Treatment Outcome of Tuberculosis Patients at Debre Tabor General Hospital, Amhara, Northwest Ethiopia

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ABSTRACT

Background: Tuberculosis is still a global health problem. Especially, in developing countries where overcrowded and lack of awareness for transmission of the disease is existed. According to WHO, to monitor the effectiveness of tuberculosis prevention and control program, assessing tuberculosis outcome is important. Therefore, the aim of this study was to determine treatment outcome of tuberculosis patients in Debre Tabor general hospital, Northwest Ethiopia, 2019.

Materials: A retrospective cross sectional study was carried out among 455 TB cases in Debre Tabor general hospital which was reported between 2016-2018. Data were entered and analyzed using SPSS version 22 software. Binary and multivariable logistic regression was done to identify predictors of TB treatment outcome. Statistical significance was declared at 95%CI.

Result: Out of 455 total TB patients, 357 (78.5), 57 (12.5), 16 (3.5), 4 (0.9), and 21 (4.6) were treatment completed, cured, death, treatment failure, and transfer out, respectively. TB treatment success rate was 89.7%. In this study the odds of TB treatment success rate was found to be higher among the age groups of 15-44 yrs old (AOR=5.49, 95%CI: (1.53-19.70)), being urban dweller (AOR=4.16, 95%CI: (1.89-9.11)), diagnosed TB for the first time (AOR=5.74, 95%CI: (2.17-15.22)). Whereas, those participants who had TB/HIV co-infection were found to be poor TB treatment outcome than the counterpart (AOR=0.22, 95%CI: (0.08-0.60)).

Conclusion: In this study TB treatment success rate was satisfactory. Age groups of 15-44 yrs old, urban dweller, diagnosed TB for the first time, and TB/HIV co-infection were the independent predictors of TB treatment success rate.

Keywords: Tuberculosis; Treatment outcome; Debre tabor general hospital; Ethiopia

Abbreviations: EPTB: Extra Pulmonary Tuberculosis; PTB$^-$: Smear Negative Pulmonary Tuberculosis; PTB$^+$: Smear Positive Pulmonary Tuberculosis;

INTRODUCTION

Tuberculosis/TB is one of the leading causes of death in the world. About one third of the world's population is infected with *M. tuberculosis* (Tubercle bacillus), with 30 million people having active disease. Globally the incidence rate is an estimated of 9.4 million people [1]. High number of new TB cases and death due to TB occur in Asia and Africa [2]. In some of Asian and sub Saharan Africa nations, nearly fifty percent of the HIV-infected population is co-infected with *M. tuberculosis*. Despite the availability of highly effective treatment for decades, Tuberculosis (TB) remains a major global health problem. In 2010, there were an estimated 8.5 million-9.2 million new cases and 1.2 million-1.5 million deaths worldwide. According to the WHO Global TB report 2013, Ethiopia is one of the lists of 22 High Burden Countries (HBCs), and 3rd in Africa, with an

estimated prevalence of all forms of TB in 394 per 100,000 populations [3].

There are strategies to reduce the diseases burden, early detection of the cases and treatment are the main means for controlling and prevention of the cases [4]. WHO introduced the DOTs (Directly Observed Treatment short course) strategy as one of the tools for prevention and control mechanism of TB [5]. The program was introduced in Ethiopia in 1992, Arsi and Bale zones of Oromia region. Currently the program is provided almost in all health institutions.

In Ethiopia, still the prevalence and incidence of tuberculosis is the highest burden even if the expansion of the DOTS (Directly Observed Treatment Short course) program is during the past decades. In Ethiopia, for long time direct microscopy of sputum-smear method is the main means to diagnose TB for both new and follow up cases.

Even though there is a wide coverage of the DOTs program in Ethiopia, still poor TB treatment outcome is a critical national agenda. Therefore, information related to TB treatment outcome is very important for program planners, evaluators and service care givers particularly in the study area. However, there is scarcity of information on TB treatment outcome in the study area. Thus, the aims of this study are to assess treatment outcomes of TB patients in Debre Tabor general hospital, Amhara region, Ethiopia.

