Treatment outcome of tuberculosis patients at Debreabor General Hospital, Amhara, Northwest Ethiopia

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Abstract

Introduction Tuberculosis is still a global health problem. Especially, in developing countries where overcrowded and lack of awareness is existed. According to WHO, to monitor the effectiveness of tuberculosis prevention and control program, assessing tuberculosis outcome is important. The aim of this study was to determine treatment outcome of tuberculosis patients in Debretabor General Hospital, Debretabor, Northwest Ethiopia, 2019. **Materials and methods** A retrospective study was carried out between December 2016 to December 2018 from TB patients attending the health institutions of Debretabor General Hospital. All tuberculosis cases reported between 2016-2018 were reviewed carefully and analyzed. A total of 455 Tb patients were enrolled in this study and data were coded and entered in to the computer for statistical analysis using SPSS version 20 and Epi-info soft wares. **Result and Discussion** Within the study period a total of 455 study participants were required. Tuberculosis type was categorized as 88(18.0%) were smear positive pulmonary tuberculosis, 192(42.2%) were smear negative pulmonary tuberculosis and 181(39.8%) were extra pulmonary tuberculosis. Among the study subjects 86(18.9%) were HIV seropositive. Of the total study subjects, treatment completed (357)78.5%, cured (57)12.%, death (16)3.5%, treatment failure(4)0.9%, transfer out (21)4.6%. Good proportion of TB treatment success rate was in 15-44 yrs 310/326(95.0%) where as poor treatment success rate was in 0-14 years 26/42 (61.9%). Being an urban also has a high treatment success rate310/325(95.4%). 408(89.7%) were successfully treated. **Conclusion** The treatment success rate of tuberculosis patients was satisfactory 89.7%. In the study, treatment of HIV-TB co-infection need a better attention for good treatment outcome.

Background

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*(2). Despite the availability of highly effective treatment for decades, tuberculosis (TB) remains a major global health problem. In 2010, there were an estimated 8.5–9.2 million new cases and 1.2–1.5 million deaths worldwide(2). According to the WHO Global TB report 2013, Ethiopia is one of the list of 22 high burden countries (HBCs), and 3rd in Africa, with an estimated prevalence of all forms of TB in 394 per 100,000 population (2, 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 (5).

Even though there is a wide coverage of the DOTs program and other controlling and prevention programs of TB in the study area, still the information related with the treatment outcomes of Tb patients is little. In this study, we assessed the treatment outcomes of TB patients in Debre Tabor General Hospital, Amhara region, Ethiopia

Materials

Study area

The study was conducted in Debertabor town, Amhara region, Northern Ethiopia. Debre Tabor is the town of south Gondar, located in Northern-west from Addis Ababa (capital city of Ethiopia). The town is 667 km far from Addis Ababa, the capital city of Ethiopia and 100km from Bahirdar. The town has an altitude and longitude of 11°51'N38°1E and 11.850°N 38.017°E with an elevation of 2,706 meters above sea level. The Town has only one public hospital, three health centers, six health posts and three private health facilities. The total projected population of Debre Tabor town is 55,596 of whom 27,644 are men and 27, 952 women for the year 2007 (source central stastical agency).

Study design and data collection

The determinants of treatment outcome were assessed through retrospective cross sectional study designs. A retrospective analysis was conducted on the profile and treatment outcome of all TB patients registered from Dec 2016 to Dec 2018 at all DOTS facilities in the Debertabor General Hospital. The reviewed documents were contained basic information such as patient's age, sex, address, TB type, treatment category, 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).

Operational definition

Extra pulmonary tuberculosis(EPTB)

It refers TB that involves organs other than the lung. e.g. pleura, lymph nodes, abdomen, genitourinary tract, skin, joints, bones and meninges. Diagnosis should be based on at least one specimen with confirmed Mtb or histological or strong clinical evidence consistent with active EPTB, followed by a decision of a clinician to treat with a full course of tuberculosis chemotherapy.

Pulmonary tuberculosis(PTB)

It refers to a case of TB involving the lung parenchyma and can be classified as:-Pulmonary TB, smear positive (SPPTB):SPPTB case is based on the presence of at least one acid fast bacillus (AFB+) in at least one sputum sample in countries with a well-functioning EQA system. In countries without functional EQA, a SPPTB case is defined as one with two or more initial sputum smear examinations positive for AFB, or one sputum smear examination positive for AFB plus radiographic abnormalities consistent with active PTB as determined by a clinician or one sputum smear positive for AFB plus sputum culture-positive for Mtb.

