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# Trends and Treatment Outcomes of Tuberculosis in Debre Berhan Referral Hospital, Debre Drehan, Ethiopia

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## To cite this article:

Tsegahun Asfaw, Moges Lewetegn, Helen Tariku. Trends and Treatment Outcomes of Tuberculosis in Debre Berhan Referral Hospital, Debre Drehan, Ethiopia. *Clinical Medicine Research*. Vol. 7, No. 5, 2018, pp. 97-102. doi: 10.11648/j.cmcr.20180705.11

**Received:** August 27, 2018; **Accepted:** September 10, 2018; **Published:** October 24, 2018

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**Abstract:** Tuberculosis (TB) remains major Public health problem and among the top ten leading causes of human deaths worldwide. Moreover, TB is the leading cause of morbidity, one of the three major causes for hospital admission, and the second killer next to malaria in Ethiopia. Early diagnosis, effective treatment and continues assessment of treatment outcome are important to improve TB management program. Retrospective study design was conducted to assess trend and treatment outcomes of TB in Debre Berhan referral hospital. 4 years (2014 to 2017) TB case records was reviewed with standard check list and entered in to EpiData 3.1 and analyzed using SPSS version 16. Among the total registered TB patients with complete record (n=506), 256(50.6%) were males and 250(49.4%) Female. The treatment cured rate varies from 23.29% in 2006 E.C to 47.45% in 2007 E.C, whereas treatment completed varies from 46.91% in 2007 E.C to 67.08% in 2009 E.C. Majority of the smear-positive pulmonary tuberculosis patients 183 (97.3%) were cured at the end of their anti-TB treatment. The proportion of HIV co-infection among TB patients was 21.3%. However, overall cure rate was nearly the same in both HIV positive and negative patients. As conclusion majority of the smear-positive pulmonary tuberculosis patients were cured at the end of their anti-TB treatment. There was also a continuous increment of treatment success rate, indicating that the hospital is within the track of WHO target currently. However the proportion of HIV co-infection among TB patients was higher which signifies the urgent need for staff capacity building and increasing public awareness.

**Keywords:** Trends, Treatment Outcomes, Tuberculosis

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## 1. Background

Tuberculosis [TB] remains major Public health problem and among the top ten leading causes of human deaths worldwide. In 2015, alone 9.6 million new cases and 1.5 million deaths were reported globally. Under resourced areas, prevalence were high particularly in south East Asian and western pacific regions with proportion of 58% share from total global estimate of new TB cases; and Africa continent were home for 28% of the global new TB cases, including the most sever Burdon of TB with 281 cases for every 1000,000 people, which is more than double the global average of 133 cases per 100,000 populations [1].

TB prevalence and incidence reduced substantially globally after implementation of DOTS program. In Ethiopia, Even if case detection rate improved from the base line 30 to

71.8 in 2006/07, TB treatment success rate improved from the base line 85 to 90.6 and TB cure rate from the baseline 69.0% in 2006/07 to 91 in 2013, and reduce the mortality rate by 50 % [2]. The country Still ranks second in Africa after Nigeria and seventh among the world's 22 high TB burden countries with estimated TB prevalence rate of 227/1000000 population , 18 TB deaths and with an estimated incidence rate of 224 per 100,000 populations respectively [3]. More over the country ranked 15th with more than 5000 estimated MDR-TB patients each year among 27 high MDR-TB countries [4].

Several reasons and risk factors for poor TB treatment outcomes have been reported. High age, low income, no or limited access to transport, distance from home to the

treatment center, incomplete treatment compliance, limited interest in information about the disease and its treatment, limited social support, multidrug resistance, and comorbidity have all been found to be related to unsuccessful treatment outcomes [5]. Therefore, this study is designed to assess trend of TB and treatment outcomes in Debre Berhan referral hospital.

## 2. Material and Methods

### 2.1. Study Area and Period

This study was conducted from Jan 2014- Jan 2018 in Debre Berhan referral hospital which is 130kms from Addis Ababa.

### 2.2. Study Design

Retrospective study design was conducted.

