Incidence of tuberculosis among canning workers in the Boland, 1987

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Summary

Tuberculosis remains a serious public health problem in South Africa. Current control policy in industry relies on passive case-finding and regards industrial workers as at low risk. Analysis of tuberculosis among a canning factory population in the Boland demonstrated high rates of pulmonary tuberculosis, comparable to the high rates in the community, and an absence of the 'healthy worker effect'. Black men were at particular risk. An argument is made for a review of current practices in tuberculosis control based on a sound knowledge of risk profiles for particular industries.

In the face of such conflicting evidence, there is a need to establish industry-based risk profiles for tuberculosis on which to base rational tuberculosis control policy in industry. This study describes the incidence of pulmonary tuberculosis in a factory population in the canning industry in the western Cape in 1987.

Material and methods

The study design is a descriptive follow-up of workers employed at a canning factory in the Boland during 1987. The study population includes all workers employed at the factory during 1987. Demographic characteristics of this population are illustrated in Fig. 1. An important feature of this population is demonstrated in Fig. 2, namely the seasonality of certain categories of workers. This phenomenon is taken into account in subsequent analysis.

Tuberculosis remains one of the most important preventable causes of mortality and morbidity in South Africa today and a major public health problem for health planners. In 1980 this disease accounted for 7% of all deaths in black adults. Current estimates of the incidence of tuberculosis in South Africa based on notifications range from 206 to 269/100,000, but there is evidence that the true rate is over three times as high. The western Cape is at present experiencing an upsurge in tuberculosis notifications.

Case-finding and treatment remain a cornerstone of tuberculosis control programmes. In order to apply appropriate control measures, knowledge of high-risk groups is necessary. The American Thoracic Association recommends that screening for tuberculosis is appropriate in groups in which the tuberculosis rate is higher than that in the general population. Other authors have argued that concentrating on high-risk groups within communities in which morbidity rates are generally high, overlooks the value of active case-finding in the general community. Unfortunately, many of the data relating to tuberculosis in South Africa are limited in terms of both comprehensiveness and validity.

Information on the risk of tuberculosis in industry in South Africa is also scanty and contradictory. Some studies have suggested that pulmonary tuberculosis is common in working populations. Mets demonstrated incidence rates of tuberculosis in industry in the western Cape as high as 1/100 workers, while a prevalence study of foundry workers showed that 5% of the workforce had pulmonary tuberculosis. In contrast, studies evaluating the effectiveness of mass radiographic screening in industry have shown pick-up rates as low as 1 case for every 400 radiographs taken. These latter findings are consistent with experiences overseas, where the prevalence of tuberculosis has been too low to justify cost-ineffective methods of case-finding, in particular mass radiographic screening. Current local authority health policy largely reflects WHO guidelines and does not offer active case-finding to industry, since these workers are regarded as a low-risk group for tuberculosis.

'Summary'

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1986 and on treatment by January 1987) are excluded from the study. The diagnosis of pulmonary tuberculosis was made on the basis of the presence of acid-fast bacilli on microscopy or culture in one or more sputum samples or evidence of active pulmonary tuberculosis on the chest radiograph. Diagnoses were made at local authority clinics and patients were referred either to hospital or to factory clinics for supervised treatment. No routine screening or pre-employment examination is applied in the workforce. Thus all cases were found by passive case-finding or contact tracing.

Data were collected on cases by retrospectively reviewing local authority clinic health records and factory clinic records for 1987. Data on the population base was obtained from monthly records kept by the employer. Collateral information on the population at risk was obtained from the records of the Food Workers Medical Benefit Fund, which covers all workers in the study population. Confidence intervals for rates were calculated according to the method of Fleiss.17

Results

In a population of 2,202 workers in 1987 there were 15 cases of pulmonary tuberculosis, giving a crude incidence rate of 681/100,000. There was no significant difference between the ages of black and coloured cases, but the mean age for male cases (39 years) was significantly higher than that for female cases (26 years) (Mann-Whitney U-test 7,5; P < 0,05). The age difference can be explained in part by the demographic characteristics of the population (Fig. 1), but is still evident from examination of age-specific rates in Table I. Table I also illustrates that overall risk for pulmonary tuberculosis declines with age in this population.

Table II illustrates incidence rates for different categories of workers for 1987, using as denominator the total number of workers employed in 1987 in each category. Black men have much higher rates of pulmonary tuberculosis than other workers.

