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RESEARCH ARTICLE

YIELD OF SMEAR POSITIVE TUBERCULOSIS AMONG PATIENTS WITH COUGH OF TWO WEEKS AND THREE WEEKS IN A COMMUNITY HEALTH CENTER IN SOUTH INDIA: EVIDENCE REINFORCED

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ABSTRACT:
Objectives: 1) To estimate the proportion of cough of ≥2 weeks and ≥3 weeks duration in adult new outpatient attendees 2) To estimate and compare the yield of smear positive pulmonary tuberculosis cases among the above two groups. **Methods:** A cross sectional study was undertaken among new adult outpatients at Community Health Center Sullia, between July through December 2010. After screening, individuals with cough for ≥2 weeks were interviewed using structured questionnaire and subjected to sputum examination. **Results:** A total of 533 Pulmonary Tuberculosis (PTB) suspects were identified by screening 24743 new adult outpatient attendees. The proportion of PTB suspects with cough ≥2 weeks was 2.15% and ≥3weeks was 1.27%. Of 407 who provided two sputum samples, 19 sputum positive cases were diagnosed among PTB suspects with cough of ≥2 weeks, and 14 sputum positive cases among PTB suspects with ≥3 weeks. **Conclusion:** There was an increase of 70% in identification of PTB suspects and increased yield of 36% of sputum smear positive tuberculosis cases when the revised criterion (cough ≥2 weeks duration) was used compared to the earlier criterion. This substantiates the continued use of "≥2weeks" definition of PTB suspects under Revised National Tuberculosis Control Programme in India.

Keywords: cough duration, yield of PTB suspect, PTB drop-outs, yield of sputum smear, positive PTB

INTRODUCTION

Tuberculosis (TB) is an infectious disease, remains the number one killer infectious disease affecting adults in developing countries. India is the highest TB burden country in the world, accounting for one fifth of the global incidence.[1]

Since the inception of Revised National Tuberculosis Control Programme (RNTCP) individuals with cough for 3 three weeks or more with or without other symptoms suggestive of TB were identified as pulmonary TB suspects (PTB) suspects. But WHO 2007 Strategic and Technical Advisory Group for Tuberculosis (STAG-TB) revised the definition of PTB suspect as "any person with cough for 2 weeks or more", which is under operation in India since 1st April 2009.[1]

RNTCP in India is now providing 100 % DOTS and has achieved more than 85% cure rate.[2] While good TB treatment success rates have been achieved, low case detection rates remain an obstacle to the long-term success of TB control programs in the developing world.

Studies done in India suggest that further studies are needed to evaluate the real prevalence of cough ≥ 2 weeks duration in adults attending Out Patient Department (OPD) for any reason. Also the prevalence of tuberculosis cases and the type of outpatients vary significantly by area, type of health facility and in time, hence it is necessary to have local studies, based on standard protocols. Therefore we conducted this study, to estimate proportion of adult new outpatient attendees with cough of ≥2 weeks and ≥3 weeks duration for any reason and to estimate and compare the yield of smear positive pulmonary tuberculosis cases among the above two groups at a Community Health Center (CHC).

METHODS

Study design and Setting

The cross sectional study was conducted at CHC Sullia, Dakshina Kannada District, Karnataka state (a state government peripheral health institution, PHI), where in DOTS care is provided free-of-charge under the guidelines of RNTCP. The study center has a Designated Microscopic Center (DMC). Since the inception of RNTCP in the study area, external quality assurance (EQA) methods have been followed to ensure quality sputum microscopy using the Ziehl Neelsen technique. Under RNTCP, diagnosis of TB is based on sputum microscopy. A new adult out-patient with at least one sputum sample positive for acid fast bacilli (AFB) was considered a Smear–positive TB case.

Method of data collection

The study was conducted from July 2010 through December 2010. All new adult out patients (an out-patient aged ≥15 years visiting a health facility for the first time for a current illness, i.e., who was not on treatment on the day of the visit) attending CHC were subjected to preliminary screening interview for presence of cough. Individuals with cough for ≥ 2 weeks who provided informed written consent were interviewed using structured questionnaire and were subjected to sputum examination for AFB. Subjects not willing to participate in the study, patients currently diagnosed as TB or on TB treatment /follow up and subjects not willing to undergo sputum smear examination were excluded from the study.

Assuming a proportion of PTB suspects of 5%, with Relative precision of 5% at 95% confidence interval (CI), a sample size of 7600 new adult outpatients was arrived at. Even though sample size was 7600 we continued data collection to ensure adequate representation from 3rd and 4th quarters of 2010 and as a consequence we screened 24,743 new adult OPD attendees in the study. The study was granted ethical clearance by the Institutional Ethics Committee, KVG Medical College, Sullia. Analysis was done using SPSS version 11.5 for Windows (SPSS Inc, Chicago, IL, USA). Pearson *Chi-square test* was applied to test the significance of differences between categorical variables at 5% level of significance.

