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Treatment Outcome of Tuberculosis Patients under Directly Observed Treatment of Short Course in Benishangul Gumuz Region, Western Ethiopia: A Ten-Year Retrospective Study

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Abstract

A retrospective study was conducted to assess TB treatment outcome and thus evaluate DOTS programme in Benishangul Gumuz Region, western Ethiopia. The records of 3658 TB patients registered in the two hospitals between November, 2003 and October, 2012 at DOTS Clinics were analyzed. From the total patients, 2,223 (60.77%) were successfully treated, 315 (8.61%) lost to follow up, 341 (9.32%) died, 4 (0.11%) failed treatment and 775 (21.19%) not evaluated. There is no association in treatment success rate between new and previously treated patients (60.55% vs. 58.33%, X^2=0.14; P>0.704). When transferred out (not evaluated) is excluded, the success rate was increased approximately by a rate of 0.03 times while the time is increased by one year (β=0.03106; CI=0.0218-0.0403). Smear negative pulmonary TB patients had 1.24 times low treatment success rate (64.08% vs. 58.07%; CI=1.02-1.51; P<0.001) compared to smear positive. Patients from Pawe areas had 1.34 times lower treatment success rate compared to cases from Assosa (64.91% vs. 58.57%; CI=1.16-1.55). Not evaluated and lost to follow up rates were higher in Pawe (24.93% vs. 14.16%; X^2=38.66; P<0.001 and 10.10% vs. 5.82%; X^2=16.40; P<0.001 respectively) while death rate was higher in Assosa (14.95% vs. 6.33%; X^2=59.05; P<0.001). Accordingly, males and elders had the trend to be more likely to experience death. In conclusion, the treatment success rate of TB patients was low which accounts for 60.77%. Low treatment success and high proportion of death (9.32%) and defaulted (8.61%) rates are serious public health concerns that point out low DOTs programme performance in the study areas.

Keywords: Tuberculosis; Directly observed treatment; Treatment outcome; Benishangul Gumuz region; Hospital

Introduction

Despite the availability of an inexpensive, effective and reasonably well-tolerated therapy, TB is continuing as a major challenge to global public health in 21st century [1]. Approximately one third of the world's population, particularly in developing countries is harboring bacilli in the form of latent or dormant infection. While most remain asymptomatic, with latent TB, approximately 10% develop active TB during their life time. About 8.7 million new cases of active TB and 1.4 million deaths of annual report [2] indicates the only limited success, slowing the rate of increase but failing to make substantial progress toward the goal of TB elimination efforts in the past decade.

DOTs programme was started in 1992 as a standardized TB prevention and control strategy in Ethiopia. It was piloted in Arsi and Bale zone, Oromia Region. This strategy has been subsequently expanded in the country at national level. It was introduced as a strategy to the TB control programme in the two hospitals of the Region in 2000. The DOTs geographic coverage reached 90%, whereas the health facility coverage is 75% [3]. Though WHO recommends routine culture and drug susceptibility testing for M. tuberculosis to evaluate and follow up effectively the treatment outcomes, most developing countries including Ethiopia are not performing it; even for patients suspected of harboring drug-resistant strains.

The DOTS strategy requires that the patient be treated for eight months which includes a two months intensive phase in which treatment is given under strict supervision by a trained observer, and a six months continuation phase. This is to ensure compliance as well as significantly reduce the rates of relapse and drug resistance. A DOT has been found to be an effective means of administering anti-TB drugs [4]. It also has been shown to be effective in achieving a high successful treatment rate, from 86% to 96.5% [5]. The utility of DOTS has also been demonstrated in developed countries. Jasmer et al. reported that DOTS was significantly associated with a higher treatment success rate than self-administered therapy (97.8% vs. 88.6%, p<0.002) and a lower TB-related mortality rate (0% vs. 5.5%, p=0.002) [6]. DOTS also lead to significant reductions in the frequency of primary drug resistance, acquired drug resistance and relapse [7].

