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Prevalence of Tuberculosis in Gambella Regional Hospital, Southwest Ethiopia: A Retrospective Study to Assess the Progress towards Millennium Development Goals for Tuberculosis (2006-2015)

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Abstract A retrospective study was carried out to evaluate the progress towards millennium development goals and to generate preliminary epidemiological information on tuberculosis (TB) in Gambella town hospital and its surroundings in Southwestern Ethiopia. The medical records of all TB patients registered from 2009 to 2014 were assessed retrospectively. A total of 2519 TB patients were registered for the last 6 years and treated in Gambella Regional Hospital. The sex proportion of male TB patients was 60.18 % (1516/2519). The mean and the standard deviation of age was 23.8±13.18. The age group between 15-44 years in both sexes was most frequently affected with both forms of TB (pulmonary tuberculosis and extra pulmonary tuberculosis), 1660 (65.9%) followed by 0-14 years of age 508 (20.2%). Of 2519 tuberculosis cases registered in the last 6 years, 637(25.3%) of them were extra pulmonary tuberculosis cases and the rest 1884 (74.79%) were pulmonary tuberculosis cases. Out of 2519 TB cases registered during the six years, 1516 (60.18%) were males, and higher tuberculosis cases were registered ($\chi 2 = 4.191$; $p=0.022$). The annual trends of TB for both sexes were gradually declined in the last six years. In conclusion, the retrospective study showed that although there was reduction in the number of both pulmonary and extra-pulmonary tuberculosis cases in the study area, what should not be undermined is the importance of regular prognostic evaluation among tuberculosis cases. Hence, we re-emphasize that Tuberculosis Control Program should give attention to control of tuberculosis and HIV-TB co-infection in Gambella Region.

Keywords: *extra pulmonary tuberculosis, Gambella, pulmonary tuberculosis, tuberculosis*

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1. Introduction

Tuberculosis (TB) is a highly infectious bacterial zoonosis, which is recognized as one of the most important threats to human and animal health causing significant mortality, morbidity and economic losses in the world, particularly in developing nations [1,2]. It remains a major global health problem and causes ill-health among millions of people each year and ranks as the second leading cause of death from an infectious disease worldwide after the human immunodeficiency virus (HIV) [3,4,5].

Tuberculosis is one of the oldest classic, long lasting and persistent zoonosis, and is the leading cause of death due to single infectious agent known among the adults in the world [6,7]. The people with HIV/acquired immunodeficiency syndrome (AIDS) are more susceptible to TB [7]. With the advent of chemotherapy during 1940s and establishment of standardized short course treatment regimen in 1970s and 1980s, it was believed that TB would surely be conquered soon. Steady declines in case notifications were observed in most of the developed countries from 1950s to 1980s [8]. While no such declines were seen in most developing countries, a reversal of the declining trend occurred in the developed world during late 1980s [8].

New challenges emerged in the form of HIV epidemic and evolution of multi-drug resistant (MDR) TB. Consequently, TB was declared a global emergency by the World Health Assembly (WHA) in 1991 and a frame work for TB control was developed in the form of DOTS; the internationally recommended strategy for TB control [9]. Within the framework of DOTS, annual targets of 70% case detection of new smear positive pulmonary TB

(PTB) cases, and 85% treatment success were set to be achieved by the year 2000, which were later revised to 2005.

The principle target of United Nations Millennium Development Goals (MDGs) for TB control adopted in the year 2000 is to ensure that the incidence rate of TB is declining by 2015 (UNSD, 2007). The supplementary targets are to halve the prevalence of TB and TB mortality rates by 2015 as compared to 1990. The ultimate goal is to eliminate TB by 2050, when the annual incidence should be less than one case per million populations [11].