MATERIALS AND METHODS

Institutional based retrospective cross-sectional study was conducted in Debre Tabor general hospital TB treatment center. We were reviewed 455 TB patients treatment outcome who had taken their treatment between April 2016-2019.

The reviewed documents were contained basic information such as patient's age, gender, address, TB type, treatment category, residence, and HIV status and treatment outcome. Data were collected by trained nurses by using data sheet. Treatment outcomes and type of TB were defined according to the standard definitions of the Ethiopian National Tuberculosis and Leprosy Control Program guideline (NLCP) adopted from WHO [6]. Patients who were provided with free TB medications for a period of 6 to 8 months by the DOTS center in the hospital and followed up regularly until completion of their treatment were included in the review.

Ethical clearance was obtained from Debre Tabor university, college of health sciences Research Review Committee (RRC). Permissions were obtained from the concerned bodies of the Debre Tabor general hospital [7].

Operational definition

We followed the standard definitions of the National Tuberculosis and Leprosy Control Program (NTLCP), ministry of health, Ethiopia and Ifa, et al. for definitions of treatment out comes.

Cured: Initially smear positive patient who is sputum smear-negative at, or one 'month' prior to, the completion of treatment.

Treatment completed: A patient who completed treatment but for whom smear results are not available at 7th month or one month prior to the completion of treatment.

Treatment failure: A patient who remains or becomes again smear positive at the end of 5 "month" or later during treatment.

Died: A patient who dies for any reason during the course of treatment.

Defaulter: A patient who has been on treatment for at least 4 weeks and whose treatment was interrupted for 8 or more consecutive weeks.

Transfer out: A patient who started treatment and has been transferred to another reporting unit and for whom the treatment outcome is not known at the time of evaluation of treatment results.

Treatment success: The sum of patients who are declared "cured" and those who have "completed" treatment.

Data processing and analysis

The data were entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 20 statistical software. Odds Ratios (OR) and their 95% Confidence Intervals (CI) were estimated using invariable and multivariable logistic regression analysis to identify possible explanatory variables on occurrence of PTB. The result at p-value<0.05 was considered as statistically significant.

RESULTS

Sociodemographic characteristics

In this study we were reviewed 455 TB patients data, among this more than half, 248 (54.5%) of them were male. About 71.6% (326) of the study participants were found between the age group of 15-44 yrs. More than a third, 71.6% (325) of the participants were urban dwellers. The proportion of TB/HIV co-infection was 18.9% (86) (Table 1).

With regard to type of TB; 18.0% (88), 42.2% (192), and 39.8% (181) were infected with smear-positive pulmonary TB (PTB+), smear-negative pulmonary (PTB-), and Extra Pulmonary TB (EPTB), respectively. Majority of, 76.5% (348) them were newly infected TB cases. High proportion of extra pulmonary TB was 51.7% (29/56), 60.0% (27/45), and 64.0% (40/62) in age groups of 45-64 yrs., relapse and transfer in cases, respectively.

Table 1: Type of TB patient by socio demographic characteristics in DTGH (2016-2018).

Characteristics	Total N (%)	Percentage	Type of TB			P value
			PTB⁺N (%)	PTB N (%)	EPTB N (%)	
Gender						
Male	248 (54.5)	54.5	51 (11.2)	104 (22.9)	93 (20.4)	0.262
Female	207 (45.5%)	45.5	31 (6.8)	88 (19.3)	88 (19.3)	
Age						
0-14	42 (9.2)	9.2	4 (0.9)	19 (4.2)	19 (4.2)	<0.001
15-44	326 (71.6)	72.8	74 (16.3)	129 (28.4)	123 (27.0)	
45-64	56 (12.3)	11.2	1 (0.2)	26 (5.7)	29 (6.4)	
>=65	31 (6.8)	6.8	3 (0.7)	18 (4.0)	10 (2.2)	
Residence						
Urban	325 (71.4)	71.4	49 (10.8)	151 (33.2)	125 (27.5)	0.005
Rural	130 (28.6)	28.6	33 (7.3)	41 (9.0)	56 (12.3)	
HIV status						
Positive	86 (18.9)	18.9	36 (7.9)	38 (8.4)	12 (2.6)	<0.001
Negative	369 (81.1)	81.1	46 (10.1)	154 (33.8)	169 (37.1)	
Categories of TB						
New	348 (76.5)	76.5	79 (17.4)	155 (34.1)	114 (25.1)	<0.001
Retreatment	45 (9.9)	9.9	0	18 (4.0)	27 (5.9)	
Transfer in	62 (13.6)	13.6	3 (0.7)	19 (4.2)	40 (8.8)	

