Original Article

EVALUATION OF DIFFERENT TYPES OF CHEST SYMPTOMS FOR DIAGNOSING PULMONARY TUBERCULOSIS CASES IN COMMUNITY SURVEYS

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Summary

***Background*:** Prevalence of tuberculosis (TB) is an important epidemiological index to measure the load of the disease in a community. A series of disease surveys were undertaken in rural community in Tiruvallur district in Tamilnadu, south India

***Objective*:** To investigate the yield of pulmonary tuberculosis (TB) cases by different symptoms status and suggest predominant symptoms for detection of cases in the community based surveys.

***Methods*:** Three disease surveys were conducted during 1999-2006, in a random sample of 82,000 adults aged ≥ 15 years to estimate the prevalence and incidence of pulmonary TB. All subjects were screened for chest symptoms and chest radiography. Sputum examination was done among those who were either symptomatic or abnormal on X-ray or both. Cases observed through symptom inquiry were included for analysis.

Results: In survey-I, 65.6% had cough of ≥ 14 days and yielded 79.1% of the total cases. In surveys II and III, symptomatic subjects with cough contributed 69.5% and 69.2% of the cases respectively. In survey I, 26.8% had symptoms without cough but with at least chest pain ≥ 1 month contributed 8.4% of total cases. The corresponding proportions in subsequent surveys were 29.3, 11.5%; and 23.4, 11.2% respectively. The number of symptomatics without cough and chest pain but with fever ≥ 1 month was negligible.

Conclusion*:** The relative importance of cough as a predominant symptom was reiterated. The yield of pulmonary TB cases from symptomatics having fever of ≥ 1 month was negligible. Fever may be excluded from the definition of symptomatics for screening the population in community surveys. ***[Indian J Tuberc 2008; 55: 116-121]

Key words: Prevalence, Chest symptoms, Tuberculosis, DOTS

INTRODUCTION

Tuberculosis (TB) is prevalent in India and continues to be a leading cause of death[1]. Its control programmes can achieve a high level of treatment success[2] and are associated with a decline in reported disease burden[3]. This is possible only if there is an effective TB control programme like the Directly Observed Treatment - Short Course (DOTS) aimed for higher cure and case detection. When the programme is successful, more cases will be detected and treated successfully. This will result in cutting the transmission in the community. Prevalence of the disease is estimated by undertaking epidemiological survey in the community and it involves researchers, trained field workers, X-ray units, X-ray films, sputum bottles, laboratory set-up and vehicles, etc,.

Different screening methods are employed for the detection of cases. First, the selected population is screened to identify persons with symptoms suggestive of tuberculosis and sputum specimens are collected from them. These specimens are processed using fluorescence microscopy[4] for acid fast bacilli (AFB) and cultured for *Mycobacterium tuberculosis* on Lowenstein-Jensen medium[5]. Alternatively, all persons are subjected to chest X-ray (CXR). These X-rays are read by independent readers who classify all persons as having shadows suggestive of TB, non- TB conditions or normal. Sometimes both methods are

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employed for the detection of TB. A case was defined as a person with a positive smear (>3 AFB) or culture irrespective of colonies or both.

Several TB surveys have been conducted in different pockets of the country. Some of these surveys[6,7] used mainly two screening methods namely, symptom inquiry and CXR. These tools considerably reduce the number of specimens to be collected and processed. A study[8] on the yield of cases by different screening methods showed that symptom screening picked up about two-third of the cases whereas CXR alone picked up more than three-fourth of the cases. With either method the prevalence was underestimated by one-third in the former method and about one-fifth in the latter method. Symptom elicitation is relatively inexpensive compared to CXR. In community surveys, the cost of mobile X-ray units, X-ray films, processing them and obtaining independent readings by at least two readers is very high. The yield of pulmonary tuberculosis cases by different chest symptoms was not documented in details based on a series of community surveys. It is essential to investigate the proportion of symptomatics by various symptoms status and yield of cases in order to suggest the symptoms that are fairly enough to employ in the community based surveys for detection of cases. The data collected from three disease surveys in the community conducted by Tuberculosis Research Centre (TRC) gave an opportunity to document the leading symptoms that yielded more cases.

This report summarizes the yield of cases employing different symptoms inquiry in three disease surveys and the relative merits of each symptom employed in screening the population for detection of cases.

