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Treatment Outcome of Tuberculosis in Selected Health Facilities of Gedeo Zone, Southern Ethiopia: A Retrospective Study

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Abstract

Background: TB continues to be a major public health problem in Ethiopia, which ranks eighth by estimated number of cases among the 22 TB high-burden countries. The impact of the programme on treatment outcomes and the trend in the service coverage for tuberculosis has not been assessed ever since. The aim of the study was to assess trends in the expansion of DOTS and treatment outcomes for tuberculosis in Gedeo zone, southern Ethiopia.

Methods: 3722 TB patients in Gedeo zone, four health facilities were analysed from September 2009 to August 2014. Data entry was done by EPiData 3.1 and descriptive analysis and multinomial logistic regression modelling for categorical outcome were carried out using STATA version12. Logistic regression is used to model categorical outcome variable, to estimate the relative risk and its corresponding 95% confidence interval. Results were reported as being statistically significant if p-value was less than 5%.

Result: Of 3722 patients, 1042 cured (28%), 1431 treatment completed (38.45%), 197 treatment defaulters (5.29%), 161 deaths (4.33%), 12 treatment failures (0.32%) and 879 cases transferred out (23.62%) to other health facilities were recorded in the study. In total, 1,705(45.81%) of the patients were SPPTB, 1,287(34.58%) were SNPTB and the rest 730(19.61%) were EPTB cases. More proportion of death and default were recorded among HIV reactive patients and unknown for their status on HIV test, respectively.

Conclusion: TSR of all types of TB patients treated in Gedeo zone health facilities were unsatisfactory (66.44%) compared to the updated Global Plan (WHO, 2011-2015) are to achieve a TSR of 87% by 2015 as a threshold. The proportion of defaulted and failure rates were higher in SPPTB than SNPTB and EPTB but death rate was high in EPTB patients. The health centres exhibited better treatment outcomes compared to hospital.

Keywords: TB treatment outcome; PTB; EPTB; DOTS; Gedeo zone southern Ethiopia

Introduction

Despite the availability of highly effective treatment for decades, tuberculosis (TB) remains a major global health problem [1]. Early one-third of the world's population is infected with tubercle bacilli and hence at risk of developing active disease. Annually about 8.4 million people develop active TB and 2.3 million die from the disease. Tuberculosis accounts for 2.5% of the global burden of disease. The multidimensional directly observed treatment short course (DOTS) strategy framework has been implemented in 184 countries and over 132 million patients have been treated with DOTS resulting in more than 125 million being cured [2]. The specific targets of DOTS detailed in the updated Global Plan (2011-2015) are to achieve a case detection rate (CDR) of 84% (for all cases and smear-positive cases specifically) and a treatment success rate (TSR) of 87% by 2015 [3].

In 2011, 6.2 million cases of TB were notified by national TB control programs and reported to World Health Organization (WHO), 5.8 million were individuals newly diagnosed in 2011 and 0.4 million were previously diagnosed TB patients whose treatment regimen was changed. India and China accounted for 39% of notified cases of TB worldwide in 2011, Africa for 24% and the 22 HBCs for 81 new cases. The provision of diagnosis and treatment according to the DOTS/stop TB strategy has resulted in major achievements in TB care and control. Between 1995 and 2011, 51 million people were successfully treated for TB in countries that had adopted the DOTS/stop TB strategy, saving 20 million lives [4]. Notifications of TB cases have stabilized in recent years, and in 2011 represented 66% (range, 64-69 of estimated incident cases. Major efforts are needed to ensure that all cases are detected, notified to national surveillance systems and treated according to international standards [5]. WHO currently-recommended approach to TB care and control is the stop TB strategy, launched in 2006. This strategy was linked to new global targets for reductions in TB cases and deaths that were set for 2015 as part of the millennium development goals (MDGs) and by the stop TB partnership. The targets are that TB incidence should be falling by 2015 (MDG Target and that prevalence and death rates should be halved compared with their levels in 1990 [6].

Nigeria has the fourth highest burden of tuberculosis (TB) in the world, with an annual incidence of 311 cases per 100,000 populations and a mortality rate of 81 per 100,000 populations in 2006 [7,8].

According to the WHO Global TB report 2011, Ethiopia ranks 8th in 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 populations [9]. TB is the leading cause of morbidity, the third cause of hospital admission, and the second cause of death in Ethiopia. Ethiopia started implementing DOTS within a standardized TB prevention and control program in 1992 [10].

Currently, Ethiopia reports treatment success and case detection rates of 83% and 72% of all forms of TB, respectively. DOTS coverage is estimated at 100% geographical and 95% health facility level. TB comprises 25% of all avoidable adult death in developing countries and is a leading infectious cause of death among young women. It is estimated that nearly one million (11%) of the total TB cases are children under 15 year of age [11].

