

Safety In Mines Research Advisory Committee

Project Summary : Health 705

Project Title:	Provisional assessment of the impact of adding sputum screening to existing active case finding methods for tuberculosis in a gold mining workforce
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Category:	Occupational Health	Applied Research	Occupational Medicine
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Summary

Tuberculosis (TB) rates amongst gold miners in South Africa continue to rise despite well implemented TB control programmes. The human immunodeficiency virus (HIV) prevalence amongst miners is high and is partly the cause for the increasing TB incidence. Case finding with annual radiographs is done routinely but the yield from radiological screening has remained constant since the advent of the HIV epidemic. A cross-sectional study was conducted amongst gold miners in the Free State. The main aims of the study were to identify appropriate screening methods in active case detection of TB, to determine the point prevalence of active TB and to identify risk factors for TB prevalence and incidence. Additional objectives were to investigate incidence of TB following intensive screening and to determine the optimum interval between screening.

Approximately 2000 gold miners were enrolled while attending for annual fitness examinations. On recruitment, a questionnaire was administered which included TB symptomatology and demographic details. In addition, two sputum specimens were collected for TB microscopy and culture, a urine specimen was collected for HIV testing, and a miniature chest radiograph was taken. Sputum smears were examined for acid-fast bacilli using microscopy with fluorochrome staining, and then cultured on Löwenstein-Jensen (LJ) medium. Urine samples were tested for HIV using a screening test and a confirmatory test. Individuals with any abnormal findings were investigated further with clinical examination, standard size chestradiograph and three more sputum specimens. Study participants were followed for a year following their date of the annual examinations (date of enrollment) for episodes of pulmonary and extrapulmonary TB. The annual TB incidence for the cohort was calculated for the year preceeding enrollment. Duration of active disease was calculated from incidence and prevalence estimates.

The refusal to participate proportion was 12%. 1978 individuals participated in the study, 580 (29%) of whom were HIV-infected. 48 cases of active TB were diagnosed using clinical features, radiography and culture. Investigation of the screening methods confirmed that the use of a single screening method for the detection of TB is insufficient. Of the four screening methods evaluated, sputum culture was the most sensitive (70%)¹. The radiological screening programme (RSP), the current standard of active case detection, had a sensitivity of 27%. The proportion of TB cases detected with sputum microscopy (25%) compared with RSP was similar. The addition of sputum microscopy to the existing case finding programme would only have identified a further 7 (15%) cases of active TB. Symptom screening (sensitivity 29%) for TB appeared to give a slightly higher yield than sputum microscopy. The three most significant symptoms were cough, weight loss and night sweats. It was also found that the combination of RSP and symptoms would detect 60% of all smear positive cases.

The prevalence of active TB was 2.5% (95%CI 1.8–3.2%). The only significant risk factor for prevalent TB was age>40y (Unadjusted Odds Ratio (OR) 2.2, 95%CI 1.2–4.3). Prevalence of TB did not vary significantly by HIV status (3.3% vs 2.2% in HIV-infected and -uninfected, Unadjusted OR 1.5, 95%CI 0.9–2.8), or silicosis grade. TB incidence was 2.4/100py(person-years) (95%CI 1.8–3.2); higher for HIV-positive than HIV-negative miners (5.4 and 1.2/100py respectively, crude incidence rate ratio (IRR) 4.4, CI 2.4–7.9). Other significant risk factors for incident TB were silicosis (p<0.001) and age>40y (IRR 2.1, CI 1.1–4.0). The estimated duration of active disease was 0.61 years in HIV-infected individuals and 1.79 years in HIV-uninfected individuals. HIV infection and silicosis are strong risk factors for incident but not prevalent (active) TB, reflecting more rapid

