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Original Research Article

Prevalence of Pulmonary Tuberculosis in Industrial Population in a Tertiary Care Center in North India

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Abstract: Epidemiological information on tuberculosis (TB) has always been vital for planning control strategies. It has now gained further importance for monitoring the impact of interventions to control the disease. The present study was done to estimate the prevalence of pulmonary tuberculosis in industrial population in a tertiary care centre in north India. It is a cross sectional study conducted at ESIC Medical college and hospital which caters to the registered /insured industrial worker under ESI scheme. All patients from chest clinic in the study period who were presumptive pulmonary TB patients were subjected to two sputum examination for AFB microscopy by ZN staining method. Demographic data of study subjects was collected, processed and statistical analyzed using SPSS software. Total 1315 patients participated in the study. Total sputum samples collected were 2623 out of which 351 were positive giving slide positivity rate of 13.58%. Among all of the total positive slides, male female ratio was 1.4:1. Maximum number of slide positive cases was present in 21-30 yr of age group in both male and female. 15.2% cases observed one of the two sputum samples as positive, thus emphasizing the importance of at least two sputum samples for diagnosis. The findings of this study reveal that younger age group patients 21-30 year old were most susceptible to tuberculosis and also percentage positivity of sputum among females was found significantly higher than males in the reproductive age group (21-50 yr). This finding, if corroborated in further studies could have major implications on the reproductive health of women.
Keywords: Pulmonary tuberculosis, prevalence, industrial worker

INTRODUCTION

Tuberculosis still remains the number one cause of adult mortality by a curable infectious disease worldwide despite the availability of effective diagnostic, preventive and curative strategies against Mycobacterium tuberculosis [1]. In 2015, 10.4 million people fell ill with TB and 1.8 million died from the disease. Over 95% of TB deaths occur in low- and middle-income countries. India accounts for more than one quarter of global TB cases and deaths [2, 3].

Pulmonary TB is the predominant form of disease. Periodic Tuberculosis (TB) prevalence studies are important in assessing the performance of TB control programs, providing information for planning, and assessing trends of the disease burden over time [4].

At present, passive case finding, based on the examination of spontaneously produced sputum samples from symptomatic patients, is the mainstay for the diagnosis of active tuberculosis [5]. Therefore, the aim of this study was to evaluate the prevalence of smear positive pulmonary TB among patients at a tertiary care Teaching Hospital which caters to all industrial population working in this area. In addition, some aspects of the performance of the pulmonary TB diagnosis, importance on number of sputum smears to be examined for making diagnosis of pulmonary tuberculosis and associated epidemiological factors are discussed.

MATERIALS AND METHODS

This prospective study was conducted in ESIC Medical College & associated Hospital. This centre is one of the 19 Designated Microscopy Centres (DMCs) under District , Faridabad. This hospital caters to the registered /insured industrial workers under ESI scheme. Institute's Ethics Committee approved the study. All new symptomatic patients presenting to the Chest clinic from 1st February 2016 to 31st December,

2016 were enrolled as study subjects. During this period, two sputum samples of patients presenting with (a) persistent cough for two or more weeks, (b) fever for two weeks or more, significant weight loss, Hemoptysis or any abnormalities in chest radiography, were examined for acid fast bacilli (AFB) microscopy and graded according to RNTCP guidelines using Ziehl-Neelsen staining (RNTCP,2005).

Information regarding demographic data e.g. age, sex and sputum smear results were recorded using a standardized data collection form. Patients with at least one smear positive for AFB were registered as smear positive tuberculosis. External Quality Assurance (EQA) of sputum smear microscopy including Random Blinded Rechecking of slides (RBRC) and Onsite evaluation of the microscopy centre was implemented during the study as per previously described guidelines (RNTCP,2005). Data processing and statistical analysis were performed using SPSS software.

RESULTS

During the above period, 1349 patients were enrolled in the study. Of these, duplicate sputum samples were submitted by 1308 (97%) patients. There were 7 such patients, who submitted only one sputum sample, which turned out to be high positive (atleast 1+). Hence, 1315 patients were considered in the final analysis and the rest (34 patients), who didn't submit any sample or submitted only one (smear negative) sample, were excluded from the study. 190 (14.44%) patients were slide microscopy positive for acid-fast bacilli. A total of 2623 slides were collected from 1315 patients and 351 were positive giving a Slide Positivity Rate (SPR) of 13.38% (Table 1).

In a significantly high number (p 0.0001) of slide positive cases, 161/190 (86.73%), both sputum samples tested positive for AFB.

Out of 190 positive patients, 111 were male while 79 were females. Male: Female was 1.4:1. Maximum number of slide positive cases was present in 21-30 year age group both in male and female patients (Table 2).

The percentage positivity of sputum for AFB among males and females in the different age groups is given in Table 3. The percentage positivity of sputum among females was found significantly higher than males in the reproductive age group (21-50 yr).