MATERIAL AND METHODS

In 1999-2001, a baseline disease survey was conducted in a random sample of 50 villages and three urban units in Tiruvallur, south India by TRC soon after the implementation of DOTS strategy in the district. All subjects (aged ≥15 years) in the selected villages/units were registered by door-to-door census to cover the required sample size of 82,000 subjects. Two more repeat surveys (2001-2003 and 2004-2006) at every 2.5 years interval were carried out to estimate the prevalence of pulmonary TB and thereby to assess the epidemiological impact of DOTS strategy. The findings of the first survey have been already reported[7]. Two screening methods namely, symptoms inquiry and CXR (a mobile unit with mass miniature radiograph) were employed in these surveys. A symptomatic was defined as a person having cough of two weeks or more, chest pain of one month or more, fever of one month or more and/or haemoptysis at any time. Elicitation on history of treatment was also included as an additional criterion for detection of cases. Two samples of sputum specimens were collected from those who were symptomatic and/or abnormal on X-ray suggestive of TB and processed for identification of cases. The symptom elicitation was carried out by the trained field workers. To ensure quality, a supervisor independently interviewed 10% of adults screened for symptom. In the present exercise, the screening tool namely, symptom inquiry alone was considered for analysis and interpretation. The institutional ethics committee of the TRC approved

Table 1: Distribution of symptomatics and number of cases identified in three surveys

Surveys	No. Eligible	No. Examined (%)	No. of symptomatics (%)	No. of sputum examined (%)	No. of cases
Survey I	83425	75974 (91)	6417 (8.4)	6204 (97)	263
Survey II	85510	78222 (91)	8969 (11.5)	8546 (95)	243
Survey III	89454	81814 (91)	8794 (10.7)	8390 (95)	179

Table 2: Distribution of sputum positive cases by different symptom status

2a. Survey I

Symptom status	Sputum examined		Observed cases				
	No.	%				Total	
			S+C+	S-C+	S+C-	No.	%
Cough(C) - all	4073	65.6	103	89	16	208	79.1
Chest pain (P) (without C)	1664	26.8	5	12	5	22	8.4
Fever (F) (without C,P)	1	-	-	-	-	-	-
Haemoptysis (H) (without C,P,F)	120	1.9	1	1	1	3	1.1
History of treatment (without C,P,F,H)	346	5.6	17	11	2	30	11.4
Total	6204	100.0	126	113	24	263	100.0

2b. Survey II

Symptom status	Sputum examined		Observed cases				
	No.	%				Total	
			S+C+	S-C+	S+C-	No.	%
Cough(C) - all	4721	55.2	84	72	13	169	69.5
Chest pain (P) (without C)	2504	29.3	3	21	4	28	11.5
Fever (F) (without C,P)	24	0.3	-	1	-	1	0.4
Haemoptysis (H) (without C,P,F)	468	5.5	3	1	2	6	2.5
History of treatment (without C,P,F,H)	829	9.7	21	15	3	39	16.0
Total	8546	100.0	111	110	22	243	100.0

2c. Survey III

Symptom status	Sputum examined		Observed cases				
	No.	%				Total	
			S+C+	S-C+	S+C-	No.	%
Cough(C) - all	4897	55.7	53	57	14	124	69.2
Chest pain (P) (without C)	1886	23.4	3	11	6	20	11.2
Fever (F) (without C,P)	14	0.2	-	-	-	-	-
Haemoptysis (H) (without C,P,F)	522	6.3	2	1	1	4	2.2
History of treatment (without C,P,F,H)	1071	14.4	13	15	3	31	17.3
Total	8390	100.0	71	84	24	179	100.0

S+ = smear positive, S- = smear negative, C+ = culture positive, C- = culture negative

Table 3: Yield of cases according to interval between the onset of cough and its elicitation

Survey	Number of cases by duration						Total
	2 wks to < 2 m		2 m to < 12 m		> 12 m		
	No.	%	No.	%	No.	%	
Survey I	68	(32.7)	61	(29.3)	79	(38.0)	208
Survey II	44	(26.0)	49	(29.0)	76	(45.0)	169
Survey III	55	(44.4)	40	(32.3)	29	(23.4)	124

m = months, wks = weeks

the project and informed consent was obtained from all the participants in the study.

RESULTS

The population eligible for symptom elicitation, number elicited for symptoms, the proportion of symptomatics, the number of persons from whom sputum was collected and number of cases diagnosed in each survey (I, II, III) are given in Table-1. The coverage for symptom inquiry and sputum examination was above 90% in all surveys. The proportion of symptomatics in survey-I was 8.4% (6417/75974). It increased to 11.5% and 10.7% in the survey-II and survey-III respectively and difference was statistically significant.

The distribution of positive cases by symptom status is given in Table- 2a, 2b, 2c. In survey-I, of 6204 symptomatics as many as 4073 (65.6%) had cough of 14 days or more and yielded 208 (79.1%) of the 263 total sputum positive cases. In survey II, the proportion of symptomatics having cough of 14 days or more was 55.2% and contributed 69.5% cases. In survey III, the corresponding figures were 55.7% and 69.2% respectively. In survey I, there were 1664 (26.8%) symptomatics without cough but with at least chest pain of one month or more. They contributed 22 (8.4%) sputum positive cases. The corresponding proportions in surveys II and III were 29.3 and 11.5%; and 23.4 and 11.2% respectively. It could be seen that the number of symptomatics without cough and chest pain but with fever of one month or more was negligible and no case (except one case in survey-II) was diagnosed from these symptomatics. In survey-I, there were 346 (5.6%) persons who reported a previous history of treatment and they contributed 30 (11.4%) cases. The corresponding proportions in the subsequent two surveys were 9.7 and 16.0%; and 14.4 and 17.3% respectively.

