Treatment outcome of tuberculosis patients and factors determining treatment outcome at peripheral health settings of Northern Ethiopia: a five year retrospective study

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Abstract

Objective

Evidences of treatment outcome and identifying factors associated with treatment failure through a register based retrospective study have significant contribution in the improvement of a National Tuberculosis Program. However there is a scarcity of data from peripheral health settings in Ethiopia. Therefore this study is aimed at determining treatment outcome of tuberculosis patients and associated factors.

Results

A total of 3471 patient records were included. More than half, (58%) were males and the mean age was 34 ± 17 years. Majority (43%) had extra-pulmonary TB. From the total TB patients, 18.8% were HIV co infected. The overall treatment success was 89.5%. Being HIV coinfected, pulmonary negative, extra-pulmonary and retreatment case were significantly associated with treatment failure.

Introduction

Tuberculosis (TB) is the second most important communicable disease in the world (1). According to the World Health Organization’s global TB Report, Ethiopia had an estimated prevalence of 211 cases per 100,000 populations in 2013, with an estimated incidence rate of 224 cases per 100,000 populations. The overall case detection is 62% (51%-74%). Moreover, the country is challenged by HIV TB coinfection with incidence rate of 24 per 100,000 populations. The TB treatment success rate among new patients registered in 2012, previously treated and MDR cases on second line drugs are 91%, 43% and 72% respectively (2).

According to the Centers for Disease Control and Prevention (CDC), the four primary goals of TB prevention and control are: to identify and treat persons who have active TB
disease, to identify and evaluate exposed contacts, offering appropriate treatment as indicated and to test populations at high risk for TB infection and disease and provide treatment for latent TB infection (LTBI) to prevent progression to active TB (3). This can be done by identifying TB cases, ensuring adequate therapy, conducting overall planning and policy development, providing laboratory and diagnostic services and providing training and education for high risk populations. The amount of LTBI in Ethiopia ranges from 51% among blood donors in Addis Ababa to 63.7% in a study of the general population of Afar region, Northern Ethiopia (4, 5, 6).

Patients that are either diagnosed clinically or bacteriologically for active TB are included in Directly Observed Treatment-short course (DOTS). DOTS implies that patients are being observed when they take their medication, optimally every day (7). However, the treatment outcome is challenged by different factors. Some of the factors include access to treatment, poor socioeconomic status, health service access and use, delays in seeking care and diagnosis and poor knowledge about the disease. The lack of TB culture and drug susceptibility testing and ambiguity in guideline recommendations especially for specific subgroups of patients are mentioned to negatively influence the treatment outcome in some regions of the country, including the study area (8, 9).

Hence, determining treatment outcome and identifying factors affecting treatment outcome will in turn contribute to the improvement of TB control programs and hence decrease TB morbidity and mortality. In Ethiopia few studies have conducted, showing different TB treatment outcome (10, 11). However, further information is required in all forms of TB and all age groups and on factors responsible for treatment outcome. Therefore, this study was aimed at assessing tuberculosis treatment outcome and factors affecting treatment outcome in all forms of TB patients that have been treated for TB in the health settings.
Methods

The study was conducted in three peripheral health facilities; Mekelle, Semen and Kasech Health Centers of Mekelle, in Northern Ethiopia. The study area is located 783 kms to the North of the capital city, Addis Ababa. The total population of Mekelle has been estimated to be around 216,000 in 2007 (12). Around 2014, the estimated population of Mekelle was 307,000 (13). According to the Regional Health Bureau, there are 9 government Health Centers in Mekelle, of which the above three are the biggest Health Centers in providing TB treatment to the people in the city (14). TB diagnosis and treatment is one of the services provided in these health facilities. Based on the TB clinics’ registration log books, on average 230, 300 and 160 patients per year were estimated to be receiving TB treatments in Mekelle, Semen and Kassech Health Centers, respectively. The study design was a register based retrospective study on patients of all TB forms who received TB therapy between July 2009 and July 2014. The inclusion criteria was having a readable record in the TB registration book and patients that were diagnosed as non TB after starting of treatment were excluded from the study. Demographic and clinical data including; sex, age, sputum result at diagnosis, weight, TB history, TB type, date starting treatment, HIV status, Sputum smear result at 2nd, 5th and 7th month, date end of treatment and treatment outcome was collected from patient charts using a pre prepared data abstraction Excel format. Treatment outcome was defined according to the WHO definitions (15). Accordingly, components were defined as follows: cured- pulmonary positive TB with negative sputum at the end of therapy plus at least one earlier negative result after commencing of therapy. Treatment completed - a patient that completed the prescribed duration of therapy without signs of failure but no sufficient data on sputum results. Died - a patient that died during the treatment period, independent of the cause.
Failed - a patient with positive smear result at month 5 or later in therapy. Lost to follow-up - a patient that did not start treatment or had an interruption of 2 consecutive months or more. SPSS version 22 for Windows was used for data analysis. Descriptive statistics were explained in tables and text. Chi square test was used for bivariate calculations. Differences between the means were calculated using ANOVA. Univariate analysis and multivariate logistic regression modeling were used to assess the impact of each variable in predicting treatment outcome.