### 2.3. Sample Size

All patients presumptive for TB (pulmonary or extra - pulmonary) and who had full documentation during the study period were included but Patients who had incomplete data, e.g., age, sex Gene-X-pert results were excluded from the study. Between January 2014 and January 2018, a total of 537 tuberculosis patients were registered. Of these, 506 (94.22%) tuberculosis cases had complete records.

### 2.4. Operational Definitions

Extra pulmonary tuberculosis (EPTB): a case of TB that involves organs other than the lung e.g. pleura, lymph nodes, abdomen, genitourinary tract, skin, joints, bones and meninges.

Pulmonary tuberculosis (PTB): a case of TB involving the lung parenchyma.

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.

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.

Cured: defined as patients whose sputum smear or culture was positive at the beginning of the treatment but smear or culture negative in the last month of treatment and on at least one previous occasion.

Treatment completed: interpreted as patients who

completed treatment without evidence of failure but did not have a negative sputum smear or culture result in the last month of treatment and on at least one previous occasion.

Treatment defaulter: defined as was a patient who had been on treatment for at least four weeks and whose treatment was interrupted for eight or more consecutive weeks.

Treatment failure: defined as patients whose sputum smear or culture was positive at the fifth month or later during treatment.

Transfer out: defined as a patient who had been transferred to another recording and reporting unit and whose treatment outcome was unknown at the original registering unit.

### 2.5. Data Collection

Structured checklist was used to collect demographic data and clinical information from TB registration book with trained data collectors.

### 2.6. Data Processing and Analysis

The data was collected from registration book with trained person with standard check list. Cleaning and analyses was done using EpiData 3.1 and SPSS software version 21. A double data entry was implemented to avoid data entry errors. Together with demographic and socio economic factors was tabulated in to frequency table to see possibility of risk association with the dependent outcome variable. Univariate or multivariate analysis was used. OR within 95% C.I. and P-Value Less than 0.05 was considered as significant association.

### 2.7. Ethical Considerations

An ethical approval was obtained from Debre Berhan University ethical review and research committee. Permission was obtained from administration of Debre Berhan referral hospital, where the study was carried out.

## 3. Result

### 3.1. Socio-Demographic Characteristics

Among the total registered TB patients with complete record (n=506), 256(50.6%) were males and 250(49.4%) Female. The median age of patients was 30 years, six in ten of the study participants were children aged less than 15 years; near to seven in ten were adults with ages ranging from 15 to 44 years; Three in ten (33.4%) were smear positive PTB, nearly three fifth (54.9%) were smear negative PTB and the rest were EPTB patients. 473(93.7%) were new, 25 (4.9%) were relapse, retreatment was 2(0.4%), treatment failure was 2(0.4%) and other cases were 3(0.6%). Eight in ten 78.7 % (398) were HIV negative and 2 in ten which is 21.3% (108) were HIV positive (Table 1).

**Table 1.** Socio-demographic and disease related characteristics of registered TB patients (n=506) in Debre Berhan referral Hospital.

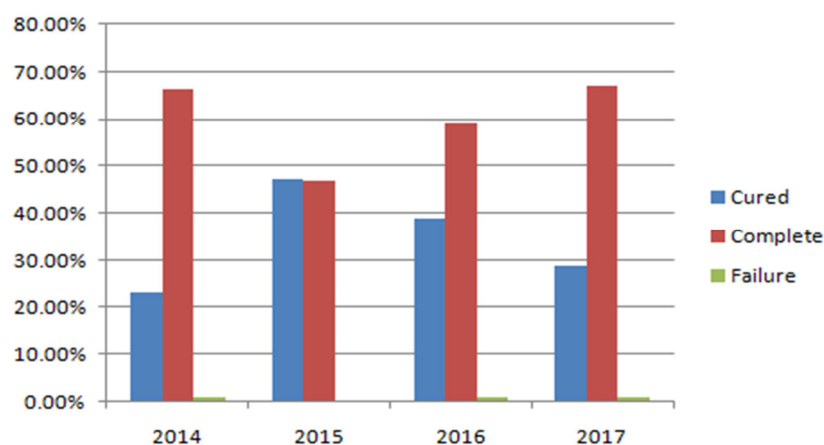
Variables	Category	Frequency	Percent
SEX	Male	256	50.6
	Female	250	49.4
Age	<14	30	5.9
	15-24	123	24.3
	25-34	159	31.4
	35-44	74	14.6
	45-54	57	11.3
	55-65	35	6.9
	>65	28	5.5
Gene Xpert	MTB detected, Rifampicin resistance not detected	41	8.1
	MTB detected, Rifampicin resistance detected	3	0.6
	MTB detected Rifampicin resistance indeterminate	1	0.2
	MTB not detected	13	2.6
	not done	448	88.5
Category	New	474	93.7
	Relapse	25	4.9
	Rx after failure	2	0.4
	Rx after loss to follow up	2	0.4
	transferred out	2	0.4
	Other	1	0.2
TB type	SPPTB	188	37.2
	SNPTB	255	50.4
	EPTB	63	12.5
HIV status	Positive	108	21.3
	Negative	398	78.7