Treatment outcomes of TB patients

Table 2 below revealed the summary of treatment outcomes of TB patients who were registered in the study period. Out of 455 total TB patients, 357 (78.5), 57 (12.5), 16 (3.5), 4 (0.9), and 21 (4.6) were treatment completed, cured, death, treatment failure, and transfer out, respectively. Most of 89.7% (408) them were successfully treated and the remaining were not successfully treated. In this study high proportions of TB treatment success rate was 95.0% (310/326), 95.4% (310/325), 94.3% (181/192), 94.5% (329/348) and 93.0% (343/369) in age group between 15-44 yrs, urban dwellers, smear-negative pulmonary TB patients, new treatment categories, and HIV non-reactive patients, respectively. Whereas, poor TB treatment outcome was 61.9% (26/42) and 72.58% (45/62) in age group 0-14 yrs. and transfer in TB patients, respectively.

Table 2: Treatment outcomes of TB patient in DTGH (2016-2018).

Variables	Treatment Outcome					Total (%)	P value
	Cured (%)	T. completed (%)	Died (%)	T. failure (%)	Transfer out (%)		
Gender							
Male	37 (8.1)	183 (40.2)	9 (2.0)	4 (0.9)	15 (3.3)	248 (54.5)	0.044

Female	20 (4.4)	174 (38.2)	7 (1.5)	0	6 (1.3)	207 (45.5)	
Age							
0-14	0	32 (7.0)	4 (0.9)	1 (0.1)	5 (1.1)	42 (9.7)	<0.001
15-44	53 (11.6)	257 (56.5)	7 (1.5)	3 (0.7)	6 (1.3)	326 (71.6)	
45-64	1 (0.2)	45 (9.9)	3 (0.7)	0	7 (1.5)	56 (12.3)	
>=65	3 (0.7)	23 (5.1)	2 (0.4)	0	3 (0.7)	31 (6.8)	
Residence							
Urban	32 (7.0)	278 (61.1)	3 (0.7)	0	12 (2.6)	325 (71.4)	<0.001
Rural	25 (5.5)	79 (17.4)	13 (2.9)	4 (0.9)	9 (2.0)	130 (28.6)	
HIV status							
Positive	26 (5.7)	45 (9.9)	8 (1.8)	2 (0.4)	5 (1.1)	86 (18.9)	<0.001
Negative	31 (6.8)	312 (68.6)	8 (1.8)	2 (0.4)	16 (3.5)	369 (81.1)	
Type of TB							
PTB+	54 (11.9)	22 (4.8)	3 (0.7)	3 (0.7)	0	82 (18.0)	<0.001
PTB-	2 (0.4)	182 (40.0)	7 (1.5)	1 (0.2)	0	192 (42.2)	
EPTB	1 (0.2)	153 (33.6)	6 (1.3)	0	21 (4.6)	181 (39.8)	
Categories of TB							
New	56 (12.3)	274 (60.2)	6 (1.3)	2 (0.4)	10 (2.2)	348 (76.5)	<0.001
Relapse	1 (0.2)	37 (8.1)	6 (1.3)	1 (0.2)	0	45 (9.9)	
Transfer in	0	46 (10.1)	4 (0.9)	1 (0.2)	11 (2.4)	62 (13.6)	

