



TREATMENT OUTCOME AND ITS ASSOCIATED FACTORS AMONG TUBERCULOSIS PATIENTS UNDER DOTS IN WEST ARSI ZONE, ETHIOPIA

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BACKGROUND

Despite the availability of effective drugs, tuberculosis remains a major public health problem in the world. World health organization developed the Directly Observation Treatment Short Course with specific targets of 84% case detection rate and 87% treatment success rate. Monitoring the treatment outcomes of tuberculosis and determining the specific factors associated with treatment outcome are essential to evaluate the effectiveness of tuberculosis control program. **Objectives:** This study aimed to assess treatment outcomes and factors associated with treatment outcomes among TB patients in west Arsi zone. **Method:** A retrospective institutional based cross sectional study design was used to assess the treatment outcome and associated factors of tuberculosis among patients registered from July 2013 to June 2018 in West Arsi zone. A total of 1912 patient's data were collected from randomly selected hospitals and health centers at West Arsi using abstraction checklist purposively designed for this study. Bivariate and multivariate analysis was used to determine predictors of successful treatment outcomes. Odds ratio and 95% confidence intervals were calculated. P value less than 0.05 were considered as statistically significant. **Result:** - Among 1912 study participants, 927(48.5%) were female and 818(42.8%) were from rural area. The overall treatment success rate was 1749 (91.5%), while 163(8.5%) had unsuccessful tuberculosis treatment outcome. In the final multi variable logistic regression model, being male (AOR = 0.59, 95%CI: 0.40-0.89), relapse (AOR=0.12, 95%CI: 0.05-0.29), age group greater than 44 years old (AOR=0.276, 95%CI: 0.14-0.556) and human immunodeficiency virus co-infected (AOR=0.036, 0.02-0.057) were significantly associated with treatment outcome. **Conclusion and Recommendation-** The treatment success rate was 91.5% and meets WHO standard. Factors such as being HIV positive, male, retreated patients and age greater than 44 years old were significantly associated with TB treatment outcome. Therefore, to sustain this success rate, early diagnosis, effective management and follow up should be done for HIV co-infected and retreated patients under directly observed short course treatment.

KEY: Tuberculosis, Treatment outcome, West Arsi.

BACKGROUND

Tuberculosis (TB) is an infectious disease caused by the bacillus *Mycobacterium tuberculosis* (MTB).^[1] Globally, there were an estimated 10.4 million new TB cases and 1.4 million deaths from the disease in 2015. Among 10.4 million new cases, 60% was accounted by six countries from Asia and Africa.^[2] Study showed that among 15 countries with the highest estimated TB incidence rates, twelve were in Africa.^[3] TB continues to be a major public health problem in Ethiopia, rank eight among the 22 TB high-burden countries.^[4]

The increasing trends of tuberculosis raised the creation of directly observed treatment short course (DOTS) in the mid-1990s. The specific targets of DOTS were

achievements of 84% case detection rate (CDR) and 87% treatment success rate (TSR) by 2015.^[5] Ethiopia has started the DOTS services in Oromia region as a pilot in 1992 and scaled up in 2010 to the entire regions. The implementation of DOTS in the country increased the rate of successful treatment outcome.^[6] Moreover, the mortality was reduced to 92 per 100,000 and sputum smear-positive rate to 163 per 100,000 populations. The cure rate and TSR was 81.6% and 92.5% respectively.^[7] However, TB control strategies were influenced by human immunodeficiency virus (HIV) co-infection with TB, and multidrug resistance TB.^[8,9]

Though the DOTS strategy was implemented to enhance patient adherence to treatment, there were still reported

cases of default, treatment interruption and low TSR. There were also variation in rates of TSR across the geographical area and institutions due to sociodemographic and economic factors. For example tuberculosis treatment success rate was 65% and 84% in East showa and Mekele respectively.^[10,11] Furthermore, report from Gambo hospital, West Arsi zone also indicated around 13.9% of patients on DOTs services were defaulted their treatment.^[12]

Even though several studies were carried out in health institutions, majority of reports contradicted with Federal Ministry of Health (FMOH) reports. Majority of studies were conducted at hospitals where patients prefer to diagnosed and transferred to health centers and health posts for treatment. Therefore, study that included health facilities where majority of patients take their treatment is needed for guideline modification and to increase efforts in reducing the increase of MDR-TB. Thus, this study aimed to assess treatment outcome and its associated factors among tuberculosis patients on DOTs in West Arsi Zone.

