discussion of the purpose and aim of the study permission was obtained from Adigrat General Hospital Chief executive officer and Laboratory Head to access the registration book. Written informed consent was not sought from the study participants as secondary data were used. Confidentiality of the result was also maintained anonymously and not communicated for other purposes.

**Consent for publication**

Not applicable

**Conflicts of Interest**

The authors declare that they have no competing interests.

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Figures
Figure 1

Trends of Mycobacterium tuberculosis and Rifampicin resistant in Adigrat General Hospital,Tigray,Northern, Ethiopia 2020.