As much as untreated TB threatens the well-being of an individual and society, defaulting from treatment may increase the risk of drug resistance, relapse, and death, and may prolong infectiousness. In resource-constrained settings where the health care services are not well developed, delayed presentation for treatment and defaulting from treatment are the two major challenges that TB programs face [12].

However, one in five patients still continued to default from treatment, and most of the factors associated with treatment non-completion, apart from the patient's age and level of education, are those related to physical access to health-care services: distance from home to treatment centre, rural residence, and a need to use public transport for ambulatory care because of low socioeconomic status, displacement due to famine, drought and war, human immunodeficiency virus (HIV)/acquired immune-deficiency syndrome (AIDS), and patient satisfaction with the care provided may influence treatment adherence [13].

The idea of DOT evolved from the need to improve treatment adherence. However, the role of DOT in maintaining treatment adherence appears to be surrounded by controversies. Reports from many countries favour DOT as a key component in DOTS strategy, a global strategy recommended by the WHO for the prevention and control of TB [14].

Ethiopia launched community-based program that deployed huge number of health extension workers (HEWs) to the community. Nevertheless, the possible contribution of HEWs in TB control program of Ethiopia has not been explored [15].

From the experience and observation of the authors, HEWs assigned in 144 Community Health Posts (CHPs) in Gedeo zone referring TB case suspects to nearby health centers and encouraging adherence to treatment but didn't involve in community-based case finding and treatment of smear positive TB cases to improve case detection rate (CDR) and TSR, and also their involvement will be cost-effective and increased the number of treated TB cases for the same amount of cost under health facility DOT. This is economically attractive option for the patients, households and the health service, and out of 39 health centers found in the zone, only 21 health centers were equipped with diagnostic facilities to detect TB cases.

Thus, early diagnosis and treatment are essential to prevent transmission of TB in the community. An effective laboratory diagnosis system is critical for confirming the cases successfully, especially to ensure good pulmonary TB (PTB) testing. The significance of TB diagnosis is high if and only if it is complemented by prompt treatment [16]. Studies that were done so far showed defaulter, treatment failure and TB transmission in the country sill occurred. However, the trends of TB and treatment outcomes have not been assessed yet in in Gedeo zone. Therefore, this study was aimed to assess the treatment outcomes of both PTB and Extra-pulmonary TB (EPTB) cases in Gedeo zone, southern Ethiopia.

Methods

Study area

The study was carried out in Gedeo zone which is situated about 90 km to the Southern segment from the Capital city (Hawassa) with a land mass of 1,347 square kilometers with a total population of 1,105,813 having 6 rural districts/woreda (Bule, Dilla Zuria, Wonago, Yirga Cheffe, Gedeb and Kochore) and 2 urban cities (Dilla, and Yirga Chfffe).

The farmers mainly cultivate cash crops (coffee and false banana) and non-farmers depend on for commercial activities.

In Gedeo zone, there were 144 community health posts (operational unit for HEWs), and 40 health centre (4 local NGO's owned health centers), 1 referral hospital (owned by Dilla University) and 4 private clinics (3 higher and 1 medium) provide treatment for tuberculosis patients. In Gedeo zone there were 27 health facilities including local NGO's owned and private clinics diagnosing and providing tuberculosis DOTs treatment in 2014 but the remaining health facilities didn't have microscopic facilities to diagnose tuberculosis but provide DOTs treatment for those tuberculosis patients transferred in, and the direct observation of TB treatment has been decentralized from hospitals to health centers. The DOTS strategy was introduced in the study area in 1996. All treatment units have standard unit registers from the National Tuberculosis and Leprosy Control Program (NTLCP).

Study design and population

Health institutions based retrospective analysis was employed in Gedeo zone selected health facilities from standard unit register of TB patients' from September 2009 to august 2014 to assess the outcome of patients registered for anti-tuberculosis treatment and to identify poor treatment outcome. All TB patients registered their treatment outcome for DOTs from september 2009 to august 2014 were analysed.

Data collection procedures and quality assurance

Data were extracted from the registers of the selected health facilities using a structured data sheet specially designed for this study. Data extraction was conducted by nurses and health officers working at the TB clinic of the selected health facilities. Before embarking on the data collection process, all data collectors attended a one-day training provided by the principal investigator on how to fill the structured data collection sheet. To ensure data quality, the following measures were taken: (a) one-day training was given for data collectors before the start of data collection, (b) the overall activities of data extraction were monitored by the principal investigator, and there was strict supervision during data collection, (c) all completed datasets were examined by the principal investigator for completeness during data collection, and (d) from the data extracted from each health center, 5% of the sample was randomly selected and validated against the registration book by the principal investigator.

