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## Prevalence of drug-resistant tuberculosis in Iran: Systematic review and meta-analysis



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Tuberculosis  
Drug resistance  
Iran

**Background:** The spread of multidrug-resistant tuberculosis (MDR-TB) is a major public health problem worldwide. Although drug resistance is common in some countries and rare in others, the extent of this condition is not precisely known in Iran.

**Methods:** We searched several databases including PubMed, Web of Science, Scopus, Iran Medex, and Scientific Information Database to identify studies addressing drug-resistant tuberculosis in Iran. A total of 19 reports published from different regions of Iran from March 1999-May 2013 were included in this study.

**Results:** The meta-analyses revealed that 23% (95% confidence interval [CI], 21.8-24.2) of new cases and 65.6% (95% CI, 62.5-68.5) of previously treated cases were resistant to at least 1 drug. Furthermore, MDR-TB was found in 5.1% (95% CI, 4.4-5.8) of new cases, whereas it was found in 33.7% (95% CI, 30.8-36.7) of retreatment cases. The highest rate of resistance in new and previously treated cases was seen against streptomycin (19%) and isoniazid (47%), respectively.

**Conclusion:** The results of the present study underscore the need for further enforcement of TB control strategies. Drug susceptibility testing, establishing advanced diagnostic facilities, and continuous monitoring of drug resistance are recommended for prevention and control of MDR-TB.

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Tuberculosis (TB) caused by *Mycobacterium tuberculosis* is a major public health problem in several countries and an obstacle in control programs.<sup>1</sup> According to the latest report released by the World Health Organization, among 8.6 million incident cases of TB in the world, 3.6% are estimated to be multidrug-resistant tuberculosis (MDR-TB). MDR-TB is caused by strains of *M. tuberculosis* resistant to at least isoniazid and rifampin, the 2 most powerful first-line anti-TB drugs.<sup>1</sup> Patients infected with MDR-TB strains require prolonged and expensive chemotherapy using second-line drugs that are less effective and more toxic in comparison with the first-line drugs. In addition, in many low- and middle-income countries, due to inadequate laboratory capacity, most of the MDR-

TB cases are not properly diagnosed; therefore, treatment in these cases mostly fails.<sup>2</sup> In this regard, transmission and spread of resistant strains from such patients constitutes the major part of the problem in TB control strategies.<sup>3</sup>