The overall goals of TB treatment are curing the patient, interrupting transmission of TB to others and preventing the emergence drug resistant TB bacilli. However, these goals are not achieved in most parts of the world including Ethiopia [8]. The

probable reasons are death of the patients during treatment, default before the scheduled end of treatment or resistance to the drugs prescribed. The Patient non-adherence to treatment is understood as a failure of the health care system to manage the natural inclination of humans to give up treatment as they feel better [6].

The treatment outcomes serve as an indicator of the quality of TB treatment delivered by the health care system. Guidelines on how to evaluate treatment outcomes using standardized categories have been provided by WHO in combination with the European Region of the International Union against Tuberculosis and Lung Disease (IUATLD) [9]. These categories were defined to evaluate the risk of future relapse and drug resistance. Ideally, treatment outcome in all TB patients should be regularly monitored and evaluated through epidemiological surveillance system. Thus, one could be able to recognize and make an amendment to system failures before the incidence and proportion of resistant bacilli get higher. However, treatment outcome of TB patients has not been yet assessed in the two hospitals of Benishangul Gumuz Region, western Ethiopia. Therefore, this study was aimed to assess treatment outcomes of TB cases and thus evaluate DOTS programme in two hospitals of the Region, western Ethiopia.

Materials and Methods

Study setting

The study was conducted in two hospitals of Benishangul Gumuz Region. It is located in the western part of Ethiopia between 34° 10'N and 37° 40'E; and in the latitude 09° 17'N & 12° 06' N. Based on the census of 2007, total population of the region is 670,847. About 85.4% of the total populations are rural residents and the rest 14.6% are Urban. The population density of the region is estimated to be 13.72 persons/km^2, and the annual growth rate is 3%. The average household size is 4.7 [10]. The Region has 2 hospitals, 32 health centers and 361 health posts. Among these health facilities, the two hospitals and few of the health centers routinely diagnose and treat TB based on the clinical findings, the chest x-ray and AFB results. Most of health centers and 120 health posts used for treatment. The two hospitals namely Asossa hospital, which is located in Asossa zone and Pawe hospital, which is located in Metekel zone, are the only tertiary health care hospitals serving the majority of the population of the Region and some from Oromiya Region [11]. The geographical location of these hospitals in the Region is indicated by Figure 1. The two hospitals provide health care service for a total population of 1.5 million.

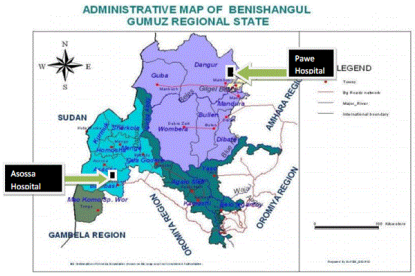

Figure 1: Sketch map of the study setting.

In these hospitals, DOTS clinics are operating under the NTLCP of Ethiopia, under which the diagnosis of pulmonary TB is followed by examination of three sputum smears by Zihel-Nielsen staining method for acid fast bacilli (AFB) .Chest radiographic and pathological findings, also used to support the diagnosis. All patients diagnosed with TB are guided to the DOTS clinic where they are registered and treated according to the national TLCP guideline [3].

Study design and data collection

A record based retrospective analysis of the profile and the determinants of treatment outcome of all TB patients registered between November, 2003 and October, 2012 at DOTS Clinics of both hospitals were conducted. The registration documents reviewed included basic information such as patient's sex, age, address, TB forms, and case categories and treatment outcome. Institutional ethical clearance was obtained from Addis Ababa University, Aklilu lemma Institute of Pathobiology institutional review board and permission was obtained from Benishangul Gumuz Region Health Bureau.

Operational definitions

According to the standard definitions of revised WHO guideline [12] the following clinical case and treatment outcome definitions were used:

Pulmonary TB, smear-positive: A patient with at least two sputum specimens which were positive for acid-fast bacilli (AFB) by microscopy, or a patient with only one sputum specimen which was positive for AFB by microscopy, and chest radiographic abnormalities consistent with active pulmonary TB.