Table 1: Pattern of sputum smear positivity and number of sputum samples

Pattern of smear positivity	N	%	*P* value
Both smear positive	161	86.73%	.0001
Only first smear positive	16	8.42%	
Only second smear positive	13	6.84%	
Total positive patients	190	100	

Table 2: Sputum smear positivity among different age groups

Age group	Males N=111(%)	Females N=79(%)	Total N=190(%)
15-20 yrs	23 (20.72)	16 (20.2)	39(21)
21-30 yrs	30 (27.02)	28 (35.4)	58(31.3)
31-40 yrs	24 (21.6)	20 (25.3)	44(23.7)
41-50 yrs	08 (7.2)	08 (10.1)	16(8.6)
51-60 yrs	16 (14.41)	04 (5)	20(10.8)
61-70 yrs	04 (3.6)	02 (2.5)	6(3.2)
71-80 yrs	06 (5.4)	1 (1.2)	7(3.7)

Table 3: Percentage sputum smear positivity in patients of different age groups

	Males		Females		*P* value
Age groups	Total tested	Sputum AFB Positive (%)	Total tested	Sputum AFB Positive (%)	
15-20	144	23(15.97)	112	16(14.28%)	0.710
21-30	183	30(16.39)	68	28(41.17%)	0.0001
31-40	168	24(14.28)	81	20(24.69)	0.044
41-50	172	08(4.65)	56	08(14.28)	0.014
51-60	157	16(10.19)	49	04(08.33)	0.676
61-70	69	04(05.7)	25	02(08)	0.655
71-80	20	06(30)	11	01(09)	0.372
Total	913	111	402	79	0.004

DISCUSSION

Sputum smear microscopy is a simple, rapid and inexpensive technique, which is highly specific in areas with a very high prevalence of tuberculosis. It also has the advantage of identifying the most infectious patients and hence is the primary method for diagnosis of pulmonary tuberculosis. In low and middle income countries, which is where nearly 95 per cent of TB cases and 98 per cent of deaths due to TB occur [5].

All the subjects in this study were industry workers or their family members residing in and around Faridabad, an industrial town in North India. To the best of our knowledge, this is the first study on prevalence of pulmonary tuberculosis in the industrial population in this area. The prevalence of sputum positivity among patients in this study was found to be 14.44%. There is little data available on the magnitude of tuberculosis in industrial workers. In a study from western India, Tiwari *et al* [6] found the prevalence of TB to be 10.7% in stone crushers while among slate pencil workers it was as high as 22.5%. However, the diagnosis of TB in the above study was purely on the basis of clinical examination and chest radiography and sputum AFB was not carried out.

In this study, younger people were most affected with tuberculosis. Age group 21-30 had maximum number of sputum smear positives both in the males 30/111(27.02%) and females 28/79 (35.4%). Nearly 55% of all sputum positive patients were in the 21-40 year age group. Similar findings have also been reported by others [7-9]. Gupta et al in a study on underlying risk factors in TB patients, observed that maximum positive cases (41.5%) were in age group 21-40 years followed by 38.2% in 41-60 years and 11.6% in age group of >60 years [10]. Contrary to these studies, QH Khan observed maximum prevalence rate (63.83/1000) in age group 60 years and more [11]. A recent study from Ranchi also reported maximum cases in the >65 year age group [12].

Several studies have reported a male dominance in pulmonary tuberculosis with M:F varying from 5:1, 2:1 and 0.3:1 [12,13,8]. The most plausible reason suggested is probably more exposure of males to outside world making them more prone to infectious diseases. Present study reveals that though, maximum study subjects were male i.e. 913 (69.5%) as compared to 402(30.5%) female, M:F being 2.27:1. However, percentage sputum positivity for AFB among females was significantly higher79/402 (19.65%) compared to males 111/913 (11.6%); (p0.004). The M:F proportion of sputum smear TB was nearly similar in both males and females(1.4:1). The percentage positivity of sputum among females was found significantly(p value <0.5) higher than males in the reproductive age group (21-50 yr). The findings of this study are significant and would have serious implications on the reproductive health of women. The notification of tuberculosis cases worldwide and India may be higher among men, especially among low-income countries. In 2015, there were an estimated 10.4 million new (incident) TB cases worldwide, of which 5.9 million (56%) were among men and 3.5 million (34%) among women. Many cases of tuberculosis among females may be missed due to socioeconomic and cultural factors leading to barriers in accessing healthcare resulting in under notification. There is a need to increase healthcare access to women.

The number of sputum specimens suggested has become a matter of debate to assess the benefit and to reduce hospital expenses in the diagnosis of pulmonary tuberculosis [14]. Studies have shown that examination of 2 consecutive specimens (on spot and overnight sputum) is sufficient to detect a large number of infectious cases in the community [15]. In this study, in 15.2% cases, one of the two sputum samples was positive, thus emphasizing the importance of at least two sputum. Recently, there has been an attempt at assessing the feasibility of diagnosing pulmonary tuberculosis by collecting two sputum samples on a single day (1-day protocol), and comparing this protocol with the national policy of collecting samples on consecutive days (2-day protocol) in the hope that it would cut down on the number of "diagnostic defaulters" [4, 16]. Its noteworthy that 2.8% (39/1349) patients either didn't submit any sample or only one and were lost to follow up. This is one of the serious limitations of sputum smear microscopy. Due to the requirement of serial sputum examinations, some patients do not come back for repeated sputum examinations and become "diagnostic defaulters" [17, 18].

There are certain limitations to this study. Firstly, this is a hospital-based study and its implications cannot be extended to the community in general. It would have been better if we could categorie our patients as industry workers or their dependent family workers. Then, further categorization of patients industry wise cohort study design would have helped better to demonstrate the cause effect association.

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