Pattern of drug resistance of *Mycobacterium tuberculosis* clinical isolates to first-line antituberculosis drugs in pulmonary cases

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ABSTRACT

**Context:** *Mycobacterium tuberculosis* (MTB), the human pathogen causes Tuberculosis (TB). It is a highly infectious and globally pandemic disease. The severity increases when the MTB becomes resistant to antituberculosis drugs. India is reported to be in the second place, with the highest number of drug-resistant TB cases. The treatment of drug-resistant TB is even more complicated. **Materials and Methods:** The present study comprises of 159 TB patients, in which 88 are reported to have drug-resistant TB (55.3%). All the patients are in the age group of 18–70 years. Patients having extrapulmonary TB and diabetes were excluded from the study. The collected samples were processed and stained for acid fastness and smear positivity. They were subjected to inoculation on Lowenstein–Jensen (LJ) slants. **Results:** The results showed that out of the four drugs — Streptomycin, Isoniazid, Rifampicin, and Ethambutol — the resistant cases reported in Streptomycin were 45 (24.9%), whereas, in Isoniazid, Rifampicin, and Ethambutol, the resistant cases were 62 (34.2%), 27 (14.9%), and 47 (26.0%), respectively. Isoniazid showed the highest percentage of resistance among the patients. **Conclusion:** Effective measures such as convincing the patients to take the prescribed drugs and follow the five major strategies under the Directly Observed Treatment, Short Course (DOTS), could help in managing such cases.

**KEY WORDS:** Anti-TB drugs, drug resistance, isoniazid, *Mycobacterium*, tuberculosis

INTRODUCTION

Tuberculosis (TB) is a fatal contagious disease. It is mainly an infection of the lungs, but can affect almost any part of the body. Although TB is a preventable and treatable disease, yet it still poses a significant threat globally. On account of the constant increase in the number of TB cases, the World Health Organization (WHO), in 1993, had declared TB as a serious public health emergency. Approximately, nine million new cases and one-and-a-half million TB-related deaths occur each year; the incidence may vary. In some countries like Sub-Saharan Africa and Asia, the annual incidence is several hundred per 100,000 population, whereas, in the United States the annual incidence is <4 per 100,000 population (http://www.who.int/tb/en/). In 2012, an estimated 8.6 million people developed TB and 1.3 million died from the disease. The new cases of TB mostly occur in a population aged between 15 and 49 years (http://www.tbcindia.nic.in/).

Tuberculosis is caused by the human pathogen *Mycobacterium tuberculosis* (MTB) — an infectious human agent. MTB may have killed more persons than any other microbial pathogen. The inadequacy of awareness and treatment results in major health problems, where the results are complicated. TB is second only to the human immunodeficiency virus (HIV). The amelioration of Latent Tuberculosis Infection (LTBI) to active TB is hastened by the most powerful risk factor, which is, HIV, as it weakens the immune system of the host. HIV not only facilitates LTBI to active TB, but also serves to bring about the progression of spread of Multi-drug Resistant Tuberculosis (MDR-TB).
The control media were incubated for a week. If a patient consumes his anti-TB drugs on a routine basis, there is a chance of TB, but on the other side they have also some negative points. Anti-TB drugs have proved to be a boon in the treatment of TB, but on the other side they have also some negative points. If a patient consumes his anti-TB drugs on a routine basis, there is a chance of TB, but on the other side they have also some negative points.

**DISCUSSION**

Anti-TB drugs have proved to be a boon in the treatment of TB, but on the other side they have also some negative points. If a patient consumes his anti-TB drugs on a routine basis, there is a chance of TB, but on the other side they have also some negative points. Anti-TB drugs have proved to be a boon in the treatment of TB, but on the other side they have also some negative points.
basis without any gap, he can be sure that these drugs will help him in combating the infection, but if the drugs are taken in a discontinuous manner the treatment can become more difficult and sometimes fatal.\[9\]

The present study shows the pattern of drug resistance to first-line antituberculosis drugs among new pulmonary cases. In this particular study the drug resistance of MTB was observed in all the cases. This shows that cases of drug resistance are increasing at a high speed. Thus, we can state that, day by day, the increasing rates of resistance to Isoniazid lead to life-threatening problems among the population.\[10\] Also, the sex factor was significantly noticeable in our study, as males showed more resistant behavior to antituberculosis drugs than females. Forty-three males and 19 females were found to be resistant to INH (Table 2).

Deaths due to TB (1.4 million) were recorded worldwide, in 2011. An estimated 8.6 million new cases of TB and 1.3 million TB-related deaths have been reported worldwide; 6.2 million cases of TB were notified by the National TB Control Programs and reported to the WHO, in 2011, out of these, 5.8 million were individuals who were newly diagnosed in 2011, and 0.4 million were the previously diagnosed TB patients, whose treatment regimen was changed. A wide variation in the prevalence rate of MDR has been reported from different Asian countries. Different surveys done by the WHO using standardized guidelines showed levels of primary resistance to antituberculosis drugs (http://www.who.int/topics/tuberculosis/en/). For example, INH ranged from 0–16.9%; SM from 0.1–23%; EMB was low ranging from 0–4.2%, and RMP had a rate ranging from 0–3%. Prevalence of initial MDR-TB reported from India varied between 0 and 5%. To know about the current TB Control Program, one may get it from the drug-resistant program of any country. Countries such as India and Kenya reported high rates of primary resistance to Isoniazid. On the other hand, countries such as Melbourne and Argentina showed low rates for primary resistance to INH.\[11\]

Thus, it becomes important to look into the case findings, convincing patients to take their prescribed medicines, and also strengthen the smear-positive patients; under the five main strategies of DOTS.

**CONCLUSION**

For a better and healthy population, all the effective measures should be adopted, to manage both the fresh and drug-resistant TB cases by following the five major strategies under DOTS and convince the patients to take the prescribed drugs on a routine basis, without any gap.

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**Table 1: Clinical profile of tuberculosis patients**

| Age range (in years) | Total patients | Ratio (male/female) | Duration of treatment (in months) | Sputumacid fast bacilli load |
|----------------------|----------------|---------------------|----------------------------------|---------------------------|
| 18-28                | 25             | 15/10               | 1-36                             | +1                        |
| 29-39                | 19             | 12/7                | 3-36                             | +2                        |
| 40-49                | 15             | 11/4                | 3-36                             | +2                        |
| 50-59                | 15             | 12/3                | 2-24                             | +2                        |
| 60-70                | 14             | 10/4                | 1-24                             | +3                        |

**Table 2: Number and percentage of antituberculosis drug resistance**

| Drug             | Total number of resistant patients (%) | Males N (%) | Females N (%) |
|------------------|---------------------------------------|-------------|---------------|
| Isoniazid        | 62 (34.2)                             | 43 (69.3)   | 19 (30.7)     |
| Streptomycin     | 45 (24.9)                             | 34 (75.0)   | 11 (25.0)     |
| Ethambutol       | 47 (26.0)                             | 32 (68.1)   | 15 (31.9)     |
| Rifampicin       | 27 (14.9)                             | 18 (66.6)   | 9 (33.3)      |