

ORIGINAL ARTICLE

**EFFICIENCY OF SERIAL SMEAR EXAMINATIONS IN
EXCLUDING SPUTUM SMEAR POSITIVE TUBERCULOSIS**

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ABSTRACT

BACKGROUND: This study determined the number of slides required to identify one additional case of sputum smear positive tuberculosis from the second smear.

METHOD: In a record based study, data was abstracted from TB laboratory register of the District Hospital laboratory.

RESULTS: A total of 4568 suspected sputum was examined at the D H Q laboratory during the period 1st January 2004 to 30th June 2007. Eight hundred forty seven suspects had two or more sputum smear positive slides; out of these 815 suspects had all three slides positive. Only 32 suspects had their 1st slide negative. One thousand six hundred and thirty extra slides were prepared to detect 4% additional case of sputum positive T.B.

CONCLUSIONS; The requirement of routine examination of three serial smears before declaring a suspect as a 'non-case' of sputum smear positive T.B needs to be reviewed.

KEY WORDS; tuberculosis; diagnosis; laboratory; microscopy

INTRODUCTION

In various studies in different settings, it has been observed that the majority of persons with suspected tuberculosis (TB) ultimately found to have sputum smear-positive TB were positive already on first smear examination.¹⁻⁵ W.H.O. has recommended the examination of three smears before declaring a person with suspected TB smear negative⁶⁻⁸. It is not clear whether this recommendation is applicable and appropriate for every setting. Although some diagnostic benefit might be gained from performing three serial smears, the added workload can be counterproductive and result in a lower quality service that may affect the efficiency of the critical first sputum smear examination. It is ultimately a cost effectiveness decision to determine the maximum number of slides required to identify one additional case of sputum smear positive tuberculosis.

METHODS AND MATERIALS

Definition of a case

For the purpose of this study, once any acid-fast bacilli (AFB) were identified on any smear examination the examinee was defined as a case of smear positive TB.

Design and data source

This was a retrospective, record based study, utilizing information routinely available in national TB control services.

Sampling

Standard TB laboratory register was selected.

Data collection

A record was made of the number of patients registered in the TB register. Data collection was limited to the following variables: TB laboratory code, laboratory serial number, registration date, sex, age, reason for examination and the results of the three possible examinations.

Data entry, validation and analysis

The primary objective was to determine the number of slides that need to identify one additional case of sputum smear-positive TB on the second or third diagnostic examination. Elements used to provide the basis for testing the hypothesis include the calculation of the proportion of cases among suspects and the incremental yield from serial diagnostic smears. The method used in a previous study by Ipuge et al, in Tanzania³ and by Rieder et al⁹ was used to compute the incremental yield from the first, second and third smear examinations.

RESULTS

Characteristics of examinees

The period from 1.1.2004 to 30.6.2007 was included in the study. Suspects whose three smears were not examined or the register did not state the reasons for examination were excluded. 54% were male and 46% were female. Out of 6181 examinee 73% were suspects and 27% were of follow up group.

Characteristics of suspects

Out of 4568 suspects 847 (18%) were cases. The distribution of cases by sex and age group are shown in figure 1 & 2.

Fig.1 Proportion of sex among cases

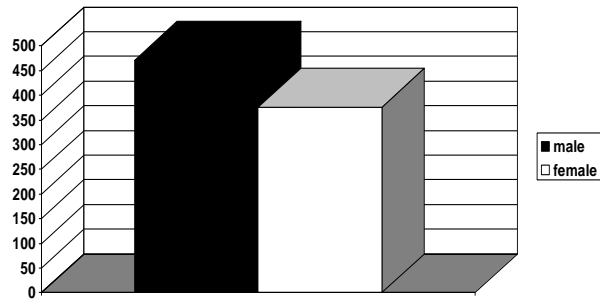
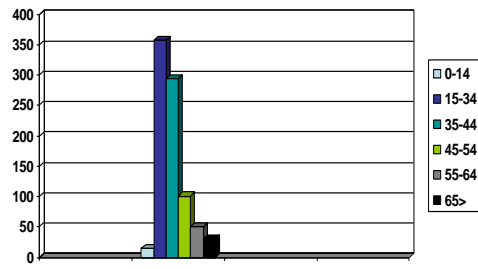


Fig 2. Proportion of age among cases



Incremental yield from serial smears

Of 847 suspects who were positive on smear examination, 815 (96%) had all three slides positive for AFB. Only 32 (4%) were negative on first smear examination.

Discussion

W.H.O defines a case of pulmonary Tuberculosis as one who excretes tubercle bacilli in the sputum. Hence for case finding in a Tuberculosis control programme sputum microscopy is the most important, specific, cost effective and reliable test for diagnosis of pulmonary T.B. All individuals who present to the general health services who are likely to have T.B are required to undergo a sputum smear examination. According to DOTS protocol three sputum samples; spot 1 (day one), morning and spot 2 (day two) are taken. Information on patients whose sputum is examined is entered in the TB laboratory register ⁶.

In several studies it has been observed that with three serial smears, about 85% of ultimately positive suspects are positive on the first smear examination ^{3, 10-14}.

In our study 96% of positive suspects were positive on first smear examination. In this way, 1630 extra slides were prepared. It takes 50 minutes to prepare a slide and it takes a minimum of 5 minutes to examine the slide. That means 8150 extra minutes.

A study by Harries et al. compared a strategy for screening TB suspects with two sputum smears and three sputum smears for different 6 month periods ¹⁵. In the two 6-month periods, the same proportion (16%) of suspects was sputum smear positive.

Examining more sputum samples may be counterproductive in the sense that the overburdened technician may examine too few fields or copy the result of the first smear examination into the result columns for the second and third sputum smears.

Concerns might be raised that a small proportion of cases may be missed by not examining the second or third serial smear. However, sputum smear-negative,

symptomatic TB suspects are investigated further by radiography, trials of antimicrobial therapy for alternative diagnosis and additional sputum smear examination if there is no clinical improvement.

By examining one or two sputum specimens, the sensitivity of sputum smear examination might actually improve as the technician will have fewer slides to prepare and examine. This will be one spot, if it is negative then morning sample or as discussed and decided by the authorities.

CONCLUSIONS

The effectiveness of the second or third serial smear in this study was low. The requirement for routine examination of three serial smears before declaring a suspect as a non-case (of sputum smear positive TB) needs to be reviewed. It therefore seems imperative that the small loss in detection of smear-positive cases due to reduction in the number of serial examinations routinely required is compensated by increasing the efficacy of the remaining examinations.

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