Factors affecting TB treatment success rate in invariable and multivariable logistic regression at DTGH (2016-2018). The multivariable analysis showed that age, residence, TB/HIV co-infection status, and categories of TB were found to be significantly associated with TB treatment success rate at 95% confidence interval in the final model. The odds of TB treatment success rate was found to be 5.49 times higher among the age groups of 15-44 yrs old than the counterparts (AOR=5.49, 95%CI: (1.53-19.70)). Being urban dweller also 4.16 times higher TB treatment success rate than the counterpart (AOR=4.16, 95%CI: (1.89-9.11)). TB/HIV co-infection was also affecting TB treatment success rate. Those participants who had TB/HIV co-infection were found to be poor TB treatment outcome than those who had no HIV co-infection (AOR=0.22, 95%CI: (0.08-0.60)). The odds of TB treatment success rate was 5.74 times higher among participants who were diagnosed TB for the first time (AOR=5.74, 95%CI: (2.17-15.22)) compared with counterparts (Table 3).

Table 3: Multivariable analysis of factors associated with TB treatment success rate in DTGH (2016-2018).

Variables	Treatment success		COR (95%CI)	AOR (95%CI)
	No N (%)	Yes N (%)		
Age				

0-14	16 (3.5)	26 (5.7)	0.31 (0.10-0.97)*	0.64 (0.16-2.64)
15-44	16 (3.5)	310 (68.1)	3.72 (1.26-10.98)*	5.49 (1.53-19.70)**
45-64	10 (2.2)	46 (10.1)	0.88 (0.27-2.86)	1.39 (0.37-5.31)
>=65	5 (1.1)	26 (5.7)	1	1
Residence				
Urban	15 (3.3)	310 (68.1)	6.74 (3.51-12.97)*	4.16 (1.89-9.11)**
Rural	32 (7.0)	98 (21.5)	1	1
HIV status				
Positive	21 (4.6)	65 (14.3)	0.23 (0.12-0.44)*	0.22 (0.08-0.60)**
Negative	26 (5.7)	343 (75.4)	1	1
Type of TB				
PTB+	6 (1.3)	76 (16.7)	1	1
PTB-	11 (2.4)	181 (39.8)	1.29 (0.46-3.63)	1.95 (0.52-7.34)
EPTB	30 (6.6)	151 (33.2)	0.39 (0.16-0.99)*	0.46 (0.12-1.80)
Categories of TB				
New	19 (4.2)	329 (72.3)	6.54 (3.16-13.50)*	5.74 (2.17-15.22)**
Relapse	11 (2.4)	34 (7.5)	1.16 (0.48-2.81)	2.99 (0.89-10.00)
Transfer in	17 (3.7)	45 (9.9)	1	1

Note: * indicates co-infection rate.

DISCUSSION

In this study TB treatment succeeds rate of tuberculosis patients at Debre Tabor general hospital was 409 (89.7%) above 85% target recommended by the WHO for all TB cases. The finding was higher than studies conducted in Nigeria 61.3%, and Ethiopia: Gambella 814 (70.76%), Gondar 1181 (29.5%), Tigray 357 (89%), Dessie and Woldiya 1, 331 (88.1%), and Southern Ethiopia 85.2% [8-13]. This differences might be due to decreased number of transfer out 21 (4.6), treatment failure 4 (0.9), sample size and the setting.

TB treatment failure rate of this study was 0.9% which is lower than the average TB treatment failure rate of the 22 high burden TB countries 16 (3.5%) TB patients were died of during their follow up of TB treatment. The report is supported by other studies in Ethiopia: Gambella 3.7%, and lower than Dessie and Woldiya 123 (8.1%), Nigeria 51 (16.2%), Nigeria 65 (19%). Of the total deaths 7 (1.5%) were under the age group of 15-44 years which is similar in Ethiopia: Gambella 2.51%. This is might be due to the study period, and geographical location.