RESULTS

Flow of screened subjects

During the study period, a total of 47903 patients attended OPD. Of this 24743 (52%) patients satisfied the criteria of new adult patients; about 2.15% (533) reported cough of ≥2 weeks and

were eligible for the study as 'PTB suspects' (a new adult out-patient with cough of ≥2 weeks). One hundred and twenty six (23.64%) PTB suspects were excluded for various reasons from the diagnostic process. The flowchart of the diagnostic process is presented in Figure 1. Among the PTB suspects, 407 provided two sputums for AFB examination and were considered for analysis of yield of smear positive pulmonary tuberculosis cases, with group-stratification according to duration of cough.

Baseline profile of PTB suspects

Gender distribution among the study population was almost equal with 47% females. Majority (61.9%) of the PTB suspects belong to 15-54 years of age group. Among the PTB suspects identified 35.5% were not literates and unskilled labour was the most common occupation (49%). About 47% were economically inactive.

Proportion of new adult outpatient attendees with cough of ≥2 weeks and ≥3 weeks duration

Total 24743 new adult outpatients attended OPD during the study period which included 14360 (58%) in the third quarter and 10383 (42%) in the fourth quarter of 2010 (Table 1). The average number of new adult outpatients per day was 135. Almost equal number of new adult males and females attended OPD in both the quarters. Among the screened new adult outpatients 533 (2.15%) patients were identified with cough of two weeks and more duration. Of these 533 PTB suspects 313 (58.8%) had cough for three weeks and more duration. Overall proportion of individuals with cough of ≥2 weeks duration was 2.15% and proportion of individuals with cough ≥3 weeks was 1.27%. Though a slightly higher proportion of PTB suspects attended OPD during third quarter (2.25%) compared to fourth quarter (2.01%), the difference was not statistically significant.

Yield of smear positive cases by duration of cough: ≥ 2 weeks vs. ≥ 3 weeks

Of the 533 identified PTB suspects 407 provided two sputum samples for smear microscopy. The overall sputum positivity rate was 4.7% (19 cases). Sputum positivity rate among PTB suspects having cough ≥3 weeks was 5.5% (14 cases). Sputum positivity rate between the two quarters did not differ significantly (Table 2).

Increased in the yield of PTB suspects and smear positive PTB case

Using the present criterion (cough ≥ 2 weeks) instead of earlier ≥3 weeks criterion for PTB suspects for smear microscopy, there was overall increase of 70% [(533-313)/313] in the PTB suspects i.e. an increase from 313 to 533 suspects (Table 2). However 407 PTB suspects provided two sputum samples for smear microscopy. Irrespective of the reason for not submitting sputum samples for AFB examination, subjects who provided two sputum smear samples were considered for estimation of sputum positivity rate. With the modified criterion in the duration of cough from ≥3 weeks to ≥2 weeks for PTB suspects, the yield of sputum positive cases increased by 36% [(19-14)/14] (Table 2).

PTB drop-outs during the diagnostic process

Among the 533 PTB suspects identified and referred for sputum smear examination 24% (126/533) of the PTB suspects did not provide two sputum samples for microscopy despite the appropriate action taken according to the programme guidelines. Among 220 PTB Suspects with cough of ≥2≤3 weeks, 66 (30%) patients did not provide two sputums. Amongst 313 PTB suspects with ≥3 weeks of cough, 60 (19%) did not give two sputums. Furthermore, in the third quarter 72% of the PTB suspects and in the fourth quarter 84% of the PTB suspects provided two

sputum samples. Significantly higher drop outs were in the younger age groups, in the third quarter and among PTB suspects with cough of ≥2≤3 weeks duration.

Table1: Distribution of total OPD attendees and new adult outpatient attendees at CHC, Sullia.

Year 2010	Total OPD attendees	New adult OPD attendees			PTB Suspects			Percentage of PTB suspects
		Male n (%)	Female n (%)	Total n (100%)	Male n (%)	Female n (%)	Total n (100%)	
3rd Quarter	27338	7245 (50)	7115 (50)	14360	179 (55)	145 (45)	324	2.25
4th Quarter	20565	5143 (50)	5240 (50)	10383	106 (51)	103 (49)	209	2.01
Total	47903	12388 (50)	12355 (50)	24743	285 (53)	248 (47)	533	2.15

Figures in parenthesis indicate percentages within the group

Table 2**:** Proportion of PTB suspects and Yield of smear positive pulmonary tuberculosis according to the duration of cough stratified by quarter, 2010.