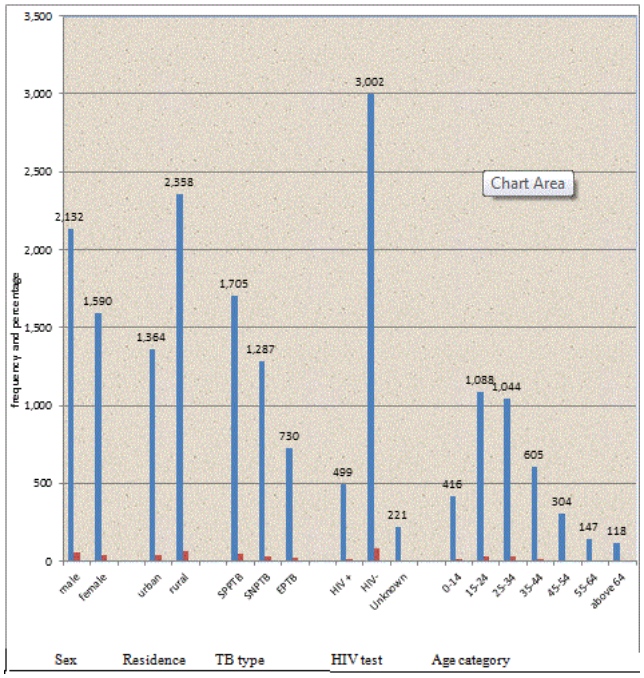

Figure 1: Distribution of TB patients (n=3722) by sex, residence, TB type, HIV test and age category in Gedeo zone, South Ethiopia, September 2009-august 2014.

Main outcome and pre-specified explanatory factors

The main outcome of interest was treatment success of all TB patients. Study participants were categorized as having successful treatment if their record showed that they were cured or they had completed treatment. Otherwise, they were categorized as treatment not successful (i.e. the record showed that the patient was either treatment failure, defaulter, died or transferred out). The pre-specified independent variables for treatment success were patients' age, sex, address, type of TB (smear-positive pulmonary TB (SPPTB), smear-negative pulmonary TB (SNPTB) and EPTB).

Data management and statistical analysis

The quantitative data extracted from the registration book of patients registered in DOTS program were checked for completeness and consistency by the principal investigator. Data entry was done by EPiData 3.1 and descriptive analysis and multinomial logistic regression modeling for categorical outcome were carried out using STATA version12. Descriptive statistical methods were used to generate frequencies for categorical variables and to summarize frequencies using graphical methods. Logistic regression is the commonly used method to model categorical outcome variable, to estimate the relative risk. Hence, we have reported relative risk ratio and its corresponding 95% confidence interval. Results were reported as being statistically significant if p-value was less than 5%.

Definitions

The Ethiopian NTLCP guideline [3], adopted from WHO, was used for the following treatment outcome definitions:

Cured: a patient who was initially sputum smear-positive and who sputum smear negative was at or one month prior to the completion of treatment and on at least one previous occasion usually at the end of the 2nd and 5th month.

Treatment completed: when a patient completed treatment but did not meet the criteria for cure or failure. This definition applies to sputum smear-positive and sputum smear-negative patients with PTB and to patients with EPTB.

Treatment success: The sum of patient who are declared "cured" and those who have "completed" treatment or finished treatment with negative TB bacteria result at the end of treatment and finished treatment, but without bacteriology result at the end of treatment.

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

Treatment failure: A patient who remains or become again smear positive at the end of five months or later during treatment. A patient who has PTB negative at the beginning turned out smear positive at the end of intensive phase.

Treatment defaulter: A patient who has on treatment at least four weeks and his/her treatment was interrupted for eight or more consecutive weeks.

Transferred out: A patient who has started DOTS treatment and has been transferred to nearby district (reporting unit) and for whom the treatment outcome is not known at the time of evaluation of treatment result.

Ethical consideration

Before data collection process, ethical clearance was secured from Dilla University, College of health sciences and Medicine, Research, Dissemination and Community Services Director Office (RDCDO). After this approval, Gedeo zone health administration and the four health facility offices approved the study. In order to ensure confidentiality of the information, names or identification numbers of TB patients were not included in the data sheet.