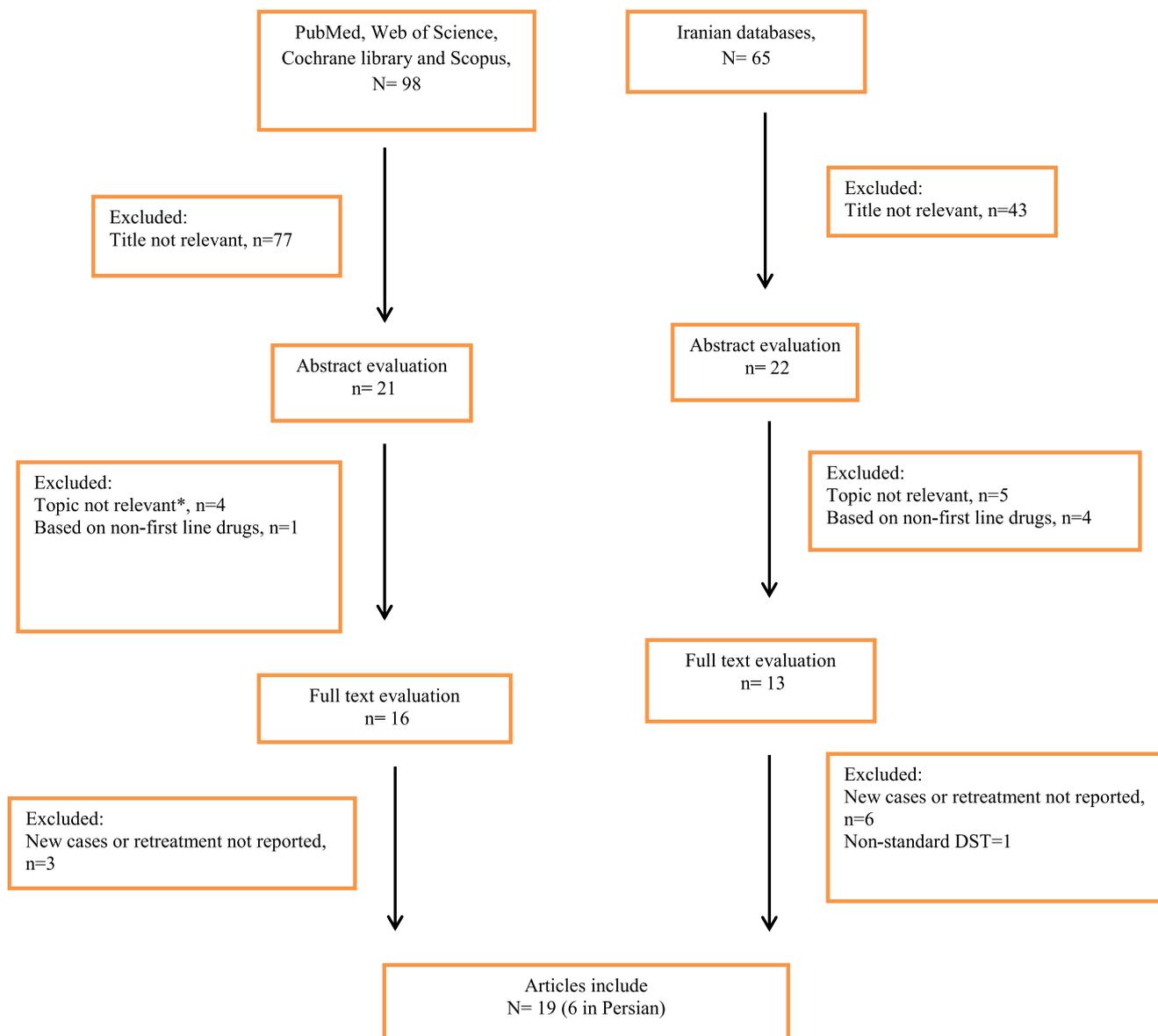
In Iran, TB incidence has been considerably lower than neighboring countries over the last decade (21 cases per 100,000 populations).<sup>4</sup> However, because Iran shares extensive borders with high TB-burden countries (Azerbaijan, Armenia, Pakistan, Afghanistan), controlling the spread of MDR-TB in Iran is a priority for national TB control programs. Recently, this concern has been intensified by reports of extensively drug-resistant TB.<sup>5</sup>

To date, the rates of drug-resistant TB have been reported in several studies in Iran.<sup>2</sup> However, most of these surveys have presented local information, and a comprehensive analysis on drug-resistant TB from different parts of Iran has not yet been performed. Furthermore, a reliable estimate of the extent of MDR-TB is needed for the programmatic management of drug-resistant TB within the context of national TB control programs.

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**Fig 1.** Summary of the literature search and study selection. \*Studies dealing only with extrapulmonary tuberculosis or that only consider childhood tuberculosis or tuberculosis cases that are infected with HIV. *DST*, drug susceptibility testing.

The present study was designed to determine the prevalence of drug-resistant TB in Iran by using a systematic review and meta-analysis according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement.<sup>6</sup>

## METHOD

### Search strategies

A database was built for prevalence of drug-resistant TB in Iran from March 1999–May 2013 using PubMed, Web of Science, Scopus, Iran Medex, and the Scientific Information Database. The search was restricted to original articles published in English and Persian that present the prevalence or incidence of TB in Iran among patients with new or retreatment TB. The following keywords from Medical Subject Headings or titles or abstracts were used with the help of Boolean operators (and, or): *tuberculosis*, *Mycobacterium tuberculosis*, *drug resistance*, *drug susceptibility*, and *Iran*. We also

searched bibliographies of retrieved articles for additional references. In addition to articles published in English, we also looked for relevant articles in Persian. All published data in Iranian databases, such as Iranmedex ([www.iranmedex.com](http://www.iranmedex.com)), Scientific Information Database ([www.sid.ir](http://www.sid.ir)), Magiran ([www.Magiran.com](http://www.Magiran.com)), Irandoc ([www.irandoc.ac.ir](http://www.irandoc.ac.ir)), and Iranian National Library ([www.nlai.ir](http://www.nlai.ir)), in the Persian language were searched with similar strategies and related Persian keywords.

### Inclusion and exclusion criteria

All original articles presenting cross-sectional or cohort studies on the prevalence of drug-resistant TB in Iran were considered. The selection of articles for review was completed based on 3 stages: titles, abstracts, and full texts. Included studies referenced a standard method for drug susceptibility testing (DST) of *M tuberculosis* against first-line anti-TB drugs (isoniazid, rifampin, ethambutol, streptomycin). Standard DST methods include the proportion

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