Introduction

Tuberculosis (TB) is one of the major global health problems, which ranked as the second leading cause of death from an infectious disease worldwide next to human immunodeficiency virus (HIV) that causes ill health among millions of people each year [1]. Based on the latest 2012 World Health Organization (WHO) estimates there were an estimated 8.6 million people developed TB and 1.3 million died from the disease (including 320,000 deaths among HIV-positive people). Increased numbers of TB deaths are occurring unacceptably while most cases are preventable [2].

Since WHO declared TB as a global public health emergency in 1993, starting in the mid-1990s, various efforts to improve TB care and control intensified at national and international levels. WHO developed the Directly Observation Treatment Short Course (DOTS), which is internationally recommended as most effective and cost-effective TB control strategy particularly in low-income country [1,3]. A successful DOTS approach has five-component packages comprising political commitment, diagnosis using sputum smear microscopy, a regular supply of first-line anti-TB drugs, short-course chemotherapy and a standard system for recording and reporting the number of cases detected by national TB control programs (NTPs) and the outcomes of treatment[1]. Treatment for TB takes long period, and high cost of drugs, which resulted wide compliance of patients, mainly in low-income countries. Failure and relapse rates among TB patients in some areas ranged from 10-60% resulting in the wide spread of multi-drug-resistance [4,5].

Beyond the increased difficulty in treating the disease, the patient remained infectious for long, which aggregate the risk to the public and to healthcare workers. Multi-drug resistant (MDR) TB also appears in association with HIV infection and AIDS which accelerate the progression of TB infection into active TB disease, further compromising the health and the immune system of these patients [6-8]. In the absence of treatment natural history of TB showed mortality could reach 70% within 10 years among smear positive and HIV-negative cases of pulmonary; 20% among culture positive (but smear negative) within 10 years. However, since 1995, over 51 million people were successfully treated and an estimate of 20 million lives saved through DOTS strategy and the Stop TB Strategy [1].

Keywords: TB; PTB; HIV-TB co-infection; Treatment
Principally treatment of TB aims at curing patients, interrupting transmission and preventing emerging of drug resistant bacilli [9]; still, these did not bring achievement in several regions of the world. Probable causes are death of patients in the course of treatment, default or resistance of bacilli to the drugs prescribed [10]. Treatment outcome show the quality of TB treatment delivered by a health system. Treatment outcome evaluation using standardized categories has been issued by WHO in conjunction with the European Region of the International Union against TB and Lung Diseases (IUATLD) [11].

At present, the Gambella Regional Hospital gives diagnostic and treatment services for TB patients based on the direct observed treatment short course (DOTS) program. In the region, TB is one of the listed causes of mortality, morbidity based on the hospital data, and WHO reports [12]. HIV/AIDS sero-prevalence indicators showed a gradual decline from year 2004 to 2010 from a prevalence of 4.3% to 2.8% in adults, which is found to be high, compared to other parts of the country. This study designed to assess treatment outcome of TB cases in Gambella Regional Hospital, Southwestern Ethiopia.

Materials and Methods

Study area

The study conducted in Gambella Peoples National Regional State, Gambella town. The region is located in the Southwestern part of Ethiopia and borders of Oromia region to the North and east and the Southern Nations, Nationalities and Peoples’ Regional State to the south and South Sudan to the west. Gambella is a name for both the region and the city, which is located about 753 kilometers West of Addis Ababa perched at an elevation of 526 meters above sea level (Figure 1). The town is founded on the banks of the River Baro, Ethiopia’s widest and the only navigable river. The Gambella Regional state has one Government owned Hospital located at Gambella Town, where the present study conducted. According to the Gambella Health Bureau, the Hospital gives serves for 390, 593 populations, which is the population of the region [13], while on average the hospital is visited annually by 44, 269 health service seekers [14].