Results

Demographic characteristics of patients

For the last 5 years (2009-2014) a total of 4217 TB patients were registered. Out of these, 495 (11.79%) patients were not properly registered their treatment outcome and they excluded from the finally data analysis. Of the total number recruited, 3722 patients were included in this study, with 2132 (57.28%) patients being male. These patients had a mean and standard deviation age of 29.25 (95%CI: 28.77; 29.73), and 14.86 years, respectively. Two thousand one hundred thirty two (57.28%) of the patients were in the age group 15 to 34 years. Most of the TB patients 3702 (99.46%) were new cases. At the start of TB treatment, the TB patients relapse and failure rates were 8 (0.22%) and 12 (0.32%), respectively. In total, 1,705(45.81%) of the patients were SPPTB, 1,287 (34.58%) were SNPTB and the rest 730 (19.61%) were EPTB cases. From the total of each TB types, 169 (9.91%), 235 (18.26%) and 95 (13.01%) were co infected with HIV respectively. among 358 (9.62%) TB patients, 197 (55.03%) (58 in Dilla university referral hospital (DURH)) 78 in Yirga chefe Health Center (Y/chefe HC), 46 in Wonago HC. 15 in Gedeb HC)) were defaulted

and 161(44.97% (70 in DURH, 46 in Y/chefe HC, 24 in Wonago HC, 21 in Gedeb HC)) were died, respectively (Figure 1 and Table 1).

Trends of TB in each health facility

As shown in Figure 2, the proportion of TB cases was greater than 400 (10.75%) in DURH in the second and third year, whereas the proportion of other health facilities were less than 200 (5.37%). Moreover, the proportion of TB cases were decreasing after third year compared to the previous years (p=000).

Variables		TB type			Total
		Smear positive PTB N (%)	Smear negative PTB N (%)	EPTB N (%)	N (%)
Sex	Male	947 (25.44)	739 (19.85)	446 (11.98)	2132 (57.28)
	Female	758 (20.37)	548 (14.72)	284 (7.63)	1590 (42.72)
Age category	<14	104 (2.79)	177 (4.76)	135(3.63)	416(11.18)
	15-24	530 (14.24)	310(8.33)	248(6.67)	1088(29.23)
	25-34	532 (14.29)	336 (9.03)	176(4.73)	1044(28.05)
	35-44	294 (7.90)	214 (5.75)	97 (2.61)	605 (16.25)
	45-54	149 (4.00)	122 (3.28)	33 (0.89)	304 (8.17)
	55-64	50 (1.34)	76 (2.04)	21 (0.56)	147 (3.95)
	>65	46 (1.24)	52 (1.40)	20 (0.54)	118 (3.17)
Residence	Urban	509 (13.68)	490 (13.16)	365 (9.81)	1364 (36.65)
	Rural	1196 (32.13)	797 (21.41)	365(9.81)	2358 (63.35)
HIV test result	Reactive	169 (4.54)	235 (6.31)	95 (2.55)	499 (13.41)
	Non reactive	1447 (38.88)	988 (26.54)	567 (15.23)	3002 (80.66)
	Unknown	89 (2.39)	64 (1.72)	68 (1.83)	221 (5.94)
Health facility	DURH	480 (12.90)	793 (21.31)	423 (11.36)	1696 (45.57)
	Y/Chefe HC	445 (11.96)	185 (4.97)	172 (4.62)	802 (21.55)
	Wonago HC	407 (10.93)	166 (4.46)	71 (1.91)	644 (17.30)
	Gedeb HC	373 (10.02)	143 (3.84)	64 (1.72)	580 (15.58)
Year of treatment	September 2009-august 2010	374 (10.05)	336 (9.03)	140 (3.76)	850 (22.84)
	September 2010-august 2011	410 (11.02)	436 (11.71)	192 (5.16)	1038 (27.89)
	September 2011-august 2012	388 (10.42)	261 (7.01)	252 (6.77)	901 (24.21)
	September 2012-august 2013	272 (7.31)	139 (3.73)	96 (2.58)	507 (13.62)
	September 2013-august 2014	261 (7.01)	115 (3.09)	50 (1.34)	426 (11.45)

Table1: General characteristics with TB types of study subjects (n=3722), Gedeo zone in September 2009-august 2014. PTB: Pulmonary Tuberculosis; EPTB: Extra Pulmonary Tuberculosis; DURH: Dilla University Referral Hospital; HC: Health Center; Y/Chefe: Yirga Chefe.

Treatment outcome of TB in the health facilities

A successful treatment outcome (finished treatment with negative TB bacteria result at the end of treatment and finished treatment, but without bacteriology result at the end of treatment) was achieved in 2473 (66.44%) of the cases in the study. Meanwhile, 197 treatment defaulters (5.29%), 161 deaths (4.33%), 12 treatment failures (0.32%) and 879 transferred out (23.62%) to other health facilities were recorded. In this study, a small high proportion of death and failure rate (4.47%, 0.57%) was recorded for female patients, respectively. But defaulter rate (5.96%) was recorded relatively high for male patients as compared to female patients (Table 2).