**Table 2.** Registered patients in sex and smear result in DBRH.

		Smear result			Total
		Positive	negative	not done	
SEX	Male	89(34.80%)	143(55.9%)	24(9.4%)	256
	Female	80(32.0%)	135(54.0%)	35(14.0%)	250

### 3.2. Trend of TB in Deber Berhan Referral Hospital from 2014-2017

The treatment cured rate varies from 23.29% in 2006 E.C to 47.45% in 2007 E.C, whereas treatment completed varies from 46.91% in 2007 E.C to 67.08% in 2009 E.C (figure 1).

**Figure 1.** Trend of treatment outcome of TB patients in DBRH, 2014-2017.

### 3.3. Treatment Outcomes

From the total of 506 registered tuberculosis patients included in the study, 480 (94.9%) had successful treatment outcome (favorable treatment outcome). Of these, 172 (34%)

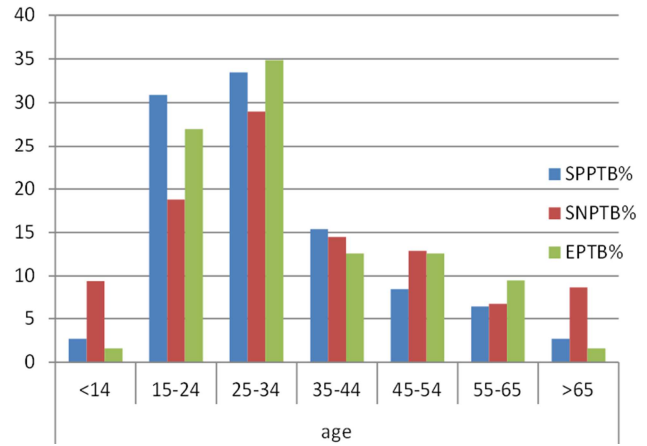
and 308 (60.9%) patients were cured and treatment completed, respectively. Similarly 10 (2%), 2 (0.4%), 9 (1.8%) and 4 (0.8%) were transferred out, defaulted, dead and treatment failed, respectively (able 3).

**Table 3.** Treatment outcomes of all TB patients in DBRH.

		Frequency	Percent %
Treatment out come	Cured	172	34
	Rx completed	308	60.9
	Failure	4	0.8
	Death	9	1.8
	Loss	1	0.2
	transferred out	10	2
	not evaluated	1	0.2
	MDR TB	1	0.2

