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Full Length Article

More than half of presumptive multidrug-resistant cases referred to a tuberculosis referral laboratory in the Tigray region of Ethiopia are multidrug resistant

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ARTICLE INFO

Article history:

Received 13 July 2016

Accepted 19 July 2016

Available online xxxx

Keywords:

Ethiopia

Multidrug-resistant tuberculosis

Previously treated

ABSTRACT

Objective/background: Generating epidemiological data on multidrug-resistant tuberculosis (MDR-TB) is essential to assess the magnitude and trends of anti-TB drug resistance. This study determined the prevalence of MDR-TB among presumptive MDR cases referred to a TB referral laboratory in the Tigray region of Ethiopia. **Methods:** A retrospective cross-sectional study was conducted on 262 culture-positive presumptive MDR-TB samples submitted to the Tigray Regional Research Laboratory for MDR testing between January 2013 and August 2014. Relevant data were recorded using a structured recording format. **Results:** Out of 262 *Mycobacterium tuberculosis* isolates, 143 (54.6%) were MDR, 28 (10.7%) were resistant to rifampicin only, and 19 (7.3%) were resistant to isoniazid only. The prevalence of MDR-TB among newly infected cases was 66.7% (8/12) and that among previously treated cases was 54.1% (97/179). Of the variables tested, being a male was found to be associated with the development of MDR-TB ($p = .003$). **Conclusion:** More than half of the presumptive MDR cases referred to the Tigray Regional Research Laboratory were MDR. The prevalence was high in both newly infected and previously treated cases. Hence, re-enforcing the TB prevention methods, and strengthening the directly observed treatment short-course (DOTS) strategy and the capacity of laboratories to undertake drug susceptibility testing (DST) in the region are imperative in order to curb the emergence and transmission of MDR-TB.

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Peer review under responsibility of Asian African Society for Mycobacteriology.

<http://dx.doi.org/10.1016/j.ijmyco.2016.07.007>

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Introduction

Multidrug-resistant tuberculosis (MDR-TB) is a form of TB caused by bacteria that are resistant to at least two of the most powerful first-line anti-TB drugs, isoniazid (INH) and rifampicin (RIF) [1]. The emergence of MDR-TB has been a global health problem threatening the progress made in TB care and control [2]. Globally, the prevalence of MDR-TB was reported to be 3.5% among new TB cases and 20.5% among previously treated TB cases in 2013 [3].

The impact of MDR-TB is much worse in low-income countries such as Ethiopia, where the socioeconomic status of the people is low, TB burden is high, and well-equipped health care facilities are limited [4]. A national drug-resistance survey conducted in Ethiopia in 2011 reported the prevalence of MDR-TB to be 2.7% and 17.9% among new and retreatment cases, respectively [5].

Previous drug resistance surveys involving presumptive MDR cases reported MDR proportions of 36.3% [6] and 33%, respectively, in the Amhara and Oromia regions [7] of Ethiopia. However, these studies might not be representative of cases from other regions of the country owing to differences in lifestyle and environmental conditions across different regions of Ethiopia [8]. Besides, regions differ in their TB control and prevention performance. In the annual performance report of the year 2013/2014, for example, the TB case detection rates in the Amhara and Oromia regions were about 58% and 61%, respectively, while this figure was about 66% in the Tigray region [9]. The TB cure rates were 75%, 78%, and 64% in the Amhara, Oromia, and Tigray regions, respectively [9]. These variations could affect the distribution of MDR strains, and hence quantifying the burden of MDR-TB regionally is justifiable. This study, therefore, determined the prevalence of MDR-TB among presumptive MDR cases referred to a tuberculosis referral laboratory in the Tigray region of Ethiopia.

Methods

Study design and setting

This was a health facility-based retrospective cross-sectional study conducted in the Tigray Regional Research Laboratory located in Mekelle, the capital of the Tigray region. This regional research laboratory is the only laboratory that provides MDR testing service in the Tigray region and is a referral site for presumptive MDR cases from all parts of Tigray (North Ethiopia).

Study population and sampling technique

Relevant data were recorded conveniently for all presumptive MDR cases (treatment failure and relapse cases, defaulters, and a few new cases) referred to the Tigray Regional Research Laboratory for MDR testing between January 2013 and August 2014, using a structured recording format. MDR testing was performed in the regional laboratory by the genotypic method (Genotype MTBDRplus test, Hain Lifescience) following the manufacturer's instructions and standard operating

procedures. Data on the sociodemographic characteristics, INH and RIF resistance outcome, previous history of treatment, and previous treatment subcategories were then extracted from a total of 262 presumptive MDR cases.

Data analysis

Data were entered using Epi Data entry version 3.1 (Denmark^{Info} @ EpiData.dk) software and analyzed using SPSS version 21 (Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp). Differences between the MDR and non-MDR cases with respect to the patients' baseline characteristics were assessed using the chi-square test. A p value $\leq .05$ was considered statistically significant.

Ethical issues

This study was approved by the ethical review committees of the College of Health Sciences, Mekelle University. A letter of cooperation was written to the Tigray Regional Research Laboratory authority. Furthermore, confidentiality of patient information was safeguarded throughout the research activities.

Results

Characteristics of the study population

Out of the 262 culture-positive presumptive MDR cases included in this study, 79.4% (208/262) were males and 20.6% (54/262) females with a mean age of 36 years. The majority of them (179 [68.3%]) were previously treated cases, while a few (12 [4.5%]) were newly infected cases. With regard to their retreatment subcategories, 55.3% (99/179) were relapse cases, 41% (77/179) treatment failure cases, and 3.7% (3/179) defaulters. However, the TB treatment history was unknown for a substantial proportion of cases (71 [27.2%]).

Rifampicin and isoniazid resistance patterns

Out of the 262 *Mycobacterium tuberculosis* isolates, 143 (54.6%) were MDR, 28 (10.7%) were resistant to RIF only, and 19 (7.3%) were resistant to INH only. The prevalence of MDR-TB among newly infected cases was 66.7% (8/12) and that among the previously treated cases was 54.1% (97/179). Within the previously treated cases, relapse cases had the highest MDR-TB prevalence (55.6% [55/179]), but the difference was not statistically significant. Of the variables tested, being a male was found to be associated with the development of MDR-TB ($p = .003$) (Table 1). The prevalence of MDR-TB in those with an unknown treatment history was 64.8% (46/71).

Discussion

In this study, more than half of *M. tuberculosis* isolates (54.6%) were MDR strains. This is notably higher than that documented in similar reports from the Amhara regional state (36.3%) [6] and Oromia region (33%) [7]. The difference could partly be attributed to differences in the TB clinical screening

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