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Screening for Pulmonary Tuberculosis among Patients with Cough Attending Different Block Public Health Centre of North Bank of Kamrup District of Assam, India: Does Location, Gender and Duration of Cough Impact on Screening?

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Abstract

India has 2.64 million tuberculosis (TB) cases, and this number is almost 30% of the worldwide TB burden. The aim of the study was to find out whether there is a relationship between the prevalence of TB cases with respect to gender, duration of cough and location. In this study, sputum samples were collected from the patients who reported cough in outdoor patient departments. All sputum samples were examined microscopically. Age, gender, and location-wise data were prepared for study. During the study period, total 37119 presumptive patients were attended outpatient department and 1103 (2.97%) presumptive patients reported cough. Out of 1103 presumptive cases, 5.98% were found to be sputum positive. The occurrence was highest among male patients (73.1%). The age group 16–30 years was found to be the most vulnerable one. Duration of cough was not found to be a significant factor for sputum positive pulmonary TB. However, there was a locality-wise difference in detection ($P < 0.05$). The findings suggested that cough reported for any duration should be brought under TB screening. Although the data showed that the occurrence of TB was maximum in male patients, female TB patients should also be brought under thorough investigation. In locations showing significant TB cases, targeted interventions should be initiated by government and non-government agencies to detect the root cause.

Keywords: Acid-fast bacilli, NTEP, Pulmonary tuberculosis, Sputum smear positive, Ziehl-Neelsen staining

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Introduction

Tuberculosis (TB) is a chronic infectious disease which is common in India. The main microbial agent *Mycobacterium tuberculosis* is bacteria responsible for TB. It is an air born disease. As per Global TB report, 2016, *M. tuberculosis* has very ancient origin, and it has survived over seventy thousand years and at present infects nearly 2 billion people worldwide with around 10.4 million new cases of TB each year.[1] TB is one of the top 10 leading causes of death of people worldwide. *Tuberculosis* has always been associated with a high mortality rate over the countries. TB is still a major global health burden. India has the highest TB burden in the world wide and having one fourth of the global TB cases.

In India, The Revised National TB Program (RNTCP) has been effective from 2006 and since then Directly Observed Treatment Short-course strategy has been implemented.[2] In Assam, 48579 numbers of TB patients were put on treatment in 2020.[3] Kamrup district is one of the largest and most populous districts of Assam with a literacy percentage of 70.95%.[4,5] The mighty Brahmaputra river divides the Kamrup district into two parts, that is, north bank and south bank. In Kamrup district alone, 1293 numbers of TB patients were treated and success rate was 87% in 2020.

The most common symptoms of TB are prolonged cough and a droplet of *M. tuberculosis* is mostly transmitted by coughing, sneezing, and so sputum is the best reliable sample for identification of TB. In India, some evidences reveal that cough more than 2 weeks is an indicator for TB.[6] Ziehl-Neelson staining is one of the most frequently used technique for the staining of acid-fast bacilli such as *M. tuberculosis*.

The aim and objective of our study is to identify the burden of pulmonary TB in different areas of north bank of Kamrup district and to find out whether the duration of cough matters for identification of TB cases. Moreover, this study is to confirm whether factors such as gender, age, and locality affect the results.

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Methodology

Ethical Approval

Ethical approval was taken from the Joint Director of Health Services, Kamrup District (reference number-DHS/K/

NTEP/2020/195 dated06/06/2020). The privacy and confidentiality of all presumptive TB patients were maintained in this study.

Sample Size, Study Design and Data Collection

The primary data of all presumptive TB patients from the outpatient department (OPD) of major 5 Block public health center (BPHC) of north bank of Kamrup district were included in this study. The BPHC are North Guwahati BPHC, Bishnu Ram Medhi BPHC, Bihdia BPHC, Gopinath Bardoloi Chest Clinic, Rangiya Sualkuchi BPHC, where sputum sample are collected for AFB evaluation from the month of January to June, 2021.

Socio-demographic Variables

All presumptive TB patients were categorized into five different age groups, (i) <15 years, (ii) 16–30 years, (iii) 31–45 years, (iv) 46–60 years and (v) more than 60 years of age. The gender of all presumptive TB patients was categorized as male and female.

Specimen Collection

Good quality of sputum sample was collected preferably at early morning and samples were collected in duplicate within 1-h gap and in a sterile sputum container. Sample containing volume less than 2 ml, only saliva or blood were discarded.