Characteristics		Treatment outcome						Total
		Cured N (%)	Treatment completed N (%)	Died N (%)	Failure N (%)	Defaulted N (%)	Transferred out N (%)	N (%)
Sex	Male	568 (-26.64)	846 (-39.68)	90 (-4.22)	3 (-0.14)	127 (-5.96)	498 (-23.36)	2132 (-57.28)
	Female	474 (-29.81)	585 (-36.79)	71 (-4.47)	9 (-0.57)	70 (-4.4)	381 (-23.96)	1590 (-42.72)
Age category	<14	70 (-16.83)	200 (-48.08)	18 (-4.33)	0	16 (-3.85)	112 (-26.92)	416 (-11.18)
	15-24	336 (30.88)	429 (-39.43)	25 (-3.3)	2 (-0.18)	52 (-4.78)	244 (-22.43)	1088 (-29.23)
	25-34	315 (30.47)	400 (-38.31)	48 (-4.6)	4 (-0.38)	50 (-4.79)	227 (-21.74)	1044 (-28.05)
	35-44	175 (-28.93)	215 (-35.54)	31 (-5.12)	2 (-0.33)	37 (-6.12)	145 (-23.97)	605 (-16.25)
	45-54	86 (28.29)	97 (31.91)	9 (2.96)	3 (0.99)	19 (6.25)	90 (29.61)	304 (8.17)
	55-64	28 (19.05)	55 (37.41)	16 (10.88)	0	8 (5.44)	40 (27.21)	147 (3.95)
	>65	32 (27.12)	35 (29.66)	14 (11.86)	1 (0.85)	15 (12.71)	21 (17.80)	118 (3.17)
Residence	Urban	375 (-27.49)	658 (-48.24)	71 (-5.21)	7 (-0.51)	57 (-4.18)	196 (-14.37)	1364 (-36.65)
	Rural	667 (-28.29)	773 (-32.78)	90 (3.82)	5 (-0.21)	140 (-5.94)	683 (-28.97)	2358 (-63.35)
Type of TB	SPPTB	942 (-55.25)	299 (-17.54)	50 (-2.93)	10 (-0.59)	106 (-6.22)	298 (-17.48)	1705 (-45.81)
	SNPTB	71 (-5.52)	709 (-55.09)	67 (-5.21)	1 (-0.08)	49 (-3.81)	390 (-30.3)	1287 (-34.58)
	EPTB	29 (3.97)	423 (57.95)	44 (6.03)	1 (0.14)	42 (5.75)	191 (26.16)	730 (19.61)
HIV test result	Reactive	91 (18.24)	216 (43.29)	51 (10.22)	3 (0.60)	22 (4.41)	116 (23.25)	499 (13.41)
	Non-reactive	922 (-30.71)	1147 (38.21)	93 (-3.1)	9 (-0.3)	154(-5.13)	677 (-22.55)	3,002 (-80.66)
	Unknown	29 (13.12)	68 (30.77)	17 (7.69)	0	21 (9.50)	86 (38.91)	221 (5.94)
Health facility	DURH	239 (-14.09)	623 (-36.73)	70 (-4.13)	4 (-0.24)	58 (-3.42)	702 (-41.39)	1696 (-45.57)
	Y/Chefe HC	309 (-38.53)	302 (-37.66)	46 (-5.74)	4 (-0.5)	78 (-9.73)	63 (-7.86)	802 (-21.55)
	Wonago HC	224 (-34.78)	280 (-43.48)	24 (-3.73)	0	46 (-7.14)	70 (-10.87)	644 (-17.3)
	Gedeb HC	270 (46.55)	226 (38.97)	21 (3.62)	4 (0.69)	15 (2.59)	44 (7.59)	580 (15.58)
Year of treatment (EC)	September 2009-august 2010	241 (-28.35)	344 (-40.47)	31 (-3.65)	1 (-0.12)	55 (-6.47)	178 (-20.941)	850 (-22.84)
	September 2010-august 2011	256 (-24.66)	359 (-34.59)	35 (-3.37)	3 (-0.29)	53 (-5.11)	332 (-31.98)	1038 (-27.89)
	September 2011-august 2012	221 (24.53)	321 (35.63)	43 (4.77)	3 (0.33)	41 (4.55)	272 (30.19)	901 (24.21)
	September 2012-august 2013	157 (30.97)	232 (45.76)	28 (5.52)	4 (0.79)	36 (7.10)	50 (9.86)	507 (13.62)
	September 2013-august 2014	167 (39.20)	175 (41.08)	24 (5.63)	1 (0.23)	12 (2.82)	47 (11.03)	426 (11.45)

Table2: Treatment outcome of TB in four health facilities from September 2009-august 2014. SPPTB: Smear Positive Pulmonary Tuberculosis; SNPPTB: Smear Positive Pulmonary Tuberculosis; EPTB: Extra Pulmonary Tuberculosis; DURH: Dilla University Referral Hospital; Y/CHEFE: Yirga Chefe; HC: Health Center.

