



Prevalence and Treatment Outcome of Smear Positive Pulmonary Tuberculosis Patients in General Population of District Swat, Pakistan

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Abstract

Mycobacterium tuberculosis is responsible for causing TB disease. Primarily it infects the lungs, which is known as pulmonary tuberculosis when the disease disseminates to other parts of the body known as extra-pulmonary tuberculosis. Recently, WHO ranked Pakistan the fifth TB endemic country in the world. The objective of this study was to evaluate the prevalence and treatment outcome of smear-positive PTB patients among all forms of TB registered with TB centre at District Swat. Two-year data from January 2016 to December 2017 were reviewed. In this study period, complete information of total 1392 cases of pulmonary tuberculosis (PTB) were reviewed. Of these, 626(45%) were founded to be males, while 766(55%) were females with an overall mean age of 32.9 years. In the age-wise distribution, this study showed a high number of cases, 657(47.3%) in the economic age group from 16-30. In contrast, the lowest number of cases, 112(8%), were recorded in the 60 years older adults. Of the two-year study period, 745(53.5%) patients were recorded in 2017, while 647(46.5%) patients were recorded in 2016. The overall prevalence rate in the 100,000 population was calculated to be 58.8(0.058%). Based on seasonality, high cases notification was reported in quarter 2 (April- June), while lower cases notification was recorded in quarter 4 (October-December). Treatment outcome record showed that 861(61.9%) were cured, 452(32.5%) treatment completed, 34(2.4%) died, 13(0.9%) treatment failed, 32 (2.3%) lost to follow up, and no patient was transferred to other facilities. In conclusion, still, PTB is prevalent in the district, and the overall treatment success rate is low.

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Introduction

Tuberculosis (TB) is an ancient infectious disease. Previous research on the human skeleton revealed that this disease has been suffering humans for thousands of years (Hershkovitz *et al.*, 2008). its causative agent was obscure until Robert Koch discovered it on March 24, 1882, which was a bacillus and then named as *Mycobacterium tuberculosis* (Cambau & Drancourt, 2014). The disease is airborne and can be transmitted by coughing or sneezing from infected individuals. It mainly affects the lungs, known as pulmonary tuberculosis. But can also affect other parts of the body except hairs and nails, which is term as extra-pulmonary tuberculosis (EPTB) (WHO, 2010).

According to World Health Organization, globally, 10 million people got suffered from TB in 2019. Of the total, 7.1 million people were officially detected. Furthermore, 87% of new TB cases has been notified from 30-TB high burden countries. The countries that account for two-thirds of the total includes India, China, Indonesia, the Philippines, Bangladesh, South Africa, Nigeria, and Pakistan. Pakistan accounts for 61% of the TB burden in the WHO Eastern Mediterranean Region and is hence ranked 5th TB-endemic country in the world (WHO, 2020).

In 2018, the number of new and relapsed cases reported in Pakistan was 360000. While, in 2019, a total of 328,000 cases were reported, which shows a slight decline compared to 2018. Of the total notified cases in 2019, 81 % was pulmonary tuberculosis, while 40% of them was detected with HIV positive. Moreover, the death rate due to TB has significantly dropped from 2016 to 2019; still, TB remains a substantial killer in the country as 20 to 23 deaths per 100,000 population reported. (WHO, 2019 and 2020).

One of the measures for efficient TB control in the community is to increase the rate of effective therapeutic outcomes. The End TB Strategy sets goals for 2030, including 80% reduction in the incidence rate (new cases per 100,000 people per year) and a

90% reduction in mortality rate compared with the number of cases in 2015 (WHO, 2017).

There is a scarcity of epidemiological data on TB in Pakistan, particularly in Khyber- Pakhtunkhwa. The literature search showed that no such study had been carried out in the district Swat of Khyber-Pakhtunkhwa. Contemplating the recommendation of the World Health Organization and the high burden of TB in Pakistan. The current study aims to assess the prevalence and treatment outcomes of smear-positive PTB patients in district Swat, Pakistan, from January 2016 to Dec 2017.

Methods

Study participants

New and retreatment smear-positive PTB patients (2-year cohort) registered with TB control centre (TBC) in central hospital at district Swat, from January 2016 to December 2017.