Pulmonary TB, smear-negative: A patient with symptoms suggestive of TB, with at least two sputum specimens which were negative for AFB by microscopy, and with chest radiographic abnormalities consistent with active pulmonary TB (including interstitial or miliary abnormal images), or a patient with two sets of at least two sputum specimens taken at least two weeks apart, and which was negative for AFB by microscopy, and radiographic abnormalities consistent with pulmonary TB and lack of clinical response to one week of broad spectrum antibiotic therapy.

Extra pulmonary TB (EPTB): This included TB of organs other than the lungs, such as lymph nodes, abdomen, genitourinary tract, skin, joints and bones, meninges, etc. Diagnosis of EPTB was based on fine needle aspiration cytology or biochemical analyses of cerebrospinal/pleural/ascetic fluid or histopathological examination or strong clinical evidence consistent with active EPTB, followed by a decision of a clinician to treat with a full course of anti-TB chemotherapy. In all the cases of EPTB, sputum examinations and chest radiographs were used to investigate the involvement of lung par enchyma. Asossa hospital lacks the facilities for culture and drug susceptibility testing.

New patients: have never been treated for TB or have taken anti-TB drugs for less than 1 month.

Previously treated patients: have received 1 month or more of anti-TB drugs in the past. They are further classified by the outcome of their most recent course of treatment as follows: Relapse patients have previously been treated for TB, were declared cured or treatment completed at the end of their most recent course of treatment, and are now diagnosed with a recurrent episode of TB (either a true relapse or a new episode of TB caused by reinfection), Treatment after failure

patients are those who have previously been treated for TB and whose treatment failed at the end of their most recent course of treatment, Treatment after loss to follow-up patients have previously been treated for TB and were declared lost to follow-up at the end of their most recent course of treatment. (These were previously known as treatment after default patients), other previously treated patients are those who have previously been treated for TB but whose outcome after their most recent course of treatment is unknown or undocumented.

Patients with unknown: Previous TB treatment history does not fit into any of the categories listed above.

Treatment Outcome

The treatment outcome was divided into seven categories according to revised WHO guideline [12]. These categories were : cured (A pulmonary TB patient with bacteriologically confirmed TB at the beginning of treatment and who was smear- or culture-negative in the last month of treatment and on at least one previous occasion), completed treatment (A TB patient who completed treatment without evidence of failure, but there is no record to show that sputum smear or culture results in the last month of treatment and on at least one previous occasion are negative, either because they were not done or because results were not available), failure (A TB patient whose sputum smear or culture is positive at month 5 or later during treatment), Lost to follow-up (A TB patient who did not start treatment or whose treatment was interrupted for 2 consecutive months or more), died (A TB patient who dies for any reason before starting or during the course of treatment), Not evaluated (A TB patient for whom no treatment outcome is assigned. This includes cases "transferred out" to another treatment unit and where the treatment outcome is unknown to the reporting unit) and successfully treated (The sum of cured and treatment completed).

Statistical Analysis

Data was recorded in the format developed for this purpose and later on entered into the Microsoft excel 2003 program and analyzed using STATA 11.0 version software. To ensure the quality of data entered into the computer, two people independently cross-checked each entry. The relationship between two categorical variables was assessed using Pearson Chi-square (X^2) test. Relationships between treatment outcomes and potential predictor variables were assessed using bivariate and multivariate logistic regression model. P values of less than 0.05 were considered statistically significant.

Results

Demographic characteristics of patients

A total of 3745 TB patients were registered in both hospitals between November, 2003 and October, 2012. Of these, the records of 87 patients were excluded due to the fact that they missed the important information about treatment outcome. Table 1 shows the general characteristics of 3658 patients. Out of these, 2,016 (55.11%) were males and 1,642 (44.89%) were females. Two thousand four hundred ninety three (69.50%) of the patients were urban resident and 1,288 (35.21%) patients were smear negative pulmonary TB cases. The mean age and standard deviation (SD) of study subjects was 28.55 ± 13.97 (range: 0.5-92) years.