Globally, the TB mortality rate (deaths per 100 000 population per year) has fallen by 45% since 1990, and TB incidence rates (new cases per 100 000 population per year) are decreasing in most parts of the world. Between 2000 and 2013, an estimated 37 million lives were saved through effective diagnosis and treatment. The global TB strategy developed by WHO for the period 2006-2015 is to stop TB. The overarching goal of this strategy is to achieve 2015 global targets for reductions in the burden of disease caused by TB. These targets are that incidence should be falling, and that prevalence and incidence rates should be halved by 2015 compared with 1990 levels.

In 2013, there were an estimated 9.0 million incident cases of TB (range, 8.6 million 9.4 million) globally, equivalent to 126 cases per 100 000 population. The absolute number of incident cases is falling slowly at an average rate of 1.5% per year 2000−2013 and 0.6% between 2012 and 2013.

Most of the estimated number of cases in 2013 occurred in Asia (56%) and the African Region (29%); smaller proportions of cases occurred in the Eastern Mediterranean Region (8%), the European Region (4%) and the Region of the Americas (3%). There are 22 countries that are sometimes referred to as the TB “high burden” countries, and they have been prioritized at a global level since 2000 (WHO, 2014). The six countries that stand out as having the largest number of incident cases in 2013 were India (2.0 million–2.3 million), China (0.9 million–1.1 million), Nigeria (340 000−880 000), Pakistan (370 000−650 000), Indonesia (410 000−520 000) and South Africa (410 000−520 000); India and China alone accounted for 24% and 11% of global cases, respectively (WHO, 2014).

Of the 9.0 million incident cases, an estimated 550 000 were children and 3.3 million (range, 3.2–3.5 million) occurred among women. The 9.0 million incident TB cases in 2013 included 1.0 million–1.2 million (11–14%) among people living with HIV, with a best estimate of 1.1 million (13%) the proportion of TB cases co-infected with HIV was highest in countries in the African Region. Overall, 34% of TB cases were estimated to be co-infected with HIV in this region, which accounted for 78% of TB cases among people living with HIV world-wide. In parts of southern Africa, more than 50% of TB cases were co-infected with HIV.

Ethiopia is among the 22 TB high burden countries in the world and the seventh ranked country in the world and the second ranked country in Africa (WHO, 2014). The World Health Organization 2009 report indicated that the status of TB in Gambella Region was the highest from all the Ethiopian Regions, with the notification rate (new and relapse) 261- 421/100, 000 [12].

The Gambella Regional Hospital is one of the dominant health delivery centers in the region that holds a total of the whole people of the region estimated to be 406, 000 population (CSA, 2013/2014) and an average of 58, 500 people visit in the hospital and gets service annually.

At present, the Gambella Regional Hospital gives diagnostic and treatment services for TB patients based on the direct observed treatment short course (DOTS) program. TB is one of the listed causes of mortality and morbidity in the area based on the hospital data and WHO, 2009 reports. HIV/AIDS sero-prevalence indicators showed a gradual decline from year 2004 to 2010 from a prevalence of 4.3% to 2.8%, which is found to be high, compared to other parts of the country. This study was designed to evaluate the trends of tuberculosis along the six year duration and to generate preliminary epidemiological information on TB in Gambella town and its surroundings in Southwestern Ethiopia.

2. Materials and Methods

2.1. Study Area

The study was conducted in Gambella Hospital of Gambella town, regional state, Southwest Ethiopia. The Gambella People's Regional State is located south west Ethiopia between the geographical coordinates of 6^0 28'38" to 8^0 34' North Latitude and 33^0 to 35^0 11’11" East Longitude, 766 km far from Addis Ababa which covers an area of about 34,063 km^2. The Region is bounded to the North, North East and East by Oromya National Regional State, to the South and Southeast by the Southern Nations and Nationalities People's Regional State and to the Southwest, West and Northwest by the Republic of south Sudan [13].