Microscopic Observations

Smears were prepared from the thick mucopurulent part of the sputum and stained with Ziehl-Neelsen stain for the detection of acid-fast bacilli (AFB) under microscope.[7] According to the NTEP guideline, AFB smears were graded as negative, Scanty, 1+, 2+ and 3+. These grading were interpreted as negative, if 0 AFB/100 microscopic field, scanty if 1–9 AFB/100 field, 1+ if (10–90) AFB/100 Field, 2+ if 1–10 AFB/field and lastly grade 3+ if AFB is more than 10/field.[8,9]

Statistical Analysis

Data were coded, entered and analyzed with SPSS, version 21 for Windows (SPSS Inc., Chicago, IL, USA). The mean standard deviation and frequency of variables were calculated. The chi square test was performed to evaluate the possible association of the variables, and $p < 0.05$ was considered as statistically significant.

Results

Baseline Characteristics

During the study period, total 37119 presumptive patients attended OPD, Out of which 1103 were presumptive patients (2.97%). Presumptive patients reported with duration of cough [Figure 1]. All 1103 patients were given sputum samples for microscopic observation. Out of 1103 presumptive patients 66 (5.98%) were found as sputum positive. Out of total 66 TB patients 49 (73.1%) were male and 17 (25.45) were female patients as shown in the Table 1. Out of total 66 positive TB patients 1(1.5%) was below 15 years and 20 (29.9%) were between 16 and 30 years and 18(26.9%) patients were between 31 and 45 years of age group and 25 (37.9%) were between 45 and 60 years of age group and finally 2 (3.0%) patients were above 60 years of age group. Most of the patients were self-employed (86.77%) and rest was peasants (12.33%) and students (2.9%).

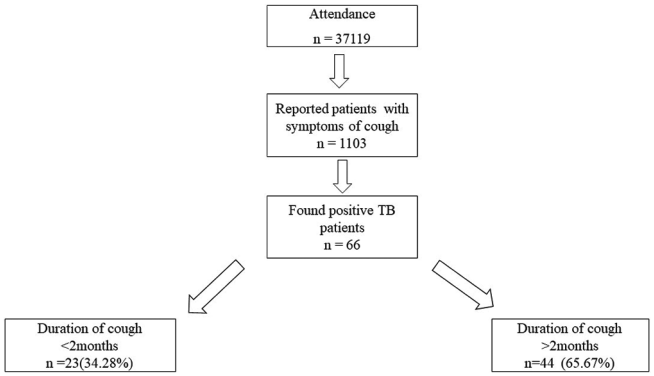

Figure 1: Algorithm for diagnosing Tuberculosis among outpatient attendees

Table 1: Smear positive patients: Sex comparison of cough in less than or more than 2 weeks

Positive smear	*Duration of cough*	
	2 weeks or more (%)	*<2 weeks (%)*
Male	43/66 (66.67)	23/66 (34.84)
Female	9/17 (52.94) s	8/17 (47.05)

Location-wise (Public Health Institution) Comparison of All Sputum Positive Pulmonary TB Patients with Duration of Cough

Out of 66 bacteriologically confirmed TB cases highest 22 (32.8%) TB patients were detected from Bishnu Ram Medhi BPHC, which was significantly higher than the other locations ($P = 0.039$).

Age- and Sex-wise Division of TB Patients

Out of 49 sputum positive male TB patients, 1 (2.04%) were male within the age group below 15 years as shown in the Table 2. Likewise, 14 (28.57%) were male within the age group of (16–30) years, 13 (26.53%) within the age group of (31–46) years, 19 (38.77%) within the age group of (46–60) years, and 2 (4.08%) within the age group of above 60 years.

Again out of 17 female sputum positive TB patients, within the age group below 15 years no patients were found. Likewise, 6 (35.29%) were female within the age group of (16–30) years, 5 (29.41%) within the age group of (31–46) years, 6 (35.29%) within age group of (46–60) years, and zero within the age group of above 60 years.

Sputum Positive Grading for TB Patients

As per Table 3, within the age group below 15 years, the number of 1+ sputum positive graded TB patient was 1 (100%), but no 2+ and 3+ sputum positive graded cases were reported. In case of 16–30 age group, the number of 1+, 2+ and 3+ sputum positive graded TB patients were 14 (70.0%), 2 (10.0%), and 4(20.0%), respectively. In case of 31–45 age group, the number of 1+, 2+, and 3+ sputum positive graded TB patients were 6 (33.3%), 3 (16.6%), and 9 (50%), respectively. Likewise, in the age group of 46–60 years, the

number of 1+, 2+, and 3+ sputum positive graded TB patients were 11 (44.0%), 9 (36.0%), and 5 (20.0%), respectively. Finally, in the age group above 60 years the number of 1+, 2+, and 3+ sputum positive graded TB patients were 1 (50.0%), 1 (50.0%), and, 0 (0.00%), respectively. It was found that there was no significant difference in the occurrence of TB and the age of the patients ($P = 0.115$).