METHOD AND MATERIAL

Study design, period and population

Institutional based cross sectional study design was conducted. The source population was all patients who had tuberculosis treatment outcome in West Arsi zone from July 2013 to June 2018.

Study Area

This study was conducted in West Arsi zone, which is 252 km far from Addis Ababa. The zone comprises of 12 woreda and two town administration with an area of 540 sq. km. According to 2017 Zonal report, the total population of this zone was 4,980,001. The health institutions in the zone comprise of 7 hospitals and 70 health centers. In hospitals and health centers a DOTs clinic operates under the National Tuberculosis and Leprosy Control Program (NTLCP) of Ethiopia. Chest radiograph and clinical investigations are also used to support the diagnosis. Patients diagnosed with tuberculosis are referred to the DOTs clinic where they are registered and treated according to the NTLCP.

Inclusion criteria

-All TB cases having complete data on registration log book.

Exclusion criteria

-Patients who have incomplete information on register and transferred to other facilities.

Sample size and sampling technique

The sample size was calculated by using single population proportion formula ($n = \frac{[(Z\alpha/2)^2 * P(1-P)]}{d^2}$). The study assumed 95% confidence level of $Z_{\alpha/2} = 1.96$, 5% margin of error, and proportion of 84.9% from a study done in Asella Hospital Since there

were no recent study conducted in that zone.^[13] The calculated sample size was 217. However, after calculating sample size for associated factor assessment the final was 1912. Since it's the largest sample size which can accommodate both specific objectives, the final minimum sample size was 1912 records of TB patients. Simple random sampling method was used to select 15 health facilities. Then sample needed was proportionally distributed based on the number of patients treated in that facility. Finally, systematic random sampling method was used to select study participants from each health facilities.

Variables in the study and operational definition

The dependent variable was treatment outcome of patient under treatment defined in line with the Ethiopian TB and leprosy treatment guidelines definitions of TB cases.^[14] The final treatment outcome patients under DOTs were cured, treatment completed, defaulted/ loss to follow up, failed and died. The treatment outcome was considered as successful when patients were cured or completed treatments. On the other hand, unsuccessful treatments were those defaulted, failed and died at end of treatment completion. The independent factors considered to influence treatment outcome were socio demographic factors (Age, Residence, Gender and base line weight), co-morbidity factors (TB/HIV co infection), tuberculosis type and category of patient (New case, retreatment case, transfer in and others).

Data collection method and quality assurance

Data was obtained from medical records of patients treated for TB from July 2013 to June 2018. The data on the tuberculosis treatment log book include socio demographic characteristics of patients, HIV status, year of treatment, type of TB, categories of patients and treatment outcome of the patients. Data was collected by trained nurses after giving two day training on data collection formats and techniques of data collection. Data comprising all the study variables have retrieved from the TB registration and entered into a data abstraction sheet purposely designed for this study. The supervisor supervised every activity of data collectors and filled formats every day. At the end of each day, the data collected was checked by the principal investigator for completeness and consistency. The treatment log books from which data were retrieved were kept safely in separately until information was retrieved.

Data processing and analysis

Data were entered in to Epi.info 7 and then exported to Statistical Package for the Social Sciences (SPSS) window version 25 for further cleaning, coding and analysis. A descriptive statistical method was used to generate frequencies for categorical variables, to summarize and present frequencies of socio-demographic characteristics of the study participants using text, tables, and graphs. Bivariate logistic regression was used to analyze the association between treatment outcome and potential predictor variables.

Then independent variables with P value less than 0.25 were considered as candidate for multivariate analysis. Forward multiple logistic regression analysis was used to adjust for potential confounding factor. P value <0.05 was considered as statistically significant for all independent variables in the models.

Ethical consideration

This study was conducted in accordance with the research ethics of the Arsi University. Ethical clearance was obtained from the institutional ethical review board of the Arsi University. Letter of support was taken from Department of public health. The consent to collect

patient's data from logbook was obtained from health facilities administrations.