Table 2 also shows that the proportion of defaulted and failure rates were higher in SPPTB than SNPTB and EPTB but death rate was high in EPTB patients. More proportion of death and default were recorded among HIV reactive patients and unknown for their status on HIV test, respectively.

Trends of TB treatment outcome

The cure rate of TB patients was increased over the last two years compared to the previous years. Generally, the proportion of TB treatment outcome during our study period were smoothly improved the treatment complete and cure rates. However, transfer out and death rates were relatively reduced. In the case of defaulter there were dramatic reductions. More proportion of death and transferred out occurred in DURH health facility and the second and third year (Table 2).

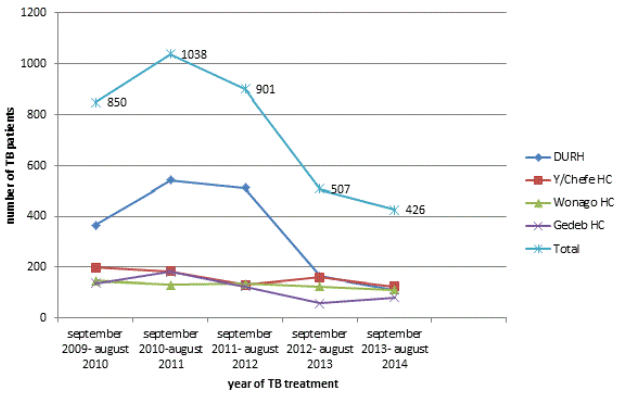

Figure2: Trend of all TB cases from September 2009-August 2014.

Factors associated with TB treatment success

This study showed that treatment success rate was not significantly associated with being female to make a treatment success rate 66.32% (RR=0.99, 95%CI=0.86 to 1.13, p=0.86). Patients with mean age greater than 29.25 had a significantly lower treatment success rate than other age groups who were being treated for TB, making a treatment success of 68.55% (RR=1.24, 95%CI=1.08 to 1.42, p=0.00). Patients who were being treated in health centers and September 2011 to august 2014 had higher treatment success rate than patients being treated in DURH and September 2009-august 2011 (RR=0.27, 95%CI=0.23 to 0.31, p=0.00; RR=0.27, 95%CI=0.23 to 0.31), respectively. Patients who were being treated for EPTB had lower treatment success than patients being treated for PTB (RR=1.28, 95%CI=1.08 to 1.51, p=0.00). As expected, the study revealed that the risk associated with unsuccessful treatment outcome for people living in rural areas could be as much as near 2 times higher than for urban residents (RR=1.99, 95%CI= 1.71 to 2.31, p=0.00) (Table 3).

Discussion

In these health facilities based retrospective study, information on the treatment outcome, and overall trend of all types of TB across the year during the study period and the association between treatment outcomes with their some predictor variables were assessed, in Gedeo zone.

The high proportion of all forms of TB observed among males compared to females in this study was consistent with study conducted in Gambella regional, Harer Felege Hiwot referral hospital and at Mizan-Aman General Hospital which reported 54.5%, 58.46% and 57.22% male TB cases, respectively [17-19]. This might be attributed to either males are more likely to develop the disease or are more likely to utilize health service and diagnose their cases than females.

The overall trend of TB in this study was gradually increasing with age until 24 and a little decrease with the age range of 25-34 which was inconsistence with Gambella and Mizan-Aman hospitals [17,19]. This might be due to Dilla university students who were treated in the hospital were in this age range of 15-24. But after 34 years of age showed a decline as age increased (28.05% to 3.17%). This was consistent with the findings reported in Gambella and Miza-Aman hospital study (28.14% to 0.69%, 32.16% to 1.42%), respectively) [17,19]; that might be as the result of study area location that is a trade and coffee cultivation area, in which youths and early adult age people are prone to come for job causing high proportion of TB cases in these age groups. Majority of patient who were registered during the study period were SPPTB, 1705 (45.81%) but this finding was contrasted with Gambella and Mizan Aman hospital studies [17,19], this might be due to the improvement of AFB diagnosis mechanism. This study also found that the occurrence of PTB was high as compared to EPTB. As to TB HIV co-infection; this study reported 13.41% TB HIV co-infection which was an agreement with report from West Arsi 13.6% [20].

