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# Treatment outcome of new smear positive pulmonary tuberculosis patients in Hamadan, Iran: A registry-based cross-sectional study



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## KEYWORDS

Tuberculosis;  
Treatment outcome;  
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**Abstract** *Objectives:* Treatment outcome of Tuberculosis (TB), as a key determinant to evaluate the effectiveness of TB control program, remains a public health challenge in many developed and developing countries. This study aimed to assess treatment outcomes of new smear-positive pulmonary tuberculosis (PTB).

*Methods:* This retrospective cross-sectional study was conducted on 510 registered new PTB patients in Hamadan province, Iran during 2005–13. The data were extracted from the National TB Program (NTP). The main outcome was treatment success. The results of evaluation of the associated factors with successful treatment were presented as Odds Ratios (OR), and bootstrap method was used to obtain 95% Confidence Interval (95% CI). All statistical analysis was performed at 0.05 significant levels using the Stata 12 (Stata Corp, College Station, TX, USA).

*Results:* Overall, successful treatment outcome was 83.1%, and 9.4% of the patients died during the study period. In univariate logistic regression, only hospitalization history was associated with

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successful treatment (OR = 2.02, 95% CI: 1.25, 3.24). After adjustment for age, weight, and delayed diagnosis, the factors associated with successful treatment were gender and having HIV risk factors and hospitalization history.

*Conclusion:* Treatment success rate in our study was 83.1%, which is slightly lower than the success target set by World Health Organization (WHO). Key determinants of poor treatment success rate, such as male gender, and not having hospitalization history during the treatment period, should be considered in efforts aimed to improve the treatment outcome in the management of TB.

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## Introduction

Tuberculosis (TB) is a public health problem and the leading cause of death with an annual incidence rate of about 8.6 million cases. Additionally, 1.3 million people have been estimated to die due to the disease every year [1]. The burden of TB is the highest in Asia (59%) and Africa (26%) [2]. Besides, the case fatality rate has exceeded 50% in some African countries where HIV infection rates are high [3]. In Iran, the incidence rate of TB was 14.4 per 100,000 people in 2012 and about 50% of them was smear-positive pulmonary tuberculosis (PTB) [4].

In TB control program, it is important to achieve and sustain acceptable levels of treatment success among all TB patients. Therefore, treatment success is measured by a standardized process of treatment outcome monitoring [5]. In fact, treatment “success” has been measured by the number of patients being “cured” and those having their “treatment completed” [6]. Successful treatment of PTB has obvious benefits to both individual patients and the community. Hence, it can have an immediate impact on TB prevalence and mortality rates. On the other hand, a 95% reduction in TB-related deaths and a 90% reduction in TB incidence rate are the overall target of the strategy to end the global TB epidemic by 2035 [7].

The treatment success rate among all new TB cases was 86% globally [7]. This proportion varied from 75% in the European Region to 92% in the Western Pacific Region among the six World Health Organization (WHO) regions [7]. A systematic review in European Union countries also showed that treatment success rate varied from 60% to 87% [8]. Some factors, such as high prevalence of HIV/AIDS, high prevalence of drug resistance, poor quality of medical services, and aging, affect the treatment success [9,10].

Monitoring and assessing the treatment outcome of TB is essential in order to evaluate the effectiveness of interventions. Therefore, this study aims to assess the treatment outcomes of all PTB patients over a 9-year period by reviewing the registered cases in Hamadan province, Iran. This will enable us to ascertain the effectiveness of our treatment program and determine the risk factors of unsuccessful treatment outcome and longer treatment duration.

## Methods

This cross-sectional study was performed on TB patients in Hamadan province, Iran using the surveillance database. All the registered smear-positive TB patients in all parts of the province (510 patients) from 2005 to 2013 were included in

the study. The inclusion criteria of the study were (a) being a new case of TB and (b) living in Hamadan province. For diagnosis of sputum smear-positive TB, a case must meet one of the following criteria: (a) two positive sputum smears by microscopy, (b) one positive sputum smear and one positive sputum culture, and (c) one positive sputum smear with typical pathology of active TB on chest X-ray [11]. The data were extracted from the National TB Program (NTP) using a checklist of items, including gender, age, weight, delayed diagnosis (the time interval between the onset of TB symptoms to diagnosis), residency status (urban/rural), HIV status, hospitalization history during the treatment period, laboratory result before treatment (1–9 Basil, 1+, 2+, 3+), and treatment outcomes of new PTB patients based on WHO’s definition (Table 1) [12].

To analyze the data, the categories “cured” and “treatment completed” were combined as treatment success (the main outcome). The TB patients with other outcomes (treatment failed,

**Table 1** Treatment outcomes for new PTB patients according to WHO’s guideline [12].

Outcome	Definition
Cured	A pulmonary TB patient with bacteriological confirmed TB at the beginning of treatment who was smear- or culture-negative in the last month of treatment and on at least one previous occasion
Treatment completed	A TB patient who completed treatment without evidence of failure BUT with no record to show that sputum smear or culture results in the last month of treatment and on at least one previous occasion were negative, either because tests were not done or because results are unavailable
Treatment failed	A TB patient whose sputum smear or culture is positive at month 5 or later during treatment
Died	A TB patient who dies for any reason before starting or during the course of treatment
Lost to follow-up	A TB patient who did not start treatment or whose treatment was interrupted for 2 consecutive months or more
Not evaluated	A TB patient for whom no treatment outcome is assigned. This includes cases “transferred out” to another treatment unit as well as cases for whom the treatment outcome is unknown to the reporting unit
Treatment success	The sum of cured and treatment completed

PTB: positive pulmonary tuberculosis.

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