Figure 1: Map of the study area (Gambella Town, where Gambella Regional Hospital is located, right side of the map)

The hospital has a Directly Observed Therapy; Short-Course (DOTS) TB clinic, under which the diagnosis of PTB is followed by examination of three sputum smears by Zihel–Nielsen staining method for acid fast bacilli (AFB) besides, chest radiographs and pathological investigations are also used to support the diagnosis. Patients diagnosed with TB referred to the DOTS clinic where they are registered and treated according to the national TLCP guideline.
Study design and data collection

A three-year retrospective descriptive analysis to assess treatment outcomes and risk factors of 1,156 TB patients registered from January 2011 to June 2013 carried out in Gambella Regional Hospital DOTS clinic. Basic demographic data such as patient’s age, sex, address, HIV sero-status, patient type, and TB type and treatment outcome were included in the pre-arranged collecting format. Treatment outcome evaluated in accordance with the National TB and Leprosy Control Program (NTLCP) adopted from the WHO [15].

Cured: (finished treatment with negative bacteriology result of the treatment). Treatment completed (finished treatment but without bacteriology result of their treatment). Defaulted: (patients who interrupted their treatment for two consecutive months or more after registration). Treatment failure: -(remaining smear-positive at five months despite correct intake of anti-TB medication). Died: (patients who died from any cause during the course of treatment). Transferred out: (patients whose treatment result is unknown due to transfer to another health facility). Successfully treated (a patient who was cured or completed treatment), and Unsuccessful treatment: (Patients, whose treatments were interrupted, transferred out or failed on treatment). Patients provided with free TB medications for a period of 6 to 8 months by the DOTS center in the hospital. Patients followed up regularly until completion of their treatment [15].

Statistical analysis

All the data entered on Microsoft Excel spreadsheets and analyzed using the Stata Version 12, software package. For categorical outcomes, we used proportions with 95% confidence interval, Odds ratio and tested the differences using the Chi-square test or the Fisher exact test to compare different groups. To ensure the quality of data entered into the computer, two people were independently crosschecks each entry. Multi-variate analysis using logistic regression model used to analyze the association between treatment outcome and potential predictor variables. P-values of less than 0.05 considered statistically significant.

Ethical permission

The Institutional Ethical Clearance Committee, Aklilu Lemma Institute of Pathobiology, Addis Ababa University, ethically cleared the study and a working permission obtained from the Gambella Regional Health Bureau.

Results

Demographic characteristics of study targets

From 1,156 TB patients documented at the Gambella Regional Hospital between January 2011 and June 2013, males comprised of 698 (60.38%) while females 458 (39.62%). Regarding TB type 905 (78.29%) cases were PTB and 251 (21.71%) were EPTB patients. The mean age of the patients was 26.64 years, ranging from 0.5 to 85 years. Around 776 (67.13%) of the patients were in the age group of 15-44 years. Out of 1,156 patients registered with residential area indicating 1,071 (98.61%) from urban while 15 (1.38%) from rural area (Figure 2).

Figure 2: Distribution of TB patients (n=4224) by sex, age category, patient’s residence, TB type and Patient type in Gambella regional Hospital, Southwest Ethiopia, Gambella town from January 2011 to June 2013.
was seen in 814 (70.42%) of the cases in the study. In the meantime, 97
WHO 2012-reported treatment success rate of TB among all new cases
1,156 TB patients as shown in Table 1. A successful treatment outcome
these, 167 (59.6%) were males and 113 (40.4 %) were females. From
Recently aggravated by the HIV/AIDS epidemic, this remains a major
cause of morbidity and mortality for poor nations [16].

Table 1: Proportions of treatment outcomes in Gambella Regional
hospital from January 2011 to June 2013.

| Treatment outcome | Proportions N (%) |
|-------------------|-------------------|
| Successfully treated | 814(70.42) |
| Died | 43(3.72) |
| Failure | 4(0.35) |
| Defaulted | 97(8.39) |
| Transfer out | 198(17.13) |

Discussion

TB is one of the chronic infectious diseases, which remained a
significant cause of morbidity and mortality for poor nations [16].
Recently aggravated by the HIV/AIDS epidemic, this remains a major
public health problem in developing countries including Ethiopia [17].
WHO 2012-reported treatment success rate of TB among all new cases
in 2010, from the 22 high burden countries, eight of them including
Ethiopia reported lower than 85%. This study found the successful
treatment rates of all TB cases 814(70.14%) treated at the DOTS clinic
in Gambella Regional Hospital, which, is lower than the national
report by [2] and a study result obtained from Northwestern Ethiopia
at Kolla Diba health center that exceeds 85%[18]. This lower treatment
outcome may be due to high transfer rate, default, and death rates
(Table 1).