Most of Gambella region is flat and its climate is hot and humid. The mean annual temperature of the Region varies from 17.3°C to 28.3°C and absolute maximum temperature occurs in mid-March and is about 45°C and the absolute minimum temperature occurs in December and is 10.3°C. The annual rainfall of the Region in the lower altitudes varies from 900-1,500mm; at higher altitudes it ranges from 1,900-2,100mm. The annual evapotranspiration in the Gambella reaches about 1,612 mm and the maximum value occurs in March and is about 212 mm [14].

Based on the 2013/2014 Census conducted by the Central Statistical Agency of Ethiopia (CSA), the Gambela Region has total population estimation of 406,000 (CSA, 2013/2014).

2.2. Study Methodology

TB registry Casebooks of Gambella Regional Hospital were used to assess the situation of TB from 2009 to 2014 in Gambella town and its surroundings. Variables such as forms of TB, sex, age pattern, patient type and as well as TB and HIV co-infection were assessed.

2.3. Ethical Considerations

Ethical clearance was obtained from the Ethical Committee of Gambella Regional Health Office (Ref. number of 16/3776/7) and working permission was obtained from the hospital higher managers.

2.4. Statistical Data Analysis

The recorded data was entered and stored in Microsoft Excel computer program and analyzed by STATA version 11 (STATA Corp. College station, TX). The variations between different factors were also analyzed using multi variable logistic regression and chi-square ($\chi 2$) was used for association of different risk factors. A p-value <0.05 was considered statistically significant at 95% confidence interval was considered.

3. Results

A total of 2519 TB patients were registered for the last 6 years and treated in Gambella Regional Hospital. The sex proportion of male TB patients was 60.18 % (1516/2519). The mean and the standard deviation of age was 23.8±13.18. Tuberculosis most frequently affected the age group between 15- 44 years in both sexes in both forms of TB (PTB and EPTB), 1660 (65.9%) followed by 0-14 years of age 508 (20.2%).

From the 2519 TB cases registered in the last 6 years, 637(25.3%) of them were extra pulmonary tuberculosis cases and the rest 1884 (74.79%) were pulmonary tuberculosis cases. Out of 2519 TB cases registered during the six years, 1516 (60.18%) were males and higher TB cases were registered ($\chi 2$ =4.191; p=0.022) and the annual trends of TB for both sexes were gradually declined in the last six years.

Table 1. All forms of tuberculosis cases in Gambella Region from 2009-2014

Years	Total TB patients	Smear		Sex		Age category				Forms of TB		HIV status		Types of TB patients			Treatment response					
		Positive TB	Negative TB	Male	Female	0-14	15-44	45-64	>=65	Pulmonary TB	Extra pulmonary TB	Reactive	Non-reactive	New	Relapsed	Others	Treatment completed	Cured	Transferred out	Defaulted	Died	Failure
2009	545	149	393	303	242	131	342	56	10	279	266	108	185	505	28	11	172	57	29	3	9	0
2010	540	171	367	312	228	143	329	63	5	427	113	104	391	500	24	15	206	92	115	23	20	2
2011	355	125	230	230	125	60	238	52	5	262	93	99	243	332	9	13	152	69	47	23	17	1
2012	386	171	214	232	154	48	285	49	4	335	51	109	272	355	18	13	130	98	73	26	14	4
2013	385	134	251	244	141	77	258	41	9	328	59	104	272	346	12	26	152	99	53	11	21	1
2014	308	107	201	195	113	49	208	41	10	253	55	81	216	278	15	15	83	57	111	3	16	2
Total	2519	857	1656	1516	1003	508	1660	302	43	1884	637	605	1579	2316	106	97	895	472	428	89	97	10