Results

A total of 3471 patient cards were included from the three health centers, of which 816 (23.5%) were from Kassech, 1151 (33.2%) from Mekelle and 1504 (43.3%) from Semen health centers. Majority, 1999 (57.7%), were males. The mean age and standard deviation of the study population was 33.88 ± 16.91 (range: 0-90). From the patients, 2983 (86.4%) were adults.

Patients with extra-pulmonary TB constitute the largest (42.5%) proportion followed by pulmonary negative (39.4%) and pulmonary positive (17.9%). Majority of the patients (91.8%) were new patients, 8.2% had been treated before. Looking at the individual years, a decrease in patients is seen from year 2009 to 2014: 984, 696, 600, 650, and 535, respectively. The decrease of the amount of pulmonary positive TB in these years was as following: 144, 135, 135, 125, and 76. With respect to HIV co infection, 18.8% was HIV positive (HIV+), 75.1% HIV negative and 6.2% was with unknown result [Table 1]. Among the study population, 371 (12.7%) were cured, 2234 (76.7%) had completed their treatment, 119 (4.1%) died, 9 (0.3) failed and 178 (6.1%) defaulted [Table 2]. In pulmonary positive patients, 364 (71.9%) were cured, 70 (13.8%) had completed their treatment, 20 (4.0%) died, 8 (1.6%) failed and 44 (8.7%) were defaults. The overall number of patients with treatment success was 2605 (89.5%). Of the different TB types,
pulmonary negative patients had the treatment success (85.8%), followed by pulmonary negative (89.4%) and extra-pulmonary (91.0%). Relapse patients had a lower success compared to newly diagnosed patients (76.9% versus 89.5%). Tuberculosis patients co-infected with HIV had lower treatment outcome (85.2%) compared to HIV negative (91.1%). Being HIV positive [P=0.000, OR 95%CI=1.7829 (1.353-2.349)], pulmonary negative [P=0.033, OR 95%CI=0.712(0.521-0.973)], extra-pulmonary TB [P=0.001, OR 95%CI=0.594(0.433-0.815)] and retreatment case [P=0.000, OR 95%CI=2.290(1.561-3.360)] were significantly associated with treatment failure [Table 3].

Discussion

Over all a significant increase in the treatment success over these five years was observed and a relatively lower success was observed in HIV co-infected patients. The treatment success in this study population increased from 87.0% to 92.8% between the 2009-2010 and 2013-2014 groups, the average was 89.5%. According to the Annual Performance Report of the Ministry of Health, in Ethiopia the treatment success showed a similar increase, growing from 84% in 2010 to 92% in 2014(16). In this report, a cure rate in pulmonary positive patients of 69.1% is found. According to the TRHB, the success rate of Tigray in 2012 was 93.3%, in Mekelle 90.2% (17), which is similar with our data. Difference in outcome could be due to variation in DOTS performance. Other reasons could be difference in duration of study period, sample size and study setting.

The number of HIV+/TB coinfections in our study is with 18.8% higher than the national average. In 2012 in Tigray the HIV+/TB coinfection was 11.2%, 10.7% in whole Ethiopia. In the Sentinel Surveillance Report, a HIV+/TB coinfection rate of 17.2% was seen in Tigray in 2013/2014, with the highest rate of 34.7% in Addis Ababa (1, 17, 18). Since HIV is a known risk factor for worse treatment outcome, HIV screening should be done in all TB patients. In 2014 the Federal Ministry of Health reported 90.3% of TB patients were
screened for HIV (19). In our study population this was 93.8%, which is higher than the rest of the region. The three health centers performed differently, with the highest success in Semen health center (92.8%) and the lowest in Mekelle health center (85.7%). The reason why this difference exists warrants further research. Possible explanations could be that Mekelle health center is with large catchment area of the Health Centers in Mekelle city. Risk factors for having treatment failure (HIV+, Transferred in, pulmonary positive, older age and being retreated) in our study are the same as those found in other register based studies (10, 11). Interesting finding was that having an unknown HIV status had a higher risk of failure than being HIV+.

In conclusion, findings from this study show good treatment outcome of patients which is in line with Ethiopian national TB program. However, being HIV positive, being transferred in, having pulmonary positive TB, being over 17 years old and being retreated were identified as predictors of unsuccessful treatment outcome. However, efforts should be strengthen in improving the treatment outcome of HIV infected patients, smear negative, extra-pulmonary and retreatment cases.

Limitations

As the study was done based on the exiting records we were not able to identify the risk factors associated with treatment outcomes from patient side.

List Of Abbreviations

ART=Antiretroviral therapy
DOTS=Directly Observed Treatment-Short course
HIV=Human Immunodeficey virus
LTBI=Latent tuberculosis infection
TB=Tuberculosis
WHO=World Health organization
Declarations

Ethics approval and consent to participate

This study was evaluated and approved by the Research Ethics Review Committee (RERC) of College of Health Sciences, Mekelle University. Moreover, letter of cooperation and permission to access TB registration books was obtained from the Tigray Regional Health Bureau and the local offices of the districts. The consent involves permission to disseminate the findings of the study through scientific workshop and publish in reputable journals.

Consent for publications

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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None

Authors’ contribution

IA participated in all phases of the study including writing the proposal, data collection and writing the manuscript. MA participated in the study as advisor and monitoring and evaluation activities. MS participated in the study as advisor and helped with statistics. SN helped with writing the proposal and helped during data collection. All authors will read and approve the final manuscript before publishing.

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