Pulmonary TB, smear-negative(SNPTB):a case of PTB is considered to be smear-negative if at least two sputum specimens at the start of treatment are negative for AFB in countries with a functional EQA system, where the workload is very high and human resources are limited; or decision by a clinician to treat with a full course of anti-TB therapy; and radiographic abnormalities consistent with active PTB and either laboratory or strong clinical evidence of HIV infection or if HIV-negative(or unknown HIV status living in an area of low HIV prevalence), no improvement in response to a course of broad-

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 bivariate and multivariate logistic regression analysis to identify possible explanatory variables on occurrence of PTB. The result at p-value < 0.05 was considered as statistically significant

Ethical Considerations

Ethical clearance was obtained from research committee of Debre Tabor University. Permissions was obtained from the concerned bodies of the Debre Tabor General Hospital

Result

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 15-44yrs. More than a third, 71.6 %(325) of the participants were urban dwellers. The proportion of TB/HIV co-infection were 18.9 %(86) (see 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(see table 1).

Table 1 Type of TB patient by Sociodemographic characteristicsin DTGH (2016-2018).

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 15-44yrs,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 transferin TB patients, respectively (see table 2).

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

Factors affecting TB treatment success rate in bivariable 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 15-44yrs 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 (see table 3).

Discussion

Tuberculosis is still one of the most common public health problem in terms of morbidity and mortality in Ethiopia though governmental and non-governmental institutions try to introduce different ways of strategies to reduces the disease burden (7). Our study found that TB treatment succeeds rate of tuberculosis patients at Debretabor General Hospital was 409(89.7%) above 85% target recommended by the WHO for all TB cases (3).The finding was higher than studies conducted in Nigeria 61.3% (8), and Ethiopia : Gambella 814 (70.76%) (9) , Gondar 1181(29.5%) (10), Tigray 357(89%) (11) , Dessie and woldiya 1,331(88.1%) (12), and southern Ethiopia 85.2%(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 22HBCS (3). 16(3.5%) TB patients were died of during their follow up of TB treatment. The report is supported by other studies Ethiopia: Gambella 3.7% (9), and lower than Dessie and Woldiya 123(8.1%) (

12), Nigeria 51(16.2%) (8) , Nigeria 65(19%) (14). Of the total deaths 7(1.5%) were under the age group of 15-44 year which is similar in Ethiopia : Gambella 2.51% (9). This might be due to the study period, and geographical location.

In our data review, all TB patients were screened for HIV. Of the total TB patients, 86(18.9%) were HIV/TB co-infection which is lower than study done in Ethiopia: Amhara 236 (24.3%) (15), Afar 82(28.6%) (16), and higher than studies done in Nigeria 10.5%(17) , Ethiopia 11.4% (18). 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. In this study there is a positive association of HIV status and TB treatment outcomes. 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(19), Addis Ababa (93.6% vs. 88.2% (20), Gondar (68.6%vs. 49.5%) (21), and Debre Markos (22). 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 v rural; 68.1% vs 21.5%). The finding is supported by other studies conducted in Nigeria (60.9% vs 76.1%)(14), Ethiopia: Gondar (42% vs 16.2%)(10), Bahir Dar (34.3 vs 4.9%) (19), and Debre Markos (22). In contrast with, study done in Ethiopia Arsi (urban vs rural ; 84.5 vs 87.5%) (23). However, Treatment outcome had no significant association with gender which supports by other studies done in Nigeria (24) and Ethiopia Tigray (11) , and it disagrees with studies done in Ethiopia : Afar (25), Gondar (10), and Addis Ababa(20) where strong association exists with female gender.

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(10), Debre Markos (22), and Addis Ababa (20) . In contrast with this, studies done in southern Ethiopia (13), and Gondar (21) indicated PTB- and EPTB patients had significantly lower treatment success rate than PTB+ patients. 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 (26, 27) 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 (20).

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 ([21](#)) indicated transfer in had greater treatment success than new cases and relapse where as a study done in Ethiopia Debreberhan ([28](#)) showed relapse had greater treatment success than new case and transfer in. This variation might be geographical location, level of awareness and others.

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

Limitations

In medical records during the review process, we didn't get the full information of sociodemographic and clinical variable.

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.

List Of Abbreviations

EPTB Extra Pulmonary Tuberculosis

PTB- Smear Negative Pulmonary Tuberculosis

PTB+ Smear Positive Pulmonary Tuberculosis

Declarations

Ethical approval and consent for participants

Ethical clearance was obtained from research committee of Debre Tabor University, College of Health Science.

Consent for publication

Not applicable

Competing interest

The authors declare that there is no competing interest among authors

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The authors declare that they didn't receive fund from any source

Authors' contributions

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

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Tables

Table 1Type of TB patient by Sociodemographic characteristicsin DTGH (2016-2018).

Characteristics	Total N (%)	Percentage	Type of TB			P value
			PTB+ N (%)	PTB- N (%)	EPTB N (%)	
Sex						
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						<0.001
Retreatment	348(76.5)	76.5	79(17.4)	155(34.1)	114(25.1)	
Transfer in	45(9.9)	9.9	0	18(4.0)	27(5.9)	
	62(13.6)	13.6	3(0.7)	19(4.2)	40(8.8)	

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 (%)		
Sex							
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)	

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