Year 2010 Quarter	Cough ≥ 2 weeks			Cough ≥ 3 weeks			Increased PTB suspects n (%)	Increased Smear positivity n (%)
	Cough ≥ 2 weeks	PTB suspects who provided two sputums	Smear Positive	Cough ≥ 3 weeks	PTB suspects who provided two sputums	Smear Positive		
	a	b	c	d	e	f	a-d	c-f
3rd	324	232	11	194	152	8	130 (67)	3 (37.5)
4th	209	175	8	119	101	6	90 (76)	2 (33.3)
Total	533	407	19	313	253	14	220 (70)	5 (35.7)

Figures in parenthesis indicate percentages within the group

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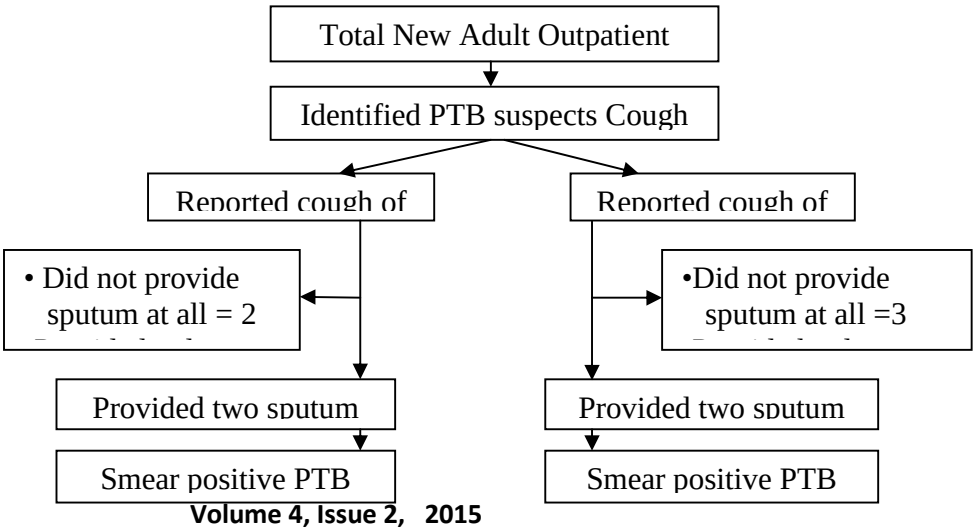
Table 3: Dropouts during diagnosis among PTB suspects by quarter, duration of cough and gender.

	PTB suspects referred for sputum smear microscopy n (%)	PTB suspects who provided two sputum samples n (%)	PTB suspect who did not provide two sputum sample n (%)	χ^2 *p-value*
3rd Quarter 2010	324 (100)	232 (72)	92 (28)	10.351 0.00129
4th Quarter 2010	209 (100)	175 (84)	34 (16)	
Duration of cough				
≥ 2 ≤ 3 weeks	220 (100)	154 (70)	66 (30)	8.395 0.0037
≥ 3 weeks	313 (100)	253 (81)	60 (19)	
Gender				
Male	285 (100)	218 (76.5)	67 (23.5)	0.006 0.93917
Female	248 (100)	189 (76.2)	59 (23.8)	
Total	533 (100)	407 (76)	126 (24)	

Figures in parenthesis indicate percentages within the group

Figure 1. The diagnostic process in the present study



DISCUSSION

In the present study more than half of the patients attending health facilities were new adult attendees. The proportion of PTB suspects with cough ≥2 weeks and ≥ 3 weeks among total new adult was 2.15% and 1.27% respectively in the present study. Both these proportions were lower in the present study compared to several other studies undertaken in India.[3-9] The relatively low proportion of PTB suspects among the new adult outpatient attendees in the present study may be because of several reasons which have not been explored in the present study. The reasons could include the accuracy of the selection of suspects which depends essentially on the competence and motivation of the health professionals at the first consultation. This could also be explained partly by patients' ignorance of symptoms and their perception of duration of their illness. In addition, the government PHIs may miss out on patients who visit private facilities for health care (which was as high as 50% in a study by Niruparani Charles et al[10]).