As shown in the Table 4, the number of 1+, 2+, and 3+ sputum positive cases are 27 (55.1%), 11 (22.4%), and 11 (22.4%), respectively, in case of male patients. Similarly, in case of female patients, the number for 1+, 2+, and 3+ sputum positive cases are 6 (35.3%), 4(23.3%), and 7(41.2%), respectively. It was observed from the statistical analysis that the sputum positive grading is not dependent on the gender of the patient, since there was no significant difference was seen ($P = 0.27$).

From the Table 5, it was observed that 1+ grading was reported to be the highest in Rangia (14, 66.7%), 2+ in Hajo (6, 27.3%) and 3+ also in Hajo (10, 45.5%). From statistical analysis, it can be concluded that there is a significant influence on locality in sputum positive TB cases ($P = 0.039$).

One patient with 3+ sputum grading showed positive HIV status with a percentage of 1.15%. The occurrence was not found to be statistically significant ($P = 0.258$).

Table 2: Age- and sex-wise division of tuberculosis positive patients: (age in years)

Age group	*<15*	*16–30*	*31–45*	*46–60*	*>60*	*Total*
Male	1 (2.04%)	14 (28.57%)	13 (26.53%)	19 (38.77%)	2 (4.08%)	49
Female	0 (0.0%)	6 (35.29%)	5 (29.41%)	6 (35.29%)	0 (0.0%)	17

Table 3: Sputum positive grading for patients with respect to age

characteristics (age in years)	*1+ (%)*	*2+ (%)*	*3+ (%)*	*Row total (%)*	*P-value*
≤15	1 (100)	0 (0)	0 (0)	1 (100)	0.115
16–30	14 (70.0)	2 (10.0)	4 (20.0)	20 (100)	
31–45	6 (33.3)	3 (16.6)	9 (50)	18 (100)	
46–60	11 (44.0)	9 (36.0)	5 (20.0)	25 (100)	
≥60	1 (50.0)	1 (50.0)	0 (0)	2 (100)	
Total	33 (50.0)	15 (22.7)	18 (27.3)	66 (100.0)	

Table 4: Gender-wise sputum positive grading

Gender	*1+ (%)*	*2+ (%)*	*3+ (%)*	*Row total (%)*	*P-value*
Male	27 (55.1)	11 (22.4)	11 (22.4)	49 (100.0)	0.27
Female	6 (35.3)	4 (23.5)	7 (41.2)	17 (100.0)	
Total	33 (50.0)	15 (22.7)	18 (27.3)	66 (100.0)	

Table 5: Location-wise sputum positive grading

Location	*1+ (%)*	*2+ (%)*	*3+ (%)*	*Row total*	*P-value*
Sualkuchi	2 (100.0)	0 (0)	0 (0)	2 (100.0)	0.039
Rangiya	14 (66.7)	3 (14.3)	4 (19.0)	21 (100.0)	
North Guwahati	2 (28.6)	2 (28.6)	3 (42.9)	7 (100.0)	
Hajo	6 (27.3)	6 (27.3)	10 (45.5)	22 (100.0)	
Bihdia	9 (64.3)	4 (28.6)	1 (7.1)	14 (100.0)	

Discussion

As per NTEP guideline, a TB patient is not considered as presumptive unless the patient has cough for 2 weeks or more. In our study, it is clear that although pulmonary TB patients who had cough for 2 weeks or more were detected, but TB cases were also detected in those who had cough for <2 weeks. Hence, it may not be necessary for some patients to have duration of cough 2 weeks or more before AFB is seen in the sputum. Therefore, a question may arise that cough for 2 weeks or more is not only a criterion, may be <2 weeks of cough should be kept as a partial definition for screening of TB.[10] Our work also tallies with the findings reported elsewhere.[11]

Another point in our study shows that more male TB patients were detected as compared to female, which is in consistent with previously reported studies.[11] The actual cause is not known, but one report established that male can expel out good quality of sputum for smear examination and female is unable to do so.[12] Another study showed that female population is less than male in case of detection of TB because of social stigma, cultural barrier and education.[12,13] The World Health Organization (WHO) has also encouraged for research work on TB in female patients.

It is also noted that as per our study, only one locality, that is, Hajo showed highest number of positive cases with significant statistical difference. Actual cause of difference in the detection of TB based on locality has not been reported so far. However, there are reports which show that socioeconomic and geographical factors might impact on the results.[14]

Conclusion

From the findings, we can conclude that although it is mandatory for the presumptive TB patients that cough for 2 weeks or more has to go for sputum microscopy but cough for <2 weeks should also be included for TB screening. The study also confirms that TB can affect individuals irrespective to their age or gender. Moreover, it is a matter of investigation why only a particular locality can have significant TB burden. 1.15% of the patients with TB were found to be associated with HIV/AIDS was found to associate with TB and therefore, HIV screening for TB patients is emerged as an utmost need.

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