In ours data review, all TB patients were screened for HIV. Of the total TB patients, 86 (18.9%) were HIV/TB confection which is lower than study done in Ethiopia: Amhara 236 (24.3%), Afar 82 (28.6%), and higher than studies done in Nigeria 10.5%. This high prevalence of HIV/TB co-infection indicates that the public and governmental institutions have to see and revise their program in the study area, increasing public health education specifically for screening for TB and HIV [14-17]. In this study there is a positive association of HIV status and TB treatment out comes. Patients with HIV negative result had successful treatment 343 (75.4%) than HIV positive patients 65 (14.3). This finding is similar with studies conducted in Ethiopia Amhara (HIV- vs. HIV+; 24.6 vs. 22.5, Addis Ababa (93.6% vs. 88.2%, Gondar (68.6% vs. 49.5%), and Debre Markos. This might be increase in drug to drug interaction, and adverse effect, which leads to decreases the adherence of the patients to their TB treatment regimen.

The proportion of patients with successful outcomes was significantly associated with residence (urban vs. rural; 68.1% vs. 21.5%). The finding is supported by other studies conducted in Nigeria (60.9% vs. 76.1%), Ethiopia: Gondar (42% vs. 16.2%),

Bahir Dar (34.3 *vs.* 4.9%), and Debre Markos [18-20]. In contrast with, study done in Ethiopia Arsi (urban *vs.* rural; 84.5 *vs.* 87.5%). However, treatment outcome had no significant association with gender which supports by other studies done in Nigeria and Ethiopia Tigray, and it disagrees with studies done in Ethiopia: Afar, Gondar, and Addis Ababa where strong association exists with female gender [21,22].

On this study the number of smear negative pulmonary tuberculosis cases 42.2% were highest compared to smear positive and extra pulmonary tuberculosis cases and had also a significant association of TB treatment success (39.8%). Other studies have also demonstrated the association of favorable TB treatment success and types of TB. Similar report was seen in Ethiopia Gondar, Debre Markos, and Addis Ababa. In contrast with this, studies done in southern Ethiopia, and Gondar indicated PTB and EPTB patients had significantly lower treatment success rate than PTB[+] patents. This could be due to culturing, for under estimation of smear positive and less treatment success rate, in the study area culturing is not done. Another might be due to high prevalence of TB/HIV co-infection for less detection of smear positive PTB.

The present study showed that Tb patients in the age range of 15-44 and HIV negative individual were independently associated with successful Tb treatment outcomes. This finding is support by other findings in Ethiopia and Nigeria respectively. However, in the age group of above 65 years of age had a greater unsuccessful treatment rate than other age groups. Similar with study done in Ethiopia Addis Ababa.

Multivariable analysis of our data showed that a significance association between the outcome of Tb treatment and new cases. It showed that on the average new cases had a successful outcome than relapse and transfer. In contrast to this other study in Ethiopia Gondar indicated transfer in had greater treatment success than new cases and relapse where as a study done in Ethiopia Debre Berhan showed relapse had greater treatment success than new case and transfer in. This variation might be geographical location, level of awareness and others.

CONCLUSION

In our study the outcomes of TB treatment in the DOTS clinic of Debre Tabor General Hospital showed us age, residence, TB/HIV co-infection status, and categories of TB were found to be significantly associated with TB treatment success rate at 95% confidence interval in the final model. TB/HIV co-infection was also affecting TB treatment success rate. Capacity building of professionals for records and keeping should be increased.

LIMITATION

In medical records during the review process, we didn't get the full information of socio demographic and clinical variable. Ethical clearance was obtained from research committee of Debre Tabor university, college of health science.

COMPETING INTEREST

The authors declare that there is no competing interest among authors

FUNDING

DATA AVAILABILITY

The data used to support the findings of this study are available in corresponding author.

AUTHORS' CONTRIBUTIONS

TA and WT design the study design, data collection, and analysis and interpret and prepared the manuscript. All the authors read and approved the final manuscript.

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