Characteristics		Frequency	Percent
Sex	Male	2,016	55.11
	Female	1,642	44.89
Site	Asossa	1,271	34.75
	Pawe	2,387	65.25
Residence	Urban	2,493	68.15
	Rural	1,165	31.85
Age group	0-14	459	12.55
	15-24	946	25.86
	25-44	1,752	47.9
	45-64	426	11.65
	≥ 65	75	2.05
Forms of TB	Ppos	671	18.34
	Pneg	1,288	35.21
	EPTB	1,699	46.45
Category	New	3,470	94.86
	Relapse	54	1.48
	Transferred in	95	2.6
	Failure	4	0.11
	Defaulter	14	0.38
	Other	21	0.57
Treatment outcome	Treatment success	2,223	60.77
	Not evaluated	775	21.19
	Lost to followup	315	8.61
	died	341	9.32
	Failure	4	0.11
	Total	3658	100

Table 1: General characteristics of the study subjects (n=3658), Asossa and Pawe Hospitals, 2003-2012. TB: Tuberculosis.

Treatment outcome

The treatment outcome of 3658 TB patients who were registered at two hospitals during the last 10 years was analyzed. Of these, 2,223 (60.77%) were successfully treated, 315 (8.61%) were lost to follow up, 341 (9.32%) were died, 4 (0.11%) were treatment failure and 775 (21.19%) were not evaluated. Treatment success rate was 60.55% (2101/3470) among new cases, 57.41% (31/54) among relapsed case, 57.14% (8/14) among defaulted case, 75.79% (72/95) among transferred in cases and 44.00% (11/25) among patients with unknown case category. There is no significant treatment success rate difference among case categories (60.55% vs. 58.33%, X^2=0.14; P>0.704). As indicated in Figure 2 the success rate was significantly increased up to

76.8% in 2008 and then decreased to 37.7% in 2011 as consequence of high not evaluated rate which were 11.2% in 2008 and 52.9% in 2011. When transfer out is excluded, the success rate was increased (from 62.0% in 2003 to 88.7% in 2012) approximately by a rate of 0.03 times while the time is increased by one year (β=0.03106; CI=0.0218-0.0403) (Figure 3). The data also showed that not evaluated and lost to follow up rates were significantly high in Pawe (X^2=38.66; P<0.001) and (X^2=16.40; P<0.001) respectively. The death rate was significantly high in Assosa (X^2=59.05; P<0.001). Table 2 shows that as the age of TB patients increased, death rate of patients was increased from 31(6.75%) to 69(7.29%), 175(9.99%), 54(12.68%), and 12(16.00%) in the age groups of 0-14 years, 15-24 years, 25-44 years, 45-64 years and >65 years respectively.

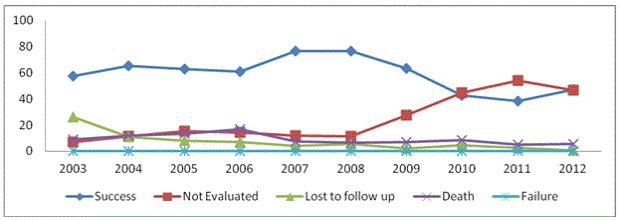

Figure 2: Ten year trend of TB treatment outcome with including not evaluated in treatment outcome at Assosa and Pawe Hospitals, Benishangul Gumuz region.