However, the present study was lower than previous reports from different health centers at Addis Ababa, Gondar University Hospital, and Felege Hiwot Referral Hospital, 27.2%, 52.1% and 25% [18,21,22], respectively. The lowered TB-HIV coinfection in this study might be due to the higher number of rural study participants than urban residents (63.35% versus 36.65%) which was consistence with the study conducted in Enfraz Health Center (64.7% versus 35.5%) [23].

The trend of TB in this study was increasing from the firs to the second year then steeply decreasing from the second to fifth year that might be as a result of consistency in prevention and control program, health professional stability and community awareness about transmission of TB in the area after 2011.

The trend of TB treatment outcome was found to be improved by cured rate and treatment completeness from first to third years of the study period. On the other hand, the trend of defaulter and death rates were decreased. The overall proportion of cured were 28% which is low and this might be due to high transfer out rate (41.39%) observed in the hospital. Furthermore, the cure rate of TB smear positive was 55.25%, which was low as compared with the nationally expected level (85%) [3]; and this difference might be due to poor data registration after follow-up AFB examination at the TB clinic and/or inability to send patients for follow-up AFB examination during scheduled standard treatment period.

The defaulter rate (5.29%) in this study was comparable conducted from study in Southern Ethiopia (6%) [24]. The default rate (5.29%) in the present study was lower than in other study conducted at Gondar University Teaching Hospital (36.4%) and Gambela regional hospital (22.9%) [17,22]. This lower defaulter rate might be due to proper supervision and health education in the study area but still needs more improvement because it reported more compared to the study reported at Miza-Aman general hospital [19].

Analysis of national surveillance data from a clinical perspective reported that the treatment failure rate in Zimbabwe and in other TB HBCs was 0.1 and 1.5%, respectively [25]. The TB treatment failure rate of this study was 0.32%, which was also consistence with reported from the different parts of Ethiopia were at ranged from 0.2% to .8% [18,22,23,26].

Characteristics		Successful	Non successful	Total	RR(risk ratio 95%CI)	p- value
Sex	Male	1414 (66.32)	718 (33.68)	2132 (57.28)	1	
	Female	1059 (66.60)	531 (33.40)	1590 (42.72)	0.99 (0.86-1.13)	0.86
Age group	<29.25	1445 (68.55)	663 (31.45)	2108 (56.64)	1	
	>29.25	1028 (63.69)	586 (36.31)	1614 (43.36)	1.24 (1.08-1.42)	0
Residence	Urban	1033 (75.73)	331 (24.27)	1364 (36.65)	1	
	Rural	1440 (61.07)	918 (38.93)	2358 (63.35)	1.99 (1.71-2.31)	0
TB type	PTB	2021 (67.55)	971 (32.45)	2992 (80.39)	1	
	EPT	452 (61.92)	278 (38.08)	730 (19.61)	1.28 (1.08-1.51)	0
Health facility	Hospital (DURH)	862 (50.83)	834 (49.17)	1696 (45.57)	1	
	Health center	1611 (79.52)	415 (20.48)	2026 (54.43)	0.27 (0.23-0.31)	0
Year of treatment	septmber2009-august2011	1200 (63.56)	688 (36.44)	1888 (50.73)	1	
	septmber2011-august2014	1273 (69.41)	561 (30.59)	1834 (49.27)	0.77 (0.67-0.88)	0
Total		2473 (66.44)	1249 (33.56)	3722 (100)		

Table3: Association between different factors, which may affect treatment outcome among tuberculosis patients (n=3722) at DOTS health facilities September 2009-august 2014.

In the agreement with the study conducted in Indian Community and Gambela region [16,17] , the current study revealed that default rate across the age groups of TB patients was increased from 3.85% in the age group of 0-14 years to12.71% in the age group of greater than 64 years. As the author wrote the possible justification for an increment in default rate across the age might be due to carelessness and dissatisfaction with the clinic service.

The overall proportion of death 4.33% in this study was consistence with death rate reported from Addis Ababa (4%) and Gambela regional hospital(3.6%) but higher than the study conducted at Mizan Aman (1.22%) general hospital [17,19,21]. This high report in this study might be due to high defaulter rates and/or lack of follow up in the area. Moreover, the death rate of patients steadily increased in older age groups. Older age has been reported to be a risk factor for death due to lowered immunity and co-morbidities [27]. Similar findings were reported from the studies conducted in Gondar University Hospital, northwest Ethiopia, southeast Ethiopia, and Eastern Taiwan [22,25,26,28]. Furthermore, the high death rates of TB in this study were occurred on EPTB which was disagreed from study conducted in Addis Ababa, Mizan Aman and Gambela regional hospital that reported SPPTB patients were more likely died than EPTB [17,19,21]. This might be due to high prevalence of HIV on EPTB patients which is supported by EPTB is more common in patients with HIV infection [27,28].