RESULT

TB patients' Sociodemographic characteristics

A total of 1912 TB patients record were analyzed in this study, 818 (42.8%) came from rural areas. Among study participants, 985 (51.5%) were males and 927 (48.5%) were females. The mean age of the respondents was 27.3 (Standard deviation (SD) $\pm$ 13.14) year. Majority of the patients were in the age group 15-24 (32.6%). In this study, the mean average baseline weight at the beginning of intensive phase was 45.07 (SD $\pm$ 13.95) kg (Table 1).

Table 1: Socio demographic of study participants on DOTS at West Arsi zone in 2018.

Variable	Categories	Frequency (%)
Sex	male	985(51.5)
	female	927(48.5)
Age category	0-14 years	274(14.3)
	15-24 years	623(32.6)
	25-34 years	542(28.4)
	35-44 years	241(12.6)
	Greater than 44 years	232(12.1)
Mean age	Mean $\pm$ SD	27.3 $\pm$ 13.14
Residence	Rural	818(42.8)
	Urban	1094(57.2)
Weight	0-7.9kg	32(1.7)
	8-14.9kg	69(3.6)
	15-19.9kg	41(2.1)
	20-29.9kg	122(6.4)
	30-39.9kg	186(9.7)
	40-54.9kg	1012(52.9)
	55-69.9kg	425(22.2)
	$\geq$ 70kg	25(1.3)
Mean weight	Mean $\pm$ SD	45.07 $\pm$ 13.95

The TB patients' clinical characteristics

Out of 1912 TB cases, 936 (49%) were SNPTB, 599 (31.3%) were SPPTB and 377 (19.7%) were EPTB. Out of all TB cases, 1840 (96.2%) of the patients were new patients meanwhile 72(3.8%) were either relapse,

transferred in, or treatment failure (others). Regarding the SPPTB patients sputum smear result conversion, 536(89.5%), 562(93.8%) and 536(89.5%) of them showed negative bacteriology result at the end of first, second and third follow up respectively (Table 2).

Table 2: TB patient's clinical characteristics on DOTS at West Arsi zone in 2018.

Clinical characteristics	Categories			Frequency (%)
HIV result	negative			1784(93.3)
	positive			128(6.7)
Type of TB	PTB			599(31.3)
	P/Negative			936(49)
	EPTB			377(19.7)
Category of patients	New			1840(96.23)
	Retreatment			35(1.83)
	Other			37(1.94)
follow up result	Term of follow up			
	1 st follow up	2 nd follow up	3 rd follow up	
Negative	536(89.5%)	562(93.8%)	536(89.5%)	
Positive	46(7.7%)	16(2.7%)	7(1.2%)	
Not done	17(2.8%)	21(3.5%)	56(9.3%)	

Tuberculosis treatment outcomes

Among 1912 patients who participated in the study, 534(27.9%) were cured, 1215 (63.6%) were treatment completed, 114(5.96%) were died, 7(0.37%) were treatment failure and 42 (2.2%) were loss to follow up.

Patient characteristics and treatment outcomes

A total of 1749 (91.5%) patients had a successful treatment outcome, whereas 163(8.5%) had an unsuccessful treatment outcome. From the total of 163 unsuccessful treated patients, 65(6.59%) deaths occurred in males and 49(5.28%) in females. The highest proportion of death 36(15.52%) was among patients greater than 44 years, and 35-44 years age group

35(14.52%) respectively while other age groups have less than 5% death. The default rate was higher for rural residents 20(2.5%), while there were fewer defaulters from urban residents 21(2.09%).

TB patients co-infected with HIV had lower successfully treated rate of 95.3 vs 38.3% when compared with HIV-negative patients. The proportion of loss to follow up was higher in patients co-infected with HIV 21(16.41%), whereas 52(40.63%) deaths were occurred in HIV positive patients. The SNPTB patients had the highest proportion of unsuccessful treatment outcome 86(9.2%) of which 60(6.41%) and 23(2.46%) were died and loss to follow up respectively (table 4).

Table 3:-Treatment outcome of TB patient by sex, HIV result, age group, residence, category of patient, year of treatment and type of TB at West Arsi zone in 2018.