Meanwhile the treatment success rate of this study is similar in a
study conducted in rural parts of Ethiopia by [19] and report of [15],
as 70 and 78 % respectively. Similarly, the success rate found to be
similar with Switzerland (70%) [20]. On the contrary, the treatment
success rate of present study was found lower than a surveillance and
outbreak report conducted in three European countries (85%) [21],
Brazil (75.9%) [22] and Spain 82% [23]; however, it is lower than
reports in California (97.8%) and WHO target success rate in
developing settings (90%) [24].

The result of this study was higher in treatment success rate than a
similar study conducted by [25] in Gambella Regional hospital, which
was 63.40%.

Increased number of transferred out [198(17.12%)] and default
cases [97(8.4%)] may contribute for lower treatment success rate in
this study. In the present study, it found a high death rate (3.7%),
which is in agreement with a result of [18] conducted in Dembia
District Northwest Ethiopia. High death rate observed in the age
groups 15-44 groups 29(2.51%) which is similar with other studies
[26]. The death rate is somehow lower than a study finding from an
Eastern Taiwan and Northwestern Ethiopia at University of Gonder
teaching hospital [27,28].

In our study treatment, 4(0.35%) of failure rate is observed, which
is lower than a study by [26] which was 0.5% conducted in northwest
Ethiopia. HIV-negative cases found to show high treatment success
rate compared to their counter parts. The treatment success rate for
HIV positive and negative cases were 17.26% and 54.85 % respectively
that indicate HIV testing before TB treatment starts is essential
(AOR=1.6, 95% CI=1.20-2.14, p=0.001). Patients in the age group
45-64 had significantly lower treatment success rate compared to the
age groups of 0-14 years (AOR=0.58, 95% CI=0.35-0.93, p=0.026),
which may be due to the chance of HIV co-infection, and other
general physiological deterioration with age, that demands special
attention[27].

Studies showed that HIV infection increases the chance of TB
reactivation and infection [19]. The HIV prevalence rate in the present
study recorded among TB patients was 24.2% which is much lower
than reports from Gondor of 52.1% [29], and higher than in reports
by[26] (1.7%), while, it is found similar in another study conducted in
Northwest Ethiopia [26]. The treatment success rate of all TB-HIV co-
infection cases treated under the DOTS program in the health institute
17.3% (n=185). The death rate among TB-HIV co-infection was
7.85%, the failure rate was 0.3%, and defaulted rate was 10.71%, which
may be due to the chance of HIV co-infection, and other
similar study conducted by [25] in Gambella Regional hospital, which
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infection cases treated under the DOTS program in the health institute
17.3% (n=185). The death rate among TB-HIV co-infection was
7.85%, the failure rate was 0.3%, and defaulted rate was 10.71%, which
shows that a close special attention to HIV-positive TB cases is
required in the study area. This study showed that patients with PTB-
HIV co-infection were more likely to have favorable treatment
outcome (56.42%) than EPTB-HIV co-infection cases (9.6%), possibly
because their illness is more severe and symptomatic [30, 26] or
probable the increased number of PTB-HIV co-infection may
contribute for the difference (Tables 2-4).
### Table 2: Treatment outcome of TB patients (n=1,156) by sex, age group, residence, and TB type, at Gambella Regional Hospital, Southwest Ethiopia, January 2011 to June 2013.