Inclusion and exclusion criteria

Smear positive PTB patients belong to district Swat were included in the study. In contrast, the patients who belong to other districts, EPTB patients, and smear-negative PTB patients were excluded from the study.

Study design and data collection

A retrospective study was designed, and data related to the patients' demographic, clinical and treatment status were collected from TB treatment card, GeneXpert MTB/RIF, Culture, and drug susceptibility test (DST) report.

Data analysis

After collecting the data, data were categorically arranged and presented in the form of tables. Data analysis was carried out using the Statistical Package for Social sciences (IBM SPSS Statistics version 25).

Ethical considerations

The study was carried out after its protocol was reviewed and approved by District TB control officer Swat.

Results

A total of 6598 cases of all forms of TB patients were registered with TBC at District Swat from January 2016 to December 2017. The current study included only smear-positive PTB patients, 1392 cases out of total [Table 1]. Of the total PTB patients, 626(45%) were males, and 766(55%) were females with an overall mean age of 32.9 years. Analysis of different

age groups revealed 657 (47.3%) highest cases and were found in the age group of 16-30 years.

Whereas the lowest cases, 112 (8%), were noted in the age group above 60 years. While 170(12.2%), 252(18.1%), and 201 (14.4%) cases were reported in the age group of 1-15 years, 31-45 years, and 46-60 years, respectively.

Table 1. All form of TB cases registered during 2016 and 2017.

Year	PTB (Smear positive)	PTB (Clinically Diagnosed*)	EPTB (smear positive or Clinically Diagnosed)	Total
2016	647	1304	1289	3240
2017	745	1253	1360	3358
Total	1392	2557	2649	6598

*Clinically Diagnosed: Smear negative.

Table 2. Prevalence and general characteristics of PTB patients registered with TBC at District Swat, from 2016-2017.

Variables	Frequency	%
Gender		
Male	626	45
Female	766	55
Age		
1-15	170	12.2
16-30	657	47.3
31-45	252	18.1
46-60	201	14.4
>60	112	8
Patient Category		
New	1287	92.4
Relapse	86	6.2
Failure	18	1.3
Default	1	0.1
Seasons/Quarters		
2016- Q1	119	8.5
2017-Q1	184	13.2
2016-Q2	199	14.3
2017-Q2	204	14.7
2016-Q3	183	13.1
2017-Q3	206	14.8
2016-Q4	146	10.5
2017-Q4	151	10.8
Years		
2016	647	46.5
2017	745	53.5
Prevalence per 100,000 populations		
2016-2017	58.8	0.058
Q1: January-March. Q2: April-June. Q3: July-September. Q4: October-December.		

All the cases included in the study were classified in terms of patient's recruitment, 1287 (92.4%) patients were recognized as new cases, 86(6.2%) relapsed, 18(1.3%) were treatment failure, and 1(0.1%) was defaulted case. The cases reported in 2017 were 745 (53.5%) higher than the cases in 2016. The prevalence rate per 100,000 population was 58.8(0.058%) calculated for both years. The cases recorded in both years were arranged based on the months of diagnosis to assess the seasonal effect on PTB patients. A higher

number of cases, 403, were recorded in Q2. In contrast, a lower number of 297 cases were recorded in Q4. In comparison, 303 and 389 cases were identified in Q1 and Q3, respectively [Table 2].

In successful treatment outcome, 861(61.9%) patients were cured, 452(32.5%) treatment completed. While in unsuccessful treatment, 34(2.4%) patients died, 13(0.9%) treatment failed, 32(2.3%) loss to follow up, and no case was reported as transfer out [Table 3].

Table 3. Treatment outcomes of PTB patients registered with TBC at District Swat, from 2016-2017. n=1392.

Treatment outcomes	Patients (n)	%	Total	%
Successful				
Cured	861	61.9		
Treatment Completed	452	32.5	1313	94.3
Unsuccessful				
Died	34	2.4		
Loss to Follow-up	32	2.3	79	5.7
Treatment Failed	13	0.9		
Transfer out	0	0.0		
Total	1392	100.0		

Discussion

For this study data were collected from TB center in central hospital at district Swat. Total 6592 cases of all forms of TB were registered in 2016 and 2017. We analyze only smear-positive pulmonary tuberculosis patients, which was identified (1392) cases out of total (Table 1).