Variable	Categories	Treatment outcome				
		Cured	Completed	Died	Failure	Defaulted
Sex	Male	243(24.7)	640(64.96)	65(6.59%)	7(0.71%)	30(3.05%)
	Female	294(31.7)	572(61.72)	49(5.28%)	1(0.11%)	11(1.19%)
HIV result	Negative	521(29.2)	1179(66.1)	62(3.48%)	2(0.11%)	20(1.11%)
	Positive	16(12.5)	33(25.7)	52(40.62)	6(4.69%)	21(16.40%)
Age category	0-14 years	33(12)	228(83.2)	12(4.4%)	0	1(0.4%)
	15-24 years	201(32.3)	394(63.2)	19(3.1%)	2(0.3%)	7(1.10%)
	25-34 years	197(36.4)	322(59.4)	12(2.21%)	1(0.18%)	10(1.81%)
	35-44 years	62(25.7)	134(55.6)	35(14.53%)	1(0.43%)	9(3.74%)
	> 44 years	44(18.97)	134(57.8)	36(15.52%)	4(1.7%)	14(6.04%)
Type of TB	SPPTB	533(88.98)	13(2.2)	35(5.84%)	5(0.83%)	13(2.17%)
	SNPTB	-	850(90.8)	60(6.41%)	3(0.32%)	23(2.46%)
	EPTB	-	353(93.6)	19(5.04%)	0	5(1.33%)
Category of patients	New	519(28.1)	1178(64)	102(5.51%)	7(0.38%)	37(2.01%)
	Relapse	11(31.4)	9(25.7)	12(34.39%)	0	3(8.51%)
	Other	10(27)	25(67.6)	0	0	2(5.4%)
Residence	Rural	216(26.4)	521(63.7)	60(7.3%)	1(0.10)	20(2.5%)
	Urban	318(29)	694(63.4)	54(4.90)	7(0.61)	21(2.09%)

Trends of treatment outcome

The proportion of TB treatment outcome during our study period was smoothly improved from 2013 to 2018. The treatment complete rate was slightly increased from 63.6% in July 2013-June 2014 to 64.9% in July 2017-

June 2018. In the case of treatment failure there was an increase from July 2013-June 2014 to July 2015-June 2016 year, but it decreased from 0.8% to 0.5% afterward (Table 5).

Table 4:-Trends of TB treatment outcome among patients on DOTS in West Arsi zone in 2018.

year of treatment	Cured	Completed	Died	Failed	Defaulted
July 2013-June 2014	91(26.7%)	217(63.6%)	23(6.8%)	0	10(2.9%)
July 2014-June 2015	125(28.7%)	278(63.8%)	25(5.7%)	0	8(1.8%)
July 2015-June 2016	99(25.5%)	253(65.2%)	24(6.2%)	3(0.8%)	9(2.3%)
July 2016-June 2017	114(30.97%)	221(60.1%)	22(5.97%)	2(0.54%)	9(2.5%)
July 2017-June 2018	105(27.7%)	246(64.9%)	20(5.3%)	2(0.5%)	6(1.6%)

Factors associated with successful TB Treatment outcome

In multivariate analyses factors like patients being male patient, age group greater than 44 years old, positive HIV status and being relapsed patient were found to be associated with successful TB treatment outcome. Male patients were 0.59 (95% CI: 0.40, 0.89) times less likely

to have successful treatment outcome compared to female counterpart and statistically significant.

Furthermore, the proportion of treatment success decline as the age of the TB patients increases. After adjusting for potential predicting factors, the result reveals age group greater than 44 year age group were 0.276 (95% CI: 0.14, 0.556) less likely to have successful treatment

outcome compared to 0-14 years old age group. It was also found that HIV positive were 0.036(95% CI: 0.023, 0.057) times less likely to have successful treatment outcome compared to HIV negative. A relapsed patient

was 0.12 (95% CI: 0.05, 0.29) less likely to achieve successful treatment outcome compared new patients (table 6).

Table 5:-Bivariate and multivariate logistic regression analysis of factors associated with treatment outcome of TB patients on DOTS at West Arsi zone in 2018.