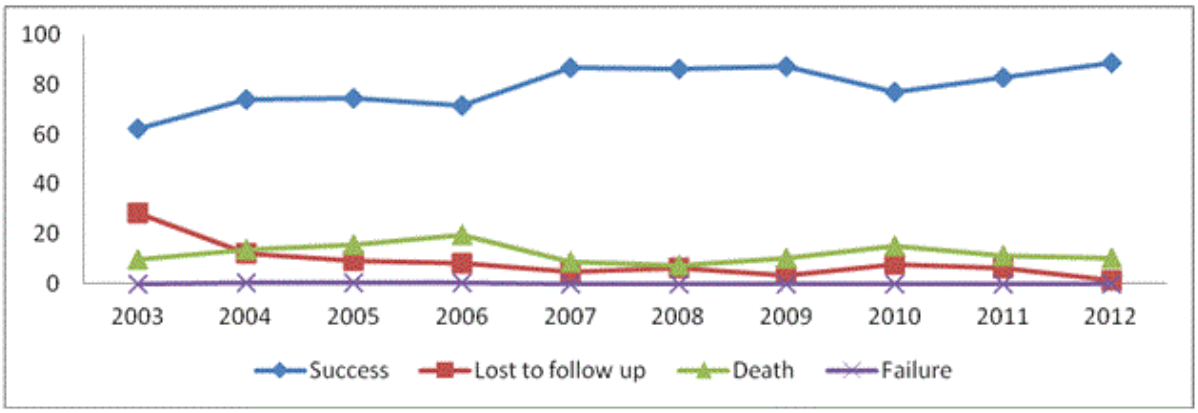

Figure 3: Ten year trend of TB treatment outcome after excluding not evaluated from treatment outcome at Assosa and Pawe Hospitals, Benishangul Gumuz region.

Characteristics	Treatment success N (%)	Not evaluated N (%)	Treatment outcomes		Death N (%)	Failure N (%)	Total
			Lost to follow up N (%)				
Sex							
Male	1,177(58.38)	442(21.92)	206(10.22)		189(9.38)	2(0.10)	2,016
Female	1,046(63.70)	333(20.28)	109(6.64)		152(9.26)	2(0.12)	1,642
Address							
Urban	1,516(60.81)	531(21.30)	182(7.30)		260(10.43)	4(0.16)	2,493
Rural	707(60.69)	244(20.94)	133(11.42)		81(6.95)	0(0.00)	1,165
Institution							
Asossa	825(64.91)	180(14.16)	74(5.82)		190(14.95)	2(0.16)	1,271
Pawe	1,398(58.57)	595(24.93)	241(10.10)		151(6.33)	2(0.08)	2,387
Age group							
0-14	270(58.82)	112(24.40)	46(10.02)		31(6.75)	0(0.00)	459
15-24	606 (64.06)	193(20.40)	78(8.25)		69(7.29)	0(0.00)	946

25-44	1,063(60.67)	358(20.43)	153(8.73)	175(9.99)	3(0.17)	1,752
45-64	248(58.22)	93(21.83)	30(7.04)	54(12.68)	1(0.23)	426
≥ 65	36(48.00)	19(25.33)	8(10.67)	12(16.00)	0(0.00)	75
TB forms						
Ppos	430(64.08)	128(19.08)	53(7.90)	58(8.64)	2(0.30)	671
Pneg	748(58.07)	285(22.13)	97(7.53)	158(12.27)	0(0.00)	1,288
EPTB	1,045(61.51)	362(21.31)	165(9.71)	125(7.36)	2(0.12)	1,699
Total	2,223 (60.77)	775 (21.19)	315 (8.61)	341 (9.32)	4 (0.11)	3,658

Table 2: Treatment outcome by sex, address, institution, age group and TB forms in two hospitals of the Region, 2003-2012. Ppos: Pulmonary positive, Pneg: Pulmonary negative, EPTB: Extra pulmonary TB.

Bivariate and multivariate logistic regression analysis was carried out for selected socio-demographic and clinical risk factors including age, sex, place of residence, site of treatment, TB form and treatment category of patients. In the final multivariate logistic model, the proportion recorded as having a successful treatment outcome varied by sex, institution and TB form (Tables 3 and 4). Male TB patients had 0.8 times lower treatment success rate (63.70% vs. 58.38%; CI=. 70-0.91) than females. Patients from Pawe areas had 1.34 times lower treatment success rate compared to cases from Assosa (64.91% vs. 58.57%; CI=1.16-1.55). Smear negative pulmonary TB patients had 1.24 times low treatment success rate (64.08% vs. 58.07%; CI=1.02-1.51; P<0.001) compared to smear positive. On the other hand, the highest treatment success rate was observed among smear positive pulmonary TB patients 321(47.8%) compared to smear negative pulmonary TB and extrapulmonary TB patients 748 (58.07%) and 1,045 (61.51%) respectively (Table 3). In addition, the highest treatment success rate (76.68%; p<0.001; CI=0.24-0.46) was observed from 2007 to 2008 compared to treatment success rates across the years during the study period.