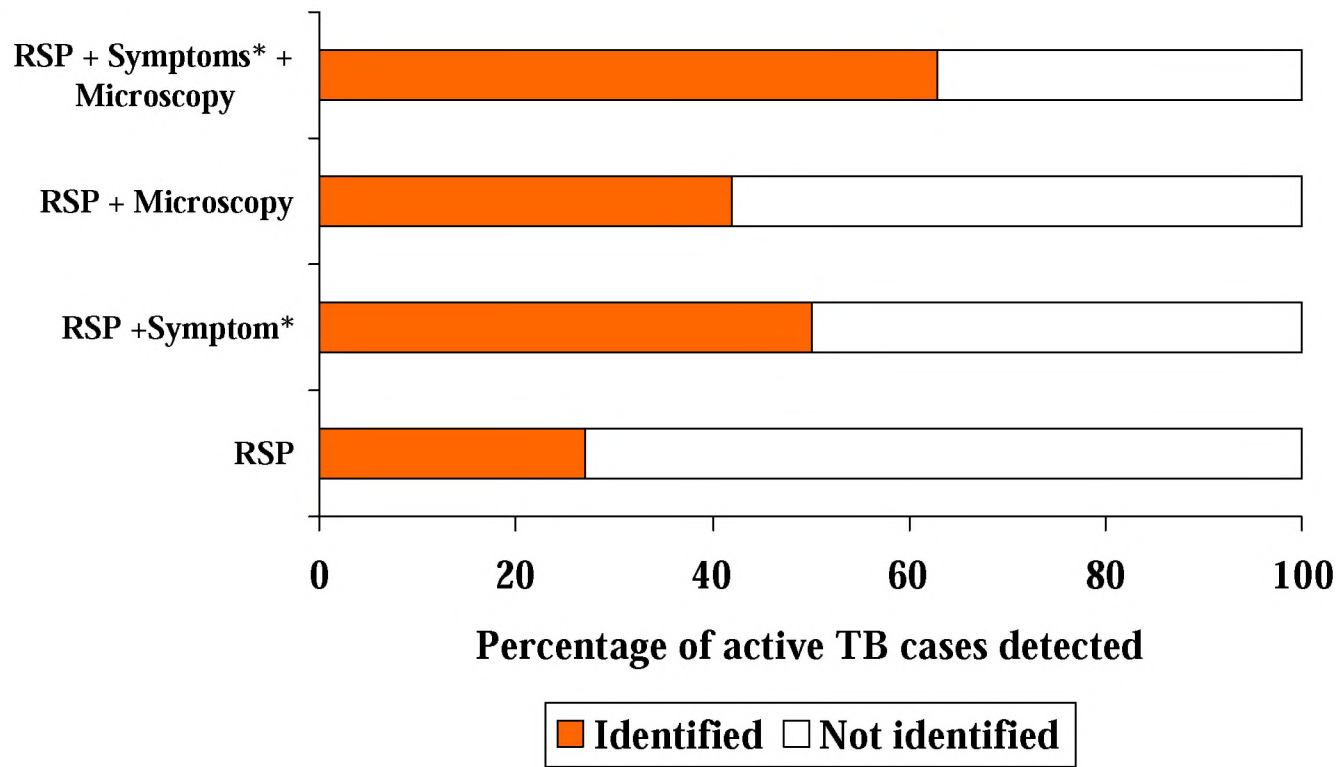
¹ Sputum culture was not used as the "gold" standard and hence was not 100% sensitive.

progression of TB in the HIV-infected host with major implications for case-finding and TB transmission. The incidence of self-presentation with TB in the cohort was 2.4/100 person-years, higher in HIV-infected individuals (IRR 5.1, 95%CI 2.5 – 10.6). Other risk factors were silicosis and age. Self-presentation with TB was insignificantly higher in the second six months after screening in both HIV groups. The optimal frequency can't be determined from this study.

We recommend that all persons with either: a new abnormality on the chest radiograph; or any of the three symptoms of cough, night sweats and fever; are identified for further investigation for TB. Further investigations

should include at least two sputum specimens for microscopy and culture. HIV-negative individuals are likely to be important sources of TB transmission despite low incidence, because of their long duration of infectivity. TB control strategies in high HIV prevalence areas should not underestimate the importance of HIV-negative TB. As HIV disease and silicosis were shown to be important risk factors for TB incidence, efforts at improving HIV and dust control remain important strategies in the reduction of TB. We recommend that further investigations are conducted to establish the efficacy of intensive screening on a six-monthly basis.

The sensitivity of combined screening methods in the detection of all pulmonary TB



* any of cough, weight loss or night sweats (symptom combination)