We found that smear-positive PTB patients were higher amongst females, 766 (55%), than males 626(45%). This high incidence in females could be due to many reasons such as limited access to hospitals, poverty, joint family system, poor hygienic condition, poor nutritional status, less availability of health diagnostic facility at the doorstep and high female illiteracy in our society. Along with these, it has been reported that females are more immune-deficient therefore more prone to disease progression (Allotey & Gyapong, 2008; Ahmad *et al.*, 2014).

This finding agrees with other related studies previously conducted in various parts of the world

(Ahmad *et al.*, 2014; Ahmad *et al.*, 2016; Kesete, 2020 and Ahmad & Jadoon, 2015).

Age is a vital factor in the epidemiology of TB. The prevalence of smear-positive PTB patients in this study demonstrated the highest cases (47.3%) in the age group of 16-30 years, followed by (18%), and (14.4%) in the age group of 31-45 years and 46-60 years respectively. However, the lowest cases (12.2%) were recorded in the age group of 1-15 years and (8%) were in the above 60 years old. The highest cases in the age groups could be attributed to socio-cultural practices, travelling, occupational hazards that encourage PTB transmission, and most of our nation's population comprises economical age groups. However, the lowest cases in our study in the age group from 1-15 years could be due to their healthy status and restricted contacts, and in the above 60-year-old people could be due to the exclusion of other form of TB from the current study. The findings of age-wise distribution of PTB patients in this study align with the previous research carried out in other

parts of the world (Abebe *et al.*, 2017; Atre *et al.*, 2004 and Ahmad *et al.*, 2016). The current study also evaluated the seasonal effect on PTB patients. Therefore, cases recorded in both years (2016-2017) were classified in terms of their months of diagnosis. Hence, collectively both years were divided into quarters, Q1 (January to March), Q2 (April to June), Q3 (July to September), and Q4 (October to December). In Q2 higher number of cases (403) were reported, while lower cases (297) were reported in Q3 (Table 2). The valid reason for variation in TB case notification with the season is unclear. However, some factors have been suggested for its reasonable explanation, such as healthcare-seeking behaviours, indoor activity, seasonal change in immune functions (Fares, 2011). A study carried out by Gashu *et al.* reported high cases in Q2 (April to June), which agrees with our findings regarding the highest cases. However, the same study reported the lowest cases in Q4 (Gashu *et al.*, 2018), contradicting our findings regarding the lowest cases. It has also been reported that the seasonal pattern of TB fluctuating with regional variation (Fares, 2011).

This study showed the overall prevalence rate (0.058%) per 100,000 population of PTB patients and the percentage (46.5%) of cases recorded in 2016 while (53.5%) in 2017. Previously no study has been conducted on the prevalence of PTB at District Swat to compare with the current research. However, a study conducted in 2015 at Malakand district (neighbor district of Swat) with which our results is consistent (Ahmad & Jadoon, 2015).

In terms of treatment outcome, the current study recorded (61.9%) patients cured, (32.5%) treatment completed. However, died (2.4%), treatment failed (0.9%), lost to follow up (2.3%). The overall treatment success rate shown in our study is less than the WHO's target rate (85%). Similarly, the suboptimal treatment success rate has been reported in high burden TB countries like Brazil (71%), India (74%), Nigeria and Somalia (81.8%) (WHO, 2016), Ali *et al.*, 2017 and Ukwaja *et al.*, 2013). Various factors such as complication of the disease among the patients, study

design and sample size of the study population, standard of facilities offered at the treatment centre and local views among the patients about Directly observed treatment short-course strategy might be the reasons for differences in TB treatment outcome around the globe.

Conclusion

This study concluded that pulmonary tuberculosis is still a prevalent infection in the population of district Swat. Females are more infected than males, and overall treatment outcome is less than the target set by WHO. Hence, suitable policies and strategies are needed for reinforcement of TB control programs to control and prevent TB.

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