Characteristics	TB forms extra-pulmonary N (%)	Pulmonary negative N (%)	Pulmonary positive N (%)	Total N%
Sex				
Male	922 (45.73)	689 (34.18)	405 (20.09)	2,016
Female	777 (47.32)	599 (36.48)	266 (16.20)	1,642
Age				
0-14	300 (65.35)	137 (29.85)	22 (4.80)	459
15-24	436 (46.09)	287 (30.34)	223 (23.57)	946
25-44	747 (42.64)	651 (37.15)	354 (20.21)	1,752
45-64	189 (44.37)	174 (40.85)	63 (14.78)	426
≥65	27 (36.00)	39 (52.00)	9 (12.00)	75
Case category				
Defaulter	2 (14.29)	9 (64.28)	3 (21.43)	14
Failure	1 (25.00)	1(25.00)	2 (50.00)	4
New	1,641(47.30)	1,208 (34.80)	621 (17.90)	3,470
Other	7 (33.33)	12 (57.14)	2 (9.53)	21
Relapse	14 (25.93)	17(31.48)	23 (42.59)	54
Transferred in	34 (35.79)	41(43.16)	20 (21.05)	95
Residence				
Urban	1,096 (43.96)	898 (36.02)	499 (20.02)	2,493

Rural	603 (51.76)	390 (33.48)	172 (14.76)	1,165
Site/Hospital				
Asossa	519 (40.84)	452 (35.56)	300 (23.60)	1,271
Pawe	1,180 (49.43)	836 (35.02)	371 (15.55)	2,387
Total	1,699	1,288	671	

Table 3: TB forms by sex, age group, case category and address at Asossa and Pawe Hospitals, 2003-2012.

Characteristics	Treatment success		Crude OR	95% CI	P-Value	Adjusted OR*	95% CI	P-Value
	Yes N (%)	No N (%)						
Sex								
Male	1,177(58.38)	839 (41.62)	1	-	-	1	-	-
Female	1,046 (63.70)	596 (36.72)	0.8	0.70-0.91	0.001	0.8	.70-0.91	0.001
Site								
Asossa	825 (64.91)	446 (35.09)	1	-	-	1	-	-
Pawe	1,398(58.57)	989 (41.43)	1.31	1.14-1.51	0.001	1.34	1.16-1.55	0.001
Age								
0-14	270 (58.82)	189 (41.18)	1	-	-	1	-	-
15-24	606 (64.06)	340 (35.94)	0.8	0.64-1.01	0.06	0.83	0.66-1.04	0.11
25-44	1,063 (60.67)	689 (39.33)	0.93	0.75-1.14	0.47	0.94	0.76-1.16	0.55
45-64	248 (58.22)	178 (41.78)	1.03	0.79-1.34	0.86	1.01	0.77-1.33	0.92
≥ 65	36 (48.00)	39 (52.00)	1.55	.95-2.53	0.08	1.58	0.96-1.04	0.07
Residence								
Urban	1,516 (60.81)	977 (39.19)	1	-	-	1	-	-
Rural	707 (60.69)	458 (39.31)	1.01	0.8-1.16	0.94	0.9	0.78-1.05	0.18
TB forms								
Ppos	430 (64.08)	241 (35.92)	1	-	-	1	-	-
Pneg	748 (58.07)	540 (41.93)	1.29	1.06-1.56	0.01	1.24	1.02-1.51	0.03
EPTB	1,045 (61.51)	654 (38.49)	1.12	1.06-1.34	0.24	1.08	0.89-1.30	0.45

Table 4: Crude and Adjusted odds ratios for various factors that might affect treatment outcome among tuberculosis patients, in two hospitals of the Region. TB: tuberculosis, OR: Odds Ratio, CI: Confidence interval, N: number, *All the variables in the table are included in the model.