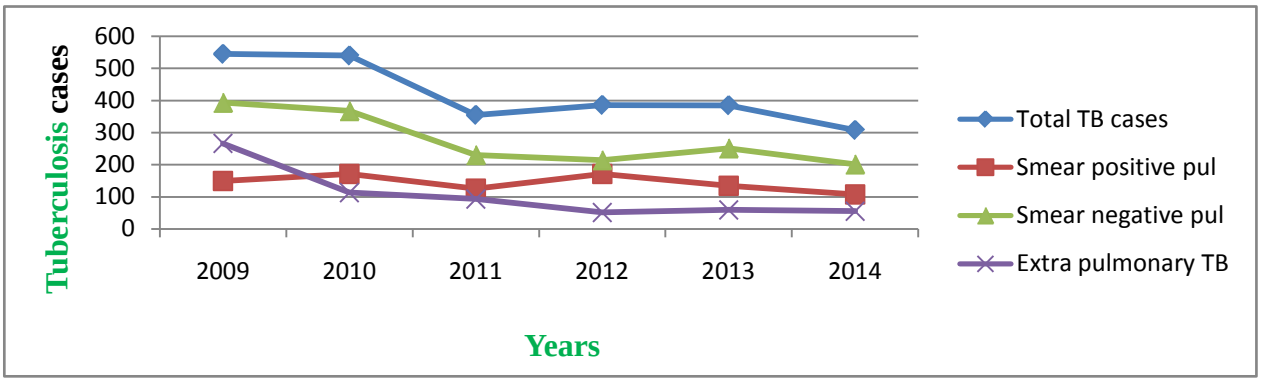

Figure 1. Trends of all forms of tuberculosis along the six year period

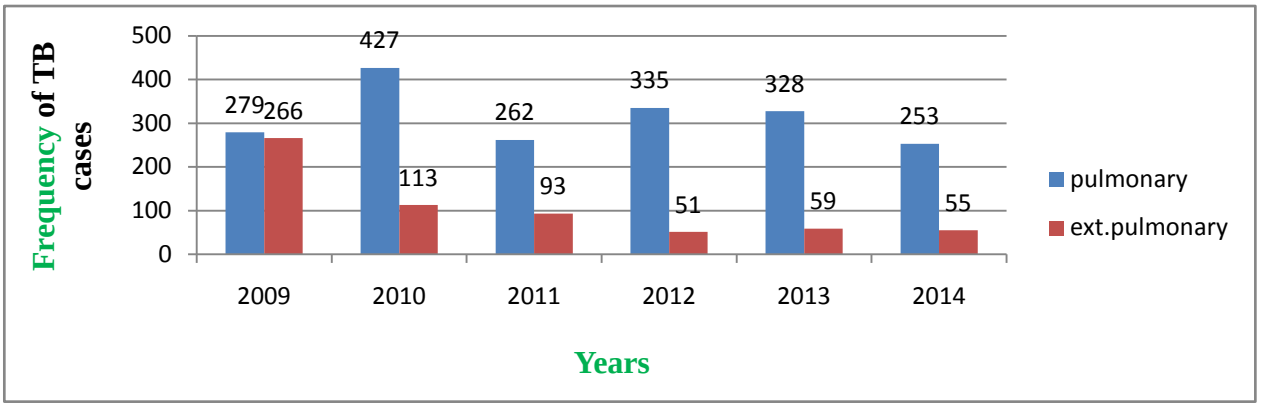

Figure 2. Six year trends on the forms of tuberculosis

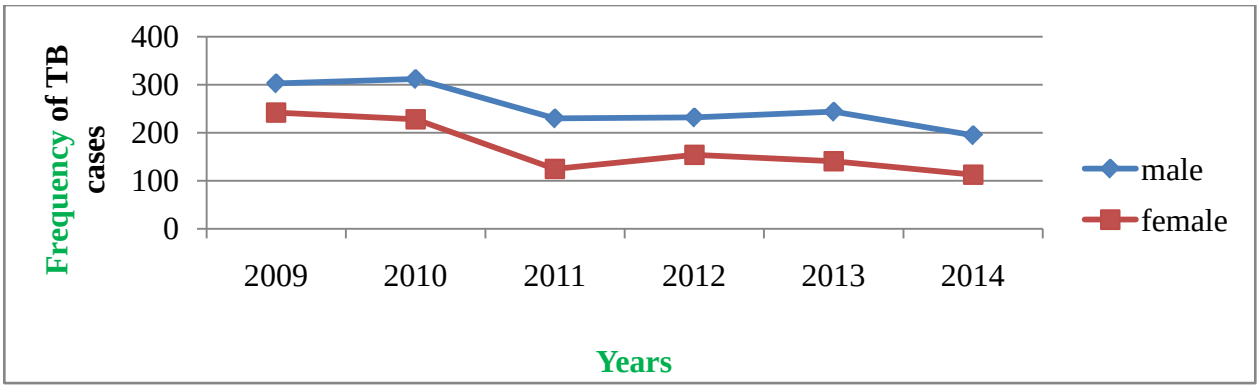

Figure 3. Trends of tuberculosis along sex distribution

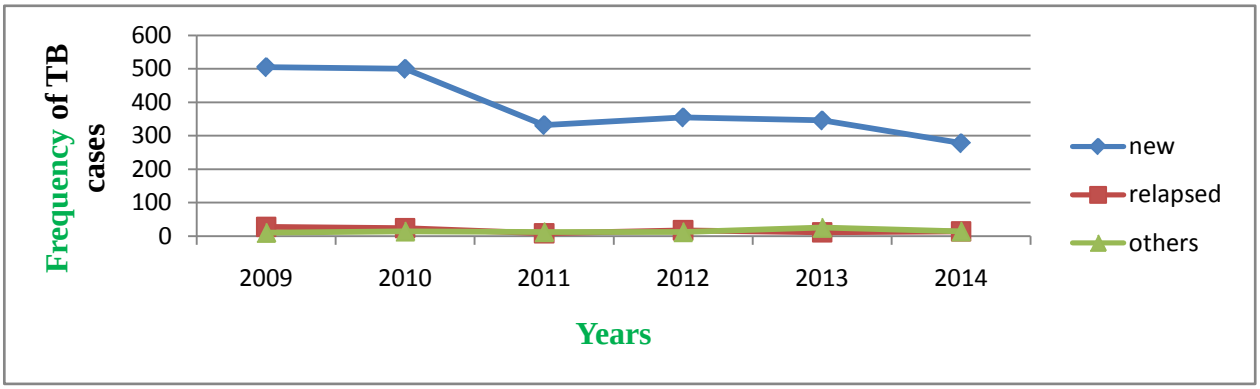

Figure 4. Types of tuberculosis cases observed in the six year trend

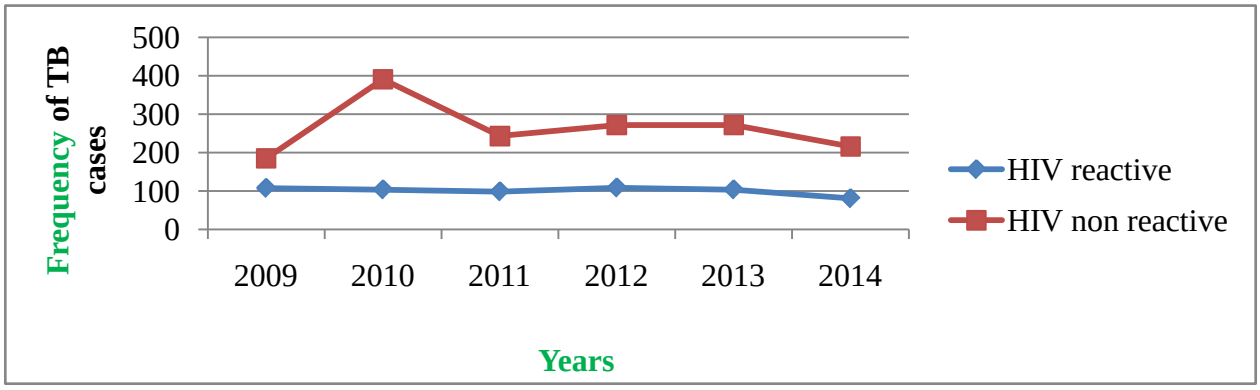

Figure 5. Trends of tuberculosis with HIV co-infection

Table 2. Associations of various risk factors with different tuberculosis forms

Variables	Total TB cases	TB category		χ2	P-value
		Pulmonary (%)	Extra pulmonary (%)		
Sex					
Male	1516	1213 (80%)	303(20%)	4.191	0.022
Female	1003	766 (76.37%)	237(23.63%)		
Age category					
0-14	769	769 (100%)			
15-44	1605	1115(69.47%)	490 (30.53%)	719.499	0.000
45-64	97		97(100%)		
>=65	43		43(100%)		
Resident					
Urban	1798	1798 (100%)		2117.266	0.000
Rural	721	86 (11.93%)	635 (88.1%)		
Patient type					
New	2316	1884(81.35%)	432 (18.7%)	655.078	0.000
Relapsed	106		106 (100%)		
Others	97		97(100%)		
HIV status					
Reactive	605	605 (100%)		268.370	0.000
Non-reactive	1579	1279 (81%)	300 (19%)		

4. Discussion

Tuberculosis has long been recognized as a major public health problem worldwide since the 1950s. By considering the impact, WHO initiated implementation of DOTS strategy in the 1990s to minimize the problem, yet it ignited by the HIV / AIDS epidemic, still remains a major health problem in Ethiopia and other developing countries [15]. This study used six years TB retrospective data to analyze the progress of TB pattern in the area.