Categories	Treatment success		COR(95%CI)	AOR(95%CI)
	Yes (%)	No (%)		
Age(in years)				
0-14	261(92.3)	13(7.7)	1	1
15-24	595(95.5)	28(4.49)	1.06(0.54,2.08)	1.48(.71, 3.09)
25-34	519(95.8)	23(4.2)	1.12(0.56,2.26)	2.0(0.94,4.35)
35-44	196(81.3)	45(18.7)	0.22(0.12,0.41)*	0.52(0.25,1.08)
>44	178(76.7)	54(23.3)	0.16(0.09,0.31)*	0.276(.14,.556)*
HIV status				
Negative	1700(95.3)	84(4.7)	1	1
Positive	49(38.3)	79(61.7)	0.03(0.02,0.05)*	.036(.023,.057)*
Type of TB				
PTB+	546(91.2)	53(8.8)	1	1
PTB-	850(90.8)	86(9.2)	0.96(0.67,1.37)	.918 (.58, 1.46)
EPTB	353(93.3)	24(6.7)	1.43(0.87,2.35)	1.5(0.803, 2.79)
Residence				
Rural	737(90.1)	81(9.9)	1	1
Urban	1012(92.5)	82(7.5)	1.36(0.98,1.87)	1.21(0.81,1.81)
Sex				
Male	883(89.7)	102(10.3)	0.61(0.44,0.85)*	0.59(0.40,0.89)*
Female	886(95.6)	61(4.4)	1	1
Weight(in kg)				
0-14.9 kg	93(92.08)	8(7.92)	1	
15-29.9kg	155(95.09)	8(4.91)	1.67(.61, 4.59)	
30-39.9kg	169(90.86)	17(9.14)	0.86(.36, 2.06)	
40-54.9kg	936(92.49)	76(7.51)	1.06(.50, 2.26)	
≥55kg	396(88)	54(12)	0.63(.29,1.37)	
Category of TB				
New	1694(92.1)	146(7.9)	1	1
Relapse	20(57.1)	15(42.9)	0.12(0.06,0.23)*	0.12(0.05,0.29)*
Other	35(94.6)	2(5.4)	1.51(0.34,6.33)	1.9(0.37,9.64)

Note: *=p<0.05

DISCUSSION

The main aim of this study was to assess treatment outcome and different associated factors among TB patients on DOTs at health facilities in west Arsi zone. The overall, treatment success rate was 91.5% which is nearly similar to the finding of studies from Northeastern Ethiopia(90%)^[15] and FMOH report(91%).^[16] However, the overall treatment success rate in this study was very high compared to previous finding from Israel (68.5%).^[17] and Ukraine (36.1%).^[18] Moreover, this finding was higher than report from studies conducted in East showa (63.7%),^[10] Mizan Aman hospital(21.6%)^[19] and in Metema Hospital, Northwest Ethiopia(65.3%).^[20] The possible reason for the observed difference between the findings of this study and the previous studies might be explained by high transfer out and retreatment patients in the previous studies.

In this study, treatment outcome among 1912 participants was, 534 (27.9%) patients got cured, 1215(63.5%) patients were treatment completed, 114 (6%) patients died, 42(2.2%) were treatment defaulters and 7(0.4%) were treatment failure. The rate of defaulters in this study was similar with finding in one of Ethiopian hospital (2.5%) and Feleg Hiwot referral hospital (3.1%).^[21,22] But, this was lower than report from study at Gambella hospital (8.39%)^[23] and higher than a study conducted in Azezo health center 0.21%.^[24] This may be due to geographical condition and accessibility and availability of healthcare facilities near to patients' home.

This finding also indicated that there were a smooth increase in trends of TB treatment outcome from 90.3% in July 2013-June 2014 to 92.1% in July 2017-June 2018 which is in proportion to study conducted in Dilla University Referral hospital from 80.5% in Sept 2008-

Aug 2009 to 84.8% in Sept 2012-May 2013^[25] and Southern Ethiopia from 79% in 2003 to 82.5% in 2007.^[26] This might be an indication that the health facilities were within the track of WHO target currently that our country used as a baseline during guideline development. Moreover, death rate was also decreased across the years from 6.8% in July 2013-June 2014 to 5.3% in July 2017-June 2018 which was in line with a study conducted in Sidama zone, Southern Ethiopia (7% in 2003 to 2% in 2012).^[27] This could be due to increased commitment of healthcare workers during providing DOTS service and accessibility and availability of healthcare facilities near to patients' home.

This finding indicated that as the patient age increases, the treatment outcome rate decreases. Low successful treatment outcome of TB patients were observed in above 44 years compared with 0-14 year's age group. This is in agreement with previous studies which reported as age increases the risk of poor treatment outcome.^[28,30] Likewise, different findings from Ethiopia identified that those at higher age groups were associated with poor treatment outcome for patients on DOTs services.^[13,31,32] The lower treatment success rate among old patient could be associated with absence of economic burden and co morbidities among on older age groups^[33,35] as well as in ability to reach health institutions due to inaccessibility of nearby health facilities.