Fig. 3 illustrates the month of diagnosis of tuberculosis according to sex and shows that among females, whose employment is often seasonal, very few cases were diagnosed after the end of seasonal employment for the year. This discrepancy suggests that seasonal female workers who are no longer employed may well develop pulmonary tuberculosis during this period but not be included as cases belonging to the study (employed) population. To compensate for this overestimate of the population at risk, person-months (person-months/12) are used in Table III, which also lists incidence rates for Paarl,18 the western Cape and South Africa excluding the black homelands.2

Table IV describes methods of case-finding, methods of diagnosis and outcome of cases.

<table>
<thead>
<tr>
<th>Age category (yrs)</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 - 69</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 - 59</td>
<td>893</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 - 49</td>
<td>1770</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 - 39</td>
<td>2239</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 - 29</td>
<td>617</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 - 19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1235</td>
<td>489</td>
<td>681</td>
</tr>
</tbody>
</table>

*95% confidence intervals in brackets.
TABLE IV. PRESENTATION, DIAGNOSIS AND OUTCOME OF TUBERCULOSIS CASES

<table>
<thead>
<tr>
<th>Mode of presentation</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>General practitioner</td>
<td>6</td>
<td>40</td>
</tr>
<tr>
<td>Local hospital referral</td>
<td>5</td>
<td>33</td>
</tr>
<tr>
<td>No information</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>SANTA referral</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Self-presentation</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Method of diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radiograph and sputum positive</td>
<td>8</td>
<td>53</td>
</tr>
<tr>
<td>Radiograph positive, sputum negative</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>Radiograph alone</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>No information</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Outcome</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cured</td>
<td>4</td>
<td>37</td>
</tr>
<tr>
<td>Still on treatment</td>
<td>9</td>
<td>60</td>
</tr>
<tr>
<td>Defaulted</td>
<td>2</td>
<td>13</td>
</tr>
</tbody>
</table>

All cases were found through passive case-finding. Only 1 patient presented to the clinic for investigation on the basis of symptoms. A large proportion of cases (40%) were treated on the basis of radiographic findings that were not confirmed by study of the sputum. Of the 2 defaulters, 1 was a seasonal worker lost to follow-up and the other had previously defaulted. A history of previous tuberculosis was confirmed in 3 cases (20%), and 1 case had been on isoniazid prophylaxis 10 years previously.

Discussion

In a descriptive study, the generalisability of the results is primarily dependent on the validity of the sampling procedure. Since this study included the entire population of one factory, the tuberculosis rates obtained are generalisable to workers in the canning industry inasmuch as the factory is representative of all factories in the canning industry. Because tuberculosis rates in Paarl are evidently higher than those for the western Cape as a whole, this inference may not be entirely valid. None the less, useful comparisons may be made and tentative industrial risks generated.

A methodological point relating to the study is that the incomplete participation of the cohort (females) in the full year at risk (denominator) due to seasonality of employment must be compensated for by the use of person-years (person-months/12). In this way seasonal workers contribute to both denominator and numerator when they are employed but are no longer included when unemployed.

Risk factors for tuberculous disease include age, time elapsed since primary infection, coexistent disease such as silicosis and diabetes, and undernutrition. Table I suggests that overall risk for pulmonary tuberculosis among canning workers increases with age but that the inconsistency between male and female trends and the wide confidence intervals to the age-specific rates limit the reliability of this observation.

In addition, various occupational hazards have been postulated as risk factors for developing pulmonary tuberculosis, including: (i) dusty environments; (ii) extremes of temperature; (iii) shift-work; and (iv) work in health care institutions. The South African Society of Occupational Medicine guidelines for tuberculosis control in industry label migrants, tuberculosis contacts and workers exposed to dust, extremes of hot or cold or shift-work with excessive overtime as high-risk groups.

The canning industry in the western Cape is characterised by intensive shift-work in the peak season (January - May) but not in the other features mentioned above.

In contrast to other studies of worker populations that showed tuberculosis rates based on mass radiographic screening to be low, this study demonstrated pulmonary tuberculosis rates appreciably higher than rates for South Africa as a whole or even for the western Cape. Possible explanations for this may be for high rates in the local community and higher pick-up rates in the canning industry due to the presence of factory health services.