**3.4. Distribution of Age with TB Type**

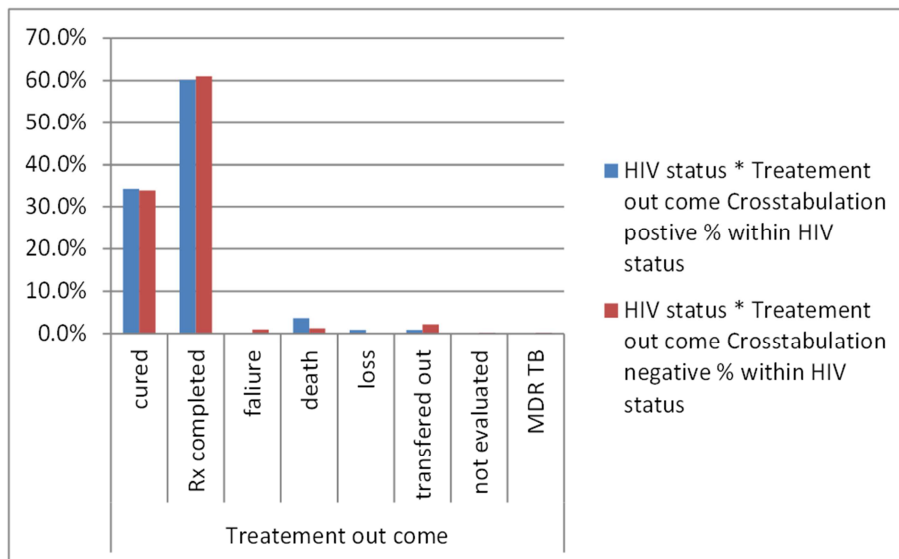
Among TB patients with full record, aged 25-34 had high percentage (33.5%) of SPPTB, and EPTB (34.9%). Low percentage of SPPTB (2.7%) and EPTB (1.6%) were in patients with age group of <14 and > 65. Elevated and decreased percent of SNTB were exhibited in age groups of 25-34 (29%) and 55-65 (6.7%) respectively (figure 2).



**Figure 2.** TB type in percentage with age categories in DBRH.

**3.5. Outcomes of Treatment in HIV Patients**

Overall cure rate was nearly the same in both HIV positive and negative patients. Death rate was higher in positive HIV patients than negatives. Treatment completed & failure rate are almost comparable (figure 3).



**Figure 3.** Treatment outcomes with HIV patients in DBRH.

Among male participants 240 (93.8%) were showed favorable treatment outcomes and 16 (6.2%) showed unfavorable treatment outcomes while female showed 240

(96%) favorable outcomes. From participants that undergo GeneXpert test 40 (97.6%) showed favorable treatment outcomes (Table 4).

**Table 4.** Distribution of treatment outcomes of registered TB patients (n=506) by socio-demographic and disease characteristics in Debre Berhan Hospital.

Variable	Categories	Treatment outcome		Total
		Favorable outcome N (%)	Unfavorable outcome N (%)	
Sex	Male	240(93.8)	16(6.2)	256
	Female	240(96)	10(4)	250
Age	0-14	30(100)	0(0%)	30
	15-24	118(95.9)	5(4.1)	123
	25-34	154(96.8)	5(3.2)	159
	35-44	72(97.3)	2(2.7)	74
	45-54	49(86)	8(14)	57
	55-65	33(94.3)	2(5.7)	35
	>65	24(85.7)	4(14.3)	28
Gene Xpert	MTB detected, Rifampicin resistance not detected	40(97.6)	1(2.4)	41

Variable	Categories	Treatment outcome		Total
		Favorable outcome N (%)	Unfavorable outcome N (%)	
Category	MTB detected, Rifampicin resistance detected	3(100)	0(0)	3
	MTB detected, Rifampicin Resistance indeterminate	1(100)	0(0)	1
	MTB not Detected	13(100)	0(0)	13
	Not done	423(94.4)	25(5.6)	448
	New	451(95.2)	23(4.8)	474
	Relapse	24(96)	1(4)	25
	Rx failure	2(100)	0(0)	2
	Rx after loss to follow up	1(50)	1(50)	2
	Transferred out	2(100)	0(0)	2
	Other	0(0)	1(100)	1
TB type	SPPTB	183(97.3)	5(2.7)	188
	SNPTB	237(92.9)	18(7.1)	255
	EPTB	60(95.3)	3(4.7)	63
HIV status	Positive	102(94.5)	6(5.5)	108
	Negative	378(95)	20(5)	398

## 4. Discussion

Among 506 TB patients registered in DOTS clinic in the DebreBerhan referral hospital, almost half of the patients are smear negative pulmonary tuberculosis 255 (50.4%); where as two out of five patients (37.2%) are smear positive pulmonary tuberculosis and the remaining are extra pulmonary TB 63(12.5%). Majority of the smear-positive pulmonary tuberculosis patients 183 (97.3%) were cured at the end of their anti-TB treatment. It is comparable with reports from study done at Tigray region, Ethiopia (85.5%) [6]

The high proportion of SPPTB observed among male TB patients in this study was consistent with the study conducted in Gambella regional hospital [7] and the epidemiological analysis of TB trends in Ethiopia [8], in which men are disproportionately affected by TB.