Discussion

TB has long been recognized as a major public health problem since the 1950s. The prevention and control efforts have been initiated and implemented as DOTS strategy in the 1990s [13]. In line with the WHO 2005 report on global TB control [11], the treatment success rates under the DOTS programs among 22 (HBCs) ranged from 60% in Uganda to 93% in China, with a mean of 83%. Our study found that the treatment outcome of TB patients treated under DOTS program in Benishangul Gumuz Region was low. The treatment success rate of all cases was 60.77%.This finding is higher than the study reported by Shargie et al. in southern Ethiopia that has shown the treatment success rate of all TB cases was 49% [14] and the study reported in ref. [15] that indicated the treatment success rate of all TB cases was 29.5% in Gondar University Teaching Hospital, northwest Ethiopia. However, it is lower than the WHO international target of 87% (updated target 2011–2015). The low treatment success rate observed in this study as compared to WHOs average might be due to high not evaluated rate 775 (21.19%), loss to follow up rate 315 (8.61%), and

death rate 341 (9.32%), particularly the high loss to follow up rate and death rate deserve special attention.

This study showed that the trend of not evaluated (previously called transferred out) was significantly increased from year to year in opposite to the trend of lost to follow up which was decreased. In the meantime, data from this study revealed that treatment success rate achieved the WHO international target of 87% (updated target 2011–2015) in 2012 (88.7%) and retreatment cases have not an increased risk of unsuccessful outcome compared to new cases. This could be the result of the decentralization of DOTS to health posts in Benishangul Gumuz Region that has substantially reduced treatment lost to follow up from 28.10% in 2003 to 1.2% in 2012. According to the report, this was attributed to two main factors: health posts nearer to patients' residence and the use of volunteer community health workers (CHWs) in tracing patients who lost to follow up from treatment [9]. This is also consistent with a finding in Tanzania where community based DOTS had higher successful outcome rate (81%) as compared to facility based DOTS (70%) [16].

Patient registration documents assessed lack information about the HIV status of our study participants. As shown in Table 2, we analyzed the death rate across the age groups of TB patients and as the age increase the death rate of patients was steadily increased from 6.75% in the age group of 0-14 years to 16% in the age group of 45-64 years. This is in agreement with the finding of a study conducted by Lee et al. [17]. Increase in age has been previously reported to be a risk factor for death, partly due to increasing comorbidities as well as the general physiological deterioration with age [18,19]. Therefore, close monitoring of treatment outcome in older patients is essential. Male TB patients had lower treatment success rate than females. This in line with other reports that indicated women had higher probabilities of successful treatment outcome [20,21]. Our result also showed the absence of overall treatment success rate difference in Assosa and Pawe, though significantly high rates of not evaluated and lost to follow up were observed in Pawe and significantly high rate of death observed in Assosa. This might be associated with the infrastructure difference between two zones.

Treatment failure rate ranged from 0.1% in Zimbabwe to 9.1% in the Russian Federation, with a mean of 1.5% in (HBCs) [11]. Treatment failure rate in the current study was 0.11%, where it is lower than the average treatment failure rate of the HBCs. This might give a clue the presence of lower of multi drug resistant strains prevalence of M. tuberculosis in the Region.

In our study the proportion of EPTB was 46.45%. While smear negative and smear positive pulmonary TB cases were 35.21% and 18.34% respectively. This figure indicates the overall increase of smear negative pulmonary TB compared to smear positive. Similarly, registration in DOTS programme areas in Addis Ababa, Ethiopia has shown a continuous increase in the proportion of smear-negative pulmonary TB from 36.3% in 1992 to 66.3% in 1999 [22]. The large proportion of smear negative pulmonary TB cases might be due to high proportion of TB-HIV co-infection at the study area, as shown by a previous study [15]. HIV-infected patients are twice as likely to have sputum smear-negative, culture-positive pulmonary TB [23-25].This may result from their compromised immune response cause less cavity development [26].

The major short comings of our study were selection bias and lack of information about the HIV status of the study participants. However, this study revealed that TB treatment success rate is lower than the national average (85%) [3], warranting the need to strengthen the DOTS strategy in the Region.

Conclusion

The treatment success rate of TB patients treated in two hospitals of Benishangul Gumuz Region in western Ethiopia was low (60.77%). The death rate of patients was 9.32%, which needs special attention as it is a serious public health concern. To improve treatment outcome of TB patients we recommend to strengthen supervision and monitoring, improved counseling during the intensive and continuation phases of treatment, home visits and motivation of patients (lost to follow up tracing) and health education to reduce treatment interruption.

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