Black men are at particularly high risk for pulmonary tuberculosis, a feature that supports findings of others. This risk is especially high in the age category 30 - 49 years. It is difficult to estimate the magnitude of this excess risk accurately because of the paucity of demographic data for the black population and the absence of age-specific data on pulmonary tuberculosis for comparison, both nationally and locally. Moreover, the sample size is too small to generate stable rates required for direct age-standardisation. Bearing in mind the problems of using unstandardised rates, the relative risk of developing pulmonary tuberculosis for black male workers (compared with other categories of workers) is 2.1 and the attributable risk is 816/100,000. These figures are significantly high (P < 0.05) and further studies are indicated to examine possible occupational and non-occupational factors that contribute to this increased risk.

Given the 'healthier worker effect' one would expect a cohort of workers to have lower rates of illness than the general community, which includes individuals too ill to work. It is clear from this study that workers in the canning industry have rates of pulmonary tuberculosis comparable to the high rates for the local municipality. This suggests that active case-finding in industry could well provide acceptable yields for pulmonary tuberculosis and that current strategy for tuberculosis control in industry should be reviewed on the basis of a sound knowledge of industry-based risk profiles for this disease.

I thank Dr M. Zwahlen of the Centre for Epidemiological Research in South Africa for his comments, the staff of the Paarl Municipality Health Department for their co-operation, and the workers of the Food and Allied Workers Union for their participation in this study.

REFERENCES

Permanent disability in black mineworkers

A critical analysis

J. P. LEGER, R. S. ARKLES

Summary

Two-thirds of all occupational permanent disabilities among black workers in South Africa occur in the mining industry. Comparison of compensated permanent disability cases shows that the incidence of permanent disability among black mineworkers is several times higher than that in any other South African industry. Most permanent disabilities sustained in mining fall into the category of 1-5% disability. Trends in the incidence of permanent disability are examined and compensation for disabled black mineworkers is investigated. The basis of workers' compensation legislation involves workers giving up their common-law right to litigate for losses owing to occupational injuries (including pain and suffering) in exchange for guaranteed protection against income losses. However, the evidence suggests that compensation generally does not redress income loss. Most disabled black miners receive compensation payments that are lower than poverty datum levels and high rates of inflation rapidly erode their real value. Since many black workers are repatriated after a disabling accident, the issue of employment becomes crucial. The problems highlighted suggest that compensation legislation requires reform to ameliorate the difficulties faced by disabled black miners and recommendations are made.

Every year occupational accidents in the South African mining industry exact a heavy toll in death and disablement of the three-quarter million strong workforce. In 1986 800 miners died and 12 700 had injuries severe enough to be notified in terms of the Mines and Works Act, 1956.1 A significant proportion of the latter were permanently disabled — their injuries ranging from the loss of fingers or toes to paraplegia.

The numbers of mineworkers permanently disabled and the adequacy of workers' compensation is examined. Workers' compensation legislation represents a historical compromise to ameliorate the consequences of industrial injuries. It embodies a trade-off in which employees lost their common-law right to sue their employers for full damages for losses including pain and suffering. In return employees were promised protection against income losses as a result of injuries, irrespective of fault.2

Permanent disabilities pose profound problems for both injured workers and employers. Studies which have traced the post-accident experiences of permanently disabled workers have described the deleterious effects of permanent disability on the lives of workers and their families.3 Most experience a decline in living standards and difficulty in finding and maintaining employment. Ginnold,4 who investigated 700 permanently partially disabled workers in Wisconsin, USA, found that compensation replaced less than one-third of expected lifetime earnings. Australian studies of injured immigrant workers show that where rehabilitation is poor or incomplete it tends to result in chronic invalidism.4,5

In South Africa no such studies have been undertaken. In the mining industry, the migrant labour system exacerbates and obscures the consequences of permanently disabling accidents. Workers no longer employed by the mines must return to their rural homes. These areas, in common with much of rural Africa, are characterised by high rates of unemployment and limited health and welfare infrastructures.

The rehabilitation of disabled miners so that they can be re-employed and integrated productively into their communities is difficult, since miners and their families are widely dispersed throughout the rural areas of southern Africa. Without emphasis on vocational and social rehabilitation and follow-up, the extent of disabled workers' financial and employment difficulties remains unknown. Preliminary studies of permanently disabled mineworkers living in rural areas have been conducted by the authors (unpublished data). These highlight a number of adverse social and economic consequences following a serious accident at work. Family visits during hospitalisation, inadequate compensation and difficulties in finding and maintaining employment emerged as problem areas. Compensation did not take into account extra expenses incurred as a result of disabling injuries, nor did periodic increases in compensation payments keep pace with inflation. Those compensated before the introduction of pensions for black mineworkers in 1977 were in the most precarious posi-

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