In this study, males were 0.59 times less likely to have successful treatment outcomes compared to females. This was consistent with finding from china that found being male was associated with outcome of died.^[36] Similarly, many previous studies found similar degree of risk of unsuccessful treatment between two genders where unsuccessful treatment outcomes among females surpassed those in males.^[37,38] This may be due to females were not engage in risk behaviors such as alcohol consumption, tobacco and substances abuse, and detention. These habits reported by several studies as have association with TB treatment outcome.^[39,40]

In the present study, HIV positive patients were 0.04 less likely to have successful treatment outcome compared to HIV negative patients. This was similar with study in Armenia which reported that patient having HIV positive status and cigarettes smokers were associated with unsuccessful TB treatment outcome.^[41] Recent studies conducted in Malaysia^[42] and Nigeria^[43] on TB treatment outcome and its associated factors also demonstrated that treatment outcome were worst for those patient known to be HIV positive compared to HIV negative cases. Similarly, study in Ethiopia indicated that being HIV positive have less likely chance of having successful TB treatment outcome.^[44] The reasons why HIV-infected TB patients had unsuccessful outcomes have been speculated to be because of immunosuppression and higher costs of seeking care separately for HIV and TB.

Another significant clinical factor observed to influence treatment default in this study was being a retreatment patient at start of DOTs service. Cases on retreatment were 0.12 times less likely to have successful treatment outcome relative to their newly diagnosed counterparts. This in agreement with studies in Uzbekistan.^[45] South Africa,^[46] and different part of Ethiopia^[25,26] that have reported poor treatment was higher among retreatment cases. The reason for high poor treatment outcome among retreatment cases may be due to a high prevalence of drug resistance (MDR-TB) among retreatment cases and discontinuation of treatment due to prolonged treatment. Based on our finding, the following should be considered in NTCP. FMOH and Regional health Beraue in collaboration with stakeholders should capacitate and facilitates all health facilities by highly advanced diagnostic tool for early diagnosis of TB/ HIV co- infected and new patients. Health facilities should also give continuous health education on behavioral and lifestyle modification in order to increase treatment outcome among male patients and HIV infected individuals. In order to improve the treatment success of new and HIV positive TB patients, health facilities should also provide effective management and early diagnosis of TB/HIV infected patients. Our study isn't free from limitations. We conducted study design, which is retrospective in nature and not appropriate to collect all factors that have impact on treatment outcome and not available on registration. The study also relies on previously collected data and information in the patient file which makes difficult to find temporal relationship between factors.

CONCLUSION

The overall treatment success rate was 91.5% and meets the WHO criteria. In this study, characteristics such as being male, older age group, a retreated and HIV positive patient was significantly associated with TB treatment outcome. Therefore, to sustain this success rate in that set up, early diagnosis, persistent monitoring and effective management of patient is needed.

AUTHOR CONTRIBUTIONS

AK designed the study; GA and MT commented on study design; AK coordinated the data collection; AK, GA and MT analyzed the data; AK drafted manuscript; AK, GA, and MT participated in the write up and critical review of the manuscript. All authors read and approved the final manuscript.

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CONFLICTS OF INTEREST

The authors declare that they have no any conflict of interests.

ABBREVIATION

AFB: Acid Fast Bacilli; AOR: Adjusted Odds Ratio; CDR: Case Detection Rate; CI: Confidence interval; COR: Crude Odds Ratio; DOTS: Directly Observed Treatment Short Course; EPTB: Extra Pulmonary Tuberculosis; FMOH: Federal Ministry of Health; HIV: Human Immunodeficiency Virus; MDR-TB: Multi-Drug Resistant Tuberculosis; MTB: Mycobacterium Tuberculosis; NTCP: National Tuberculosis Control Program, NTLCP: National Tuberculosis and Leprosy Control Program PTB: Pulmonary Tuberculosis; SNPTB: Smear Negative Pulmonary Tuberculosis; SPPTB: Smear Positive Pulmonary Tuberculosis; SPSS: Statistical Package for Social Sciences; TSR: Treatment Success Rate; TB: Tuberculosis; WHO: World Health Organization; YLD: Years Lived With Disability

Availability of data and materials

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

Consent for publication

Consent to publish is secured from study participants.

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