Of these 407 PTB suspects with cough of ≥2 weeks duration who submitted two sputum samples, a positive diagnosis was made in 19 (4.7%) suspects and among the 253 PTB suspects with cough of ≥3 weeks duration, who submitted two sputum samples for AFB smears, a positive diagnosis was made in 5.5% of the suspects. The sputum positivity rates in both cases were lower in the present study compared to most other studies which used the ≥2 weeks criteria[3,4,8,9,11] and ≥3 weeks criteria[3,4,11]. The reasons behind the low positivity rates encountered in the present study need to be explored further. The widely varying sputum positivity rates as shown in several other studies substantiates the need for carrying out local operational research in order to set benchmarks for comparison.

There was 70% increase in the number of PTB suspects (from 313 to 533) and 36% increase in the detection of smear positive cases (from 14 to 19) when the definition of PTB suspect was set at cough ≥2 weeks compared to ≥3 weeks . The increase in the proportion of PTB suspects with the criteria of ≥2 weeks was demonstrated to be 61%, 58% and 55% in studies done by Santha et al[3], Thomas A et al[4] and Nimbarte et al[11] respectively. These figures are lower in comparison to the increase demonstrated in the present study. It was observed in the present study that using a criterion of PTB suspect of ≥3 weeks cough duration misses out on many PTB cases in comparison to the revised PTB suspect criterion of ≥2 weeks. In the present study an increment of 36% in case detection was observed. Findings of the studies done by Santha et al[3], Thomas et al[4] and Nimbarte et al[11] demonstrated increments of 42%, 36% and 33% respectively which are consistent with present study.

India being the largest contributor of PTB cases to the world, screening all the patients with cough duration of ≥2 weeks, could shorten the duration of TB transmission, as it might reduce diagnostic delays. Early detection and prompt treatment of these cases who act as reservoir of infection can halt and reverse the incidence of tuberculosis. This gains a greater significance in the view of the fact that TB is frequently associated with immune compromised states, the commonest being HIV/AIDS.

Approximately one fourth (n=126, 23.6%) of the 533 suspects referred were not traced to the designated microscopic center (DMC). Similar to our findings a proportion of 24% dropouts during diagnostic process was seen in the study conducted at TB DOTS clinic in Lahore,

Pakistan by Shumaila et al.[12] This could be due to a problem of access to health facility. Also since the present study was conducted in the third and fourth quarter of the year, the third quarter being the rainy season, some of the patients might not have returned to provide the second sputum possibly because of the heavy rains. A significantly higher proportion of dropouts were observed during the diagnostic process among PTB suspects with cough of ≥2 ≤3 weeks duration compared to ≥3 weeks. A plausible explanation for this could be that PTB suspects with cough ≥3 weeks were more worried / bothered about their cough in comparison to PTB suspects with cough ≥2 ≤3 weeks duration. The difference in the proportion of dropouts in the diagnostic process between male and female PTB suspects was not statistically significant.

CONCLUSIONS

Of the total out-patients attending the health facility, more than half were new adult attendees. The present study showed proportion of PTB suspects with cough ≥2 weeks duration was 2.15% and cough ≥3 weeks duration was 1.27%. The study showed that sputum positivity rate among PTB suspects with cough of ≥2 weeks (4.7%) was as high as that among PTB suspects with ≥3 weeks (5.5%). About a quarter of the PTB suspects did not provide adequate number of sputum samples. The Medical Officer In-charge of health care institutions should conduct weekly review of laboratory registers to reduce dropout rates for sputum submission thereby preventing missed TB cases. Significantly higher drop outs were in the younger age groups, in the third quarter and among PTB suspects with cough of ≥2≤3 weeks duration. This highlights the need for creating awareness among all PTB suspects about necessity of two sputum smear examination with emphasis on the younger ones. The present study demonstrated an increase of 70% in identification of PTB suspects and increased yield of 36% of sputum smear positive cases when the revised criterion (cough ≥2 weeks duration) was used compared to the earlier criterion. This substantiates the continued use of "≥2weeks" definition of PTB suspects under RNTCP in India, as it improves the speed and extent of case finding. This is crucial as regards to the Universal access to quality diagnosis and treatment of tuberculosis.

LIMITATIONS

The results of the study should be read keeping in mind that the observations from the current study are limited to CHC, a first referral unit which is a government PHI. More comprehensive knowledge base could be provided by a multicenter study, with a mixture of primary and secondary PHIs and government & private health facilities including both urban and rural areas. Another limitation of the study is the potential possibility of imprecise estimation of cough duration due to recall bias. The present study was conducted under routine programmatic conditions, and our analysis relied on patients' self-reported duration of cough.

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The present study was undertaken at K V G Medical College, Sullia, Karnataka, India and the designation of authors at that time was as follows:

Dhabadi B B: Postgraduate student in Community Medicine, K V G Medical College, Sullia.

Meundi A D: Professor, Department of Community Medicine, K V G Medical College, Sullia.

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