DIAGNOSIS OF TUBERCULOSIS UNDER DIRECTLY OBSERVED TREATMENT FOR SHORT-COURSE (DOTS): EXAMINATION OF TWO OR THREE SPUTUM SPECIMENS

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Abstract: The DOTS programme recommends examination of three sputum smears for diagnosis of pulmonary tuberculosis. This may not be practicable under all conditions, especially in difficult areas. It further adds to the cost of diagnosis and inconvenience to the patients. In order to study the diagnostic yield of examining only two smears and additional yield by third smears a retrospective study was carried out from February 2002 to December 2003 in the laboratory of DOTS clinic in Kanchanpur district. In 2002, in all, 101(22.4%) sputum positive patients were diagnosed out of 450 new chest symptomatic examined and in 2003, there were 103(26.4%) sputum positive patients from 390 new chests symptomatics examined. The diagnostic yield of single sputum examined is insufficient in laboratory situation, especially where the sputum positivity is low. However, sputum positivity of two or more sputum smears did not affect the diagnostic yield. Further, of three smears examined (spot, early in the morning, spot), the early morning specimen had the best result. Two sputum smears one of which is early in the morning is an effective as the three smears for screening the chest symptomatics.

Key words: TB; DOTS; Sputum; Diagnosis.

INTRODUCTION

Ever since sputum smear examination was made the specific tool for the diagnosis of tuberculosis, scientists have investigated the additional case yield from examination of multiple successive sputum.[1] Study from National Tuberculosis Center (NTC) [2], Thimi, examined this aspect with the three successive smears tested amongst chest pulmonary tuberculosis suspects. It was observed that the first two smears examination was sufficient to detect 95% of the sputum positive patients with overall positivity in the group were 14.78%. Accordingly, in the NTP, the recommendation regarding number of specimen was limited to two smear examinations for the case finding under programme condition.

The diagnosis of pulmonary tuberculosis is also primarily sputum based in accordance with the WHO[3] and IUALD[4] guidelines. Each chest symptomatic was required to give three sputum smears (spot, early in the morning, spot). To facilitate this requirement sputum testing has been conducting under the laboratory of DOTS centres, and these microscopy centres have been fully upgraded in terms of equipments and trained staffs.

With the increasing threat of TB/ HIV co-infection, the burden of disease would increase further and, accordingly, the number of smears required to be done would also increase. Studies conducted in Tanzania[5] have shown that successive yield of smears amongst positive cases was 83.4% from the first specimen, increase of 12.2% from the second and 4.4% from the third. Other studies in Malawi also yield similar results [6-8]. These results suggest that the third smear is not likely to yield much. In order to test this assumption, a study was conducted in the DOTS laboratory of DPHO Kanchanpur district among the attending chest symptomatics to determine the value of third sputum smears in case finding.

MATERIALS AND METHODS

The DOTS clinic of DPHO Kanchanpur district is implementing under the NTP as per national guidelines. DOTS has established to provide the diagnosis and treatment facilities to tuberculosis patients. The centre is facilitated by Macrocopist and technicians.The attending symptomatics is required to give three sputum smears first spot, second early in the morning and third spot specimen over two consecutive days for the case finding of pulmonary tuberculosis.

A retrospective study was carried out in the DOTS clinic from February 2002 to December 2003 in order to determine: I. The number of chest symptomatics II. The number of symptomatics who had the entire three smears positive and various combination of positivity i.e. only first smear positive, first and second, first and third and second and third smears positive and III. The

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Table 1: Distribution of smears positives among symptomatic in successive specimens and year.

	Year 2002		Year 2003	
	No	**%**	**No**	**%**
New chest symptomatics	450	-	390	-
Total sputum positives detected	101	22.4	103	26.4
Positive by all three specimen	79	78.2	81	78.6
Positive by:				
1st specimen(spot)	87	86.1	93	90.3
2nd specimen (morning)	99	98.0	99	96.1
3rd specimen (spot)	84	83.1	88	85.4
Additional positivity by:				
2nd specimen (morning)	13	12.9	9	8.7
3rd specimen (spot)	1	0.9	1	0.9

Table 2: Comparision of early morning specimen with successive spot specimens.

Year	No. of smears + ve	Only 1st (spot) + ve	Only 2nd (morning) + ve	Only 3rd (spot) + ve	1st vs 2nd	2nd vs 3rd
2002	101 (-)	87/101 (86.1%)	99/101 (98.0%)	84/101 (83.1%)	P<0.001	P<0.001
2003	103 (-)	93/103 (90.3%)	99/103 (96.1%)	88/103 (85.4%)	P<0.001	P<0.001

percentage of positivity of the first specimen, incremental yield of the second specimen, and incremental yield of the third specimen.

RESULTS

Table 1 shows that in 2002, a total of 450 new chest symptomatics were examined of whom 101(22.4%) were sputum positive. For the year 2003, the total new chest symptomatics examined were 390 of whom 103(26.4%) were sputum positive. The past treatment history of newly discovered sputum positives was not the part of study. The result showed that reliance on the first specimens (spot) could detect 86.1% of the sputum positive patients in 2002 and 90.3% in 2003. In addition, if the second morning specimen was taken into consideration then 98% of the patients were detected in 2002 and 96.1% in 2003. The incremental yield of third specimen (spot) smear was less than 1% in both the years.

Table 2 shows the comparison between the first spot specimen, second early morning specimen and third spot specimen in terms of case yield. The first specimen had the case yield of 86.1% to 90.3%. The second specimen which is early in the morning took about 98%.

DISCUSSION AND CONCLUSION

The third spot specimen as recommend by NTP adds not only the work load but also the cost of diagnosis, both for the patients as well as for the laboratory staffs in health care system.

When the overall sputum positivity content of laboratory workload is around 26.4%, then, 90.3% of the sputum positive patients are detected by the first sputum positive sputum specimen. This yield gets reduced to 86.1% while the positivity content of laboratory workload is around 22.4%. This difference is statistically significant($p<0.05$) and indicates that with lower sputum positivity in the workload the value of single specimen for reaching diagnosis would be considerably less and can not be dependent upon examination situations.

However, overall sputum positivity content does not affect the detection value of the test if specimens, one of which is overnight sample, are examined. In the comparison for both years, though there was a significant difference in positivity content, two smears (spot plus early morning) could detect nearly 100% of the patients. Thus, two sputum specimens, one of which is overnight may sufficient and are dependable for diagnostic purposes under laboratory situation where it is preferable to avail of every opportunity to examine situation.

Of three specimens, the early morning one gives the best result as compared to the other two spot specimens. When only the early morning specimen was required for testing, then approximately 98% of the patients were

Table 3: Comparison of morning with spot specimens according to diagnostic yield and year.

Year	Total smears + ves	Positives by spot specimens 1st and 3 rd smears	Positives by morning specimens (spot)
2002 22.4%	101 (-)	87+1 (87.1%)	99 98%
2003 26.4%	103 (-)	93+1 (91.3%)	99 (96.1%)

detected in 2002 and 96.1% in 2003. This is higher yield than the results with the two spot specimens (first and third) and the difference is statistically significant ($p<0.05$) (Table 3).

Thus, under routine conditions, two sputum smears (one of which is early in the morning) can be recommended in place of three smears for screening the chest symptomatics. The reduction in the workload may give more time to an over burdened laboratory for improving quality of sputum microscopy. However, further study in different situations in the country is needed.

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