According to this study, there was a continuous increment of treatment success rate from the end of 2014 to 2017. The treatment success rate between 2014 and 2017 was 89.7%, 94.4%, 98.0%, 96.1% in respective years and overall was 94.9%, which is better than the WHO international target of 87% [9]. This might be a clue indicating that the hospital is within the track of WHO target currently.

The majority of TB patients, 480 (94.9%), had successful treatment outcome (cured + treatment completed) in comparison with other hospitals like Gondar University Hospital (29.5%) [10] Felege Hiwot Referral Hospital (26%) [11], Gambo Rural Hospital (66.9%) [12]. It also improved from the past 5 years prior to study period which was 79.4%. The present study showed successful treatment outcome (94.9%) which met the target (90%) set in the Global Plan to stop TB by 2015 [13]. The average cure rate of tuberculosis was 34%, almost similar with a study done in Gambella, Ethiopia (30.7%) [14]. This shows the hospital is doing well in comparison.

The average treatment completed rate was 60.9% in this study, which was in agreement with 64.6% according to study done in Addis Ababa, Ethiopia [15]. However, it was higher than 9.5% in Gondar Hospital, Northwest Ethiopia [10], and 25% in Gambella, Ethiopia [7]. The default rate in this study 1(0.2%) was also lower than the average 6.2%

observed among other studies conducted in the country; 22.9%, 18.3% and 2.5% in Gambella, Gondar and Felege Hiwot hospitals, respectively [7, 10, 11]. This lower defaulter rate in this study might be due to proper supervision and health education in the study area.

The TB treatment failure rate of this study was 4(0.8%), which was lower than the average TB treatment failure rates that ranged from 0.2% to 18.6%; reported from the different parts of Ethiopia [10, 16]. In addition, 1.8% of the TB patients died between 2014 and 2017, which was relatively consistent with an average of 3.7% in Addis Ababa, Ethiopia [15]. However it was lower than 10.1% in Gondar Hospital, Northwest Ethiopia [16].

In this study, the proportion of HIV co-infection among TB patients was 21.3%; nearly similar to the studies conducted in Nigeria (20.0%) [17]. However, this finding is lower than that of study conducted in Northwest Ethiopia (25%) [10], and higher than that of 2013 WHO report for Ethiopia (9.6%). This high prevalence of HIV co-infection among TB patients in the study area signifies the urgent need for staff Capacity building and increasing public awareness.

## 5. Conclusion and Recommendation

In this study, majority of the smear-positive pulmonary tuberculosis patients 183 (97.3%) were cured at the end of their anti-TB treatment. There was a continuous increment of treatment success rate from the end of 2014 to 2017 in the hospital. The treatment success rate in the year 2014-2017 was 94.9%, indicating that the hospital is within the track of WHO target currently. The proportion of HIV co-infection among TB patients was 21.3%, which is higher than that of 2013 WHO report for Ethiopia (9.6%). This high prevalence of HIV co-infection among TB patients in the study area signifies the urgent need for staff Capacity building and increasing public awareness. And also TB prevention and control should be strengthened, data record keeping system, including patient information should be improved.

## Conflicting of Interests

The authors declare that they have no conflict of interests.

## Funding

This research is funded by Debre Berhan University

## Authors' Contributions

TA and HT – Collect and analyzed the data. TA – Analyze the data and wrote the manuscript. All authors read and approved the final manuscript.

## Acknowledgements

We would like to thank Debre Berhan University for giving this opportunity. We also thank laboratory and nurse staffs of Debre Berhan referral hospital for their help during data collection process.

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