| Characteristics | Treatment outcomes |
|-----------------|-------------------|
|                 | Cured N(%) | Treatment competed N(%) | Failure N(%) | Defaulted N(%) | Died N(%) | Transferred out N(%) | Total |
| **Sex**         |            |                        |              |                |           |                     |       |
| Male            | 154(13.32) | 334(28.89)              | 1(0.09)      | 59(5.10)       | 24(2.08)  | 126(10.90)           | 698   |
| Female          | 108(9.34)  | 218(18.86)              | 3(0.36)      | 38(3.29)       | 19(1.64)  | 72(6.23)             | 458   |
| **Age (years)** |            |                        |              |                |           |                     |       |
| 0-14            | 11(0.95)   | 158(13.67)              | -            | 15(1.30)       | 7(0.61)   | 31(2.68)             | 222   |
| 15-44           | 225(19.46) | 316(27.34)              | 3(0.26)      | 68(5.88)       | 29(2.51)  | 135(11.68)           | 776   |
| ≥ 65            | -          | 5(0.43)                 | -            | 1(0.09)        | -         | 3(0.26)              | 9     |
| **Residence**   |            |                        |              |                |           |                     |       |
| Urban           | 258(22.32) | 549(47.49)              | 4(0.35)      | 97(8.39)       | 43(3.72)  | 190(16.44)           | 1,141 |
| Rural           | 4(0.35)    | 3(0.26)                 | -            | -              | -         | 8(0.69)              | 15    |
| **TB type**     |            |                        |              |                |           |                     |       |
| PTB             | 252(21.80) | 391(33.82)              | 4(0.35)      | 77(6.66)       | 34(2.94)  | 147(12.72)           | 905   |
| EPTB            | 10(0.87)   | 161(13.93)              | -            | 20(1.73)       | 9(0.78)   | 51(4.41)             | 251   |

### Table 3: Treatment outcome of seropositive TB patients by sex, age group, residence, and TB type (n=280), Gambella Regional Hospital, Southwest Ethiopia, January 2011 to June 2013.

| Characteristics | Treatment outcomes |
|-----------------|-------------------|
|                 | Cured N(%) | Treatment competed N(%) | Failure N(%) | Defaulted N(%) | Died N(%) | Transferred out N(%) | Total |
| **sex**         |            |                        |              |                |           |                     |       |
| Male            | 34(12.14)  | 75(26.79)               | -            | 20(7.14)       | 12(4.29)  | 26(9.29)             | 167   |
| Female          | 26(9.29)   | 50(17.86)               | 1(0.36)      | 10(3.57)       | 10(3.57)  | 16(5.71)             | 113   |
| **Age (years)** |            |                        |              |                |           |                     |       |
| 0-14            | 1(0.36)    | 14(5.00)                | -            | 3(1.07)        | 2(0.71)   | 3(1.07)              | 23    |
| 15-44           | 55(19.64)  | 99(35.36)               | 1(0.36)      | 24(8.57)       | 18(6.43)  | 38(13.57)            | 235   |
| ≥ 65            | 4(1.43)    | 12(4.29)                | -            | 3(1.07)        | 2(0.71)   | 1(0.36)              | 22    |
| **Residence**   |            |                        |              |                |           |                     |       |
| Urban           | 58(20.71)  | 123(43.93)              | 1(0.36)      | 30(10.71)      | 22(7.86)  | 39(13.98)            | 273   |
| Rural           | 2(0.71)    | 2(0.71)                 | -            | -              | -         | 3(1.07)              | 7     |
| **TB type**     |            |                        |              |                |           |                     |       |
| PTB             | 59(21.07)  | 99(35.36)               | 1(0.36)      | 27(9.64)       | 17(6.07)  | 36(12.86)            | 239   |
| EPTB            | 1(0.36)    | 26(9.29)                | -            | 3(1.07)        | 5(1.76)   | 6(2.14)              | 41    |

Table 3: Treatment outcome of seropositive TB patients by sex, age group, residence, and TB type (n=280), Gambella Regional Hospital, Southwest Ethiopia, January 2011 to June 2013.
In summary, this study shows that TB patients’ treatment success rate treated at the Gambella Regional Hospital DOTS clinic in South West Ethiopia found below the national rate (70.42%). The treatment outcome in the clinic showed 3.72% of death, 8.39% defaulted, 0.35% treatment failure, and 17.13% transferred out cases. This study also revealed positive association of treatment success rate with that of HIV-negative cases. Older age groups showed a decreased treatment success rate compared to younger groups. Treatment of HIV-TB co-infection cases needs a better attention in the study area with coordinating and monitoring treatment outcome of TB control program. As a recommendation, further research should be done to identify causes of a common reason for unsuccessful treatment outcome in TB patients and working on the awareness of the disease in the community.

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