In our study, it was observed that males comprised of the higher proportion of TB compared to females and is in agreements with [16-22].

Age groups of 15-44 years were affected more than the other age groups, which is consistent with WHO [27] report. This is also is in agreement with the reports of other previous studies [16-22].This may be due to the fact that this age group is sexually active and hence infected with HIV, which predisposes this group to TB. The proportions of the different types of TB recorded in the area were similar with those reported [22,23,25]. On the other hand, lower proportions were recorded from India [26]. The proportion of smear positive TB recorded by the present study was similar with that of the Ethiopian national prevalence [27]. It was also observed that most of the cases were smear negative and co-infected with HIV.

The overall fall of annual distribution of all forms of TB registered cases in this study is in agreement with other studies [28], in Japan [29] and the countries profile (WHO, 2012). The probable reasons of falling down may be due to continuous implementation of DOTS, increased availability of health facilities and health service delivery increment and increased awareness by the public about the disease in the area [30]. Currently, due to DOTS program implementations in the study area, the relapse and defaulters cases were generally in a decreasing manner per years in responding to the program, which was similar to other studies done in South Ethiopia [16], in Northwestern Shewa [31], in Western Ethiopia [21] and in Jijiga district [32]; yet these studies showed increased observations of relapse cases contrary to the present study. Thus, this decreasing in the observation of relapse cases may show the low drug resistance strain circulation in the area.

The proportion of TB in HIV positive individuals was found to be 24% in this study, which is higher than the national incidence (6.3%), according to the WHO report [33]. This high proportion of TB and HIV co-infection in area may be due to the high HIV/AIDS dissemination that would have the effect on TB development.

5. Conclusion

Prevalence of both pulmonary and extra-pulmonary tuberculosis showed a downward trend. Most new infections were found to be pulmonary tuberculosis, and no drug resistance was noted among the prevailing *Mycobacterium* strains. Results of this study have also noted a reduction in the number of relapse infections among pulmonary tuberculosis cases. The cause of concern is the increasing trends in the tuberculosis cases among HIV seropositive individuals, which were noted to be more in this particular region as compared to the average prevalence throughout the country. It is, therefore, imperative that to control the spread and stop TB cases, TB elimination programmes should also concentrate on the HIV-TB co-infection.

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