The yield of cases according to the interval between the onset of cough and the time of elicitation of cough is given in Table-3. It could be seen that proportion of the cases yielded were 32.7, 29.3 and 38.0% from symptomatics who reported cough of 2 weeks to < 2 months, 2 months to < 12 months and ≥ 1 year respectively. In survey II, the corresponding proportions were 26.0, 29.0 and 45.0% and that in survey III were 44.4, 32.3 and 23.4% respectively. On an average, one- third of the cases were yielded from each category of symptomatics.

DISCUSSION

The findings of the three surveys showed the relative importance of cough as a predominant symptom employed in screening the population. In fact, two screening tools namely, symptom inquiry and chest radiography were used in all these surveys. In order to study the yield of cases by different symptoms (cough, chest pain, fever and haemoptysis including history of treatment), the cases diagnosed

by symptom inquiry were only considered for analysis. An earlier report[8] on yield of TB cases by employing these two screening methods in the first two surveys showed that the prevalence was under estimated by both methods; 54-66 (60%) of the cases were identified by symptom inquiry alone whereas 82% were identified using chest radiography in both surveys. In survey-III, a total of 277 cases were detected employing symptom inquiry and chest radiography as screening tools. The sensitivity of symptom inquiry was 65% (179/277) and that of CXR was 80% (222/277) showing that yield of cases was similar in all the surveys. Symptom inquiry is relatively simple and inexpensive compared to chest radiograph with exorbitant cost on CXR examination including mobile X-ray unit, film, processing the film and obtaining the readings from two independent readers. A correction factor (CF) of 1.5 (277/179) can be used to estimate the total prevalence of TB if symptom inquiry alone is employed. This has also been validated in the study[6] conducted by National Tuberculosis Institute, Bangalore and in our earlier report[8]. Our present study has shown that cough was relatively important and predominant symptom among the symptomatics as well as among cases as observed in all the three surveys. A TB prevalence survey[9] based on symptom inquiry in Raichur district of Karnataka showed similar findings. In that survey, of the 3685 symptomatics, 3193 (87%) had cough of 14 days or more and yielded 405 (92%) of the 440 sputum positive cases. In that survey, the additional contribution of persons with cough of less than two weeks (0.2%) towards sputum eligibility was negligible and hence it may not affect the calculation of the prevalence of the disease. In another study[10] in North Arcot district (now known as Kancheepuram district) of Tamilnadu it was shown that 61.4% (4932/8032) of the symptomatics reported cough of duration 14 days or more and 77% (211/274) cases came from those who had cough of 14 days or more with or without some other symptom. The relative importance of cough against chest pain for screening the population was reported by Gothi et al[6] and Baily et al[11]. The contribution of fever alone (without cough and chest pain) in identifying symptomatics and cases was negligible as observed in all the three present disease surveys similar to the findings in the earlier studies[9,10]. This showed that fever can, safely, be excluded from symptom inquiry in community surveys. The workload and the cost involved in collection of sputum from these symptomatics and processing the specimens in the laboratory can also be avoided. The study emphasized the importance of eliciting the previous history of treatment during symptom inquiry yielding substantial proportion of cases as observed in our study (11-17%).

In Revised National TB Control Programme (RNTCP), a symptomatic is defined as a patient having cough of three weeks or more with or without other symptoms. The importance of including quality check in the survey employing symptom inquiry was well demonstrated in an earlier report[12] by our centre. A multi-centric study[13] by our centre has demonstrated that inclusion of chest symptomatics with cough of two weeks or more has yielded a substantial increase in the number of sputum positive cases compared to symptomatics of three weeks or more as defined in RNTCP. This indicated the importance of identifying symptomatics employing cough of two weeks or more instead three weeks or more for diagnosis of TB. Among the 55561 adult outpatients screened, 2210 had cough of two weeks or more and yielded 267 (12%) smear-positive cases compared to 1370 with cough of three weeks and 182 (13%) cases. The estimated work-load of sputum microscopy in the laboratory using cough of two weeks or more, the number of smear per day was slightly higher costing about Rs. 130 (US$ 3) for every additional smear-positive patient detected. This as well as the effectiveness of this criterion on the provider point of view needs to be further assessed in a separate study.

There are a few limitations in this study. TB patients with Human Immuno-deficiency Virus (HIV) may have different symptoms from those without HIV. However, the prevalence of HIV among TB patients in this area was observed to be <1% (unpublished data) The findings of this study may not be applied to routine case detection, since the characteristics of the patients detected by DOTS

and those detected by the survey may be different. Patients with fever may visit health facility for care and may not get detected in survey.

CONCLUSION

The proportion of symptomatics in the community survey seemed to be stabilized to about 11% as observed in the last two surveys. As already reported in any other community surveys, the relative importance of cough as a predominant symptom was reiterated in this study also. The inclusion of fever in the definition of symptomatics yielded small proportion of symptomatics and negligible cases. In future surveys, fever may be excluded from the definition of symptomatics for screening the population in community surveys.

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