Currently, Ethiopia reports treatment success rate is 83%. The specific targets of DOTS detailed in the updated Global Plan (2011-2015) are to achieve a case detection rate (CDR) of 84% (for all cases and smear-positive cases specifically) and a treatment success rate (TSR) of 87% by 2015 [11]. TSR in this study was 66.44%. The observable difference in the TSR might be due to high transfer out rate and defaulters during the study period which might be as a result of establishment of different health facilities in the region and/or seems refractory to the conventional approach of treatment supervision; social and cultural factors that might play a role need to be explored.

This study showed that treatment success rate was not significantly associated with being female to make a total treatment success rate 66.44% (RR=0.99, 95%CI=0.86 to 1.13, p=0.86). In agreement with Felege Hiwot referral hospital [18] and Indian Community [16], the present study revealed that patients with mean age greater than 29.25 had a significantly lower treatment success rate than other age groups who were being treated for TB, making a treatment success of 68.55% (RR=1.24, 95%CI=1.08 to 1.42, p=0.00). The lower TSR in the elderly patients were mainly due to the high default rate or older age has been reported to be a risk factor for death, partly due to co-infection and general physiological deterioration with age, and thus it is crucial to exercise close monitoring of TB treatment also in older patients [22]. A study conducted on DOTS improve treatment outcome and service coverage for TB in Hadiya, south Ethiopia reported that the smaller institutions exhibited better treatment outcomes compared to the larger ones including the zonal hospital [24]. Similarly, the current study found that patients who were being treated in health centers and the third year to fifth year had higher treatment success rate than patients being treated in DURH and the first year to second year (RR=0.27, 95%CI=0.23 to 0.31, p=0.00; RR=0.27, 95%CI=0.23 to 0.31), respectively. This might be due to high death and transfer out rate occurred in DURH and the year 2003. Patients who were being treated for EPTB had lower treatment success rate than patients being treated for PTB (RR=1.28, 95%CI=1.08 to 1.51, p=0.00). This might be due to delayed diagnosis of EPTB patients which coincide with the study done in Felege Hiwot referral hospital [18]. In agreement with study done in Felege Hiwot referral hospital [18], the current study reported that the risk associated with unsuccessful treatment outcome for

people living in rural areas was higher than for urban residents (RR=1.99, 95%CI=1.71 to 2.31, p=0.00); the lower treatment success rate in rural patients is probably due to lower awareness of TB treatment and the long distance between their homes and the treatment center [26]. Close monitoring and health education for rural patients is a great importance.

Since data were taken from those already visited and registered at health facilities, it may be subjected to selection bias. Nevertheless, our study tried to provide base line information, identified gaps and gave relevant recommendations related to treatment outcome of TB patients. DURH is a referral hospital and patients came from other health facilities to be diagnosed. Because of this, the study was done both in the hospital and health centers. The results of this study also indicate that TB is still a major public health problem in Gedeo zone.

Conclusion

Generally, the proportion of TB treatment outcome during our study period were smoothly improved the treatment complete and cure rates. However, transfer out and death rates were relatively reduced. Defaulted and failure rates were higher in SPPTB than SNPTB and EPTB but death rate was high in EPTB patients. More proportion of death was recorded among HIV reactive patients. Overall, the TSR of all types of TB patients treated in Gedeo zone health facilities were unsatisfactory (66.44%) compared to the updated Global Plan (WHO, 2011-2015) are to achieve a TSR of 87% by 2015 as a threshold. 5.29% defaulters, 4.33% deaths, 0.32%) failures and 23.62% transferred out to other health facilities were recorded. The health centers exhibited better treatment outcomes compared to hospital. Continuous follow up of patients by family and health workers, supportive supervision, home visits especially by health extension workers, strengthening health extension program in the area, community mobilization for early detection and treatment of cases and defaulter tracing are important strategies to reduce TB burden and treatment interruption and improve TSR in the zone. We identified many patients with missing information in the unit registers and this issue needs to be addressed.

Author's Contribution

BA was involved in the conception, collected data, design, analysis, interpretation, report writing and manuscript writing. GN had been involved in the analysis, interpretation and report. BA is the guarantor of the paper.

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