

# Tuberculosis in National Health Service hospital staff in the West Midlands region of England, 1992-5

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## Abstract

**Background** – This study was designed to assess the current incidence of tuberculosis (TB) in National Health Service hospital staff in the West Midlands region of England and to evaluate the effectiveness of occupational health screening and surveillance procedures.

**Methods** – A four year prospective study (1992-5) was carried out with case ascertainment through occupational health departments and the Midlands Thoracic Society registry of rare respiratory diseases.

**Results** No case was known to an occupational health department that was not notified by the registry and, in addition, the registry yielded a further six cases. There were 26 cases of active TB, of which 24 presented with symptoms and 12 had no pre-employment screening. All except one doctor were foreign born – mainly from the Indian subcontinent (ISC) – and of recent UK entry, whilst all except one nurse were white females. The following are annual TB incidences per 10<sup>4</sup> (95% confidence interval): ISC and non-white doctors 17.0 (7.8 to 26.2), not significantly greater than in the local ISC and non-white social class 1 working age population (11.8 (8.5 to 15.1)); white nurses 0.6 (0.2 to 1.0), significantly greater ( $p < 0.05$ ) than that of white women in the local social class 2 working age population (0.2 (0.1 to 0.3)); others (mortuary attendant, physiotherapist, radiographer and theatre technician) 1.0 (0.02 to 2.0), not significantly greater than in the local social class 2 working age population (0.6 (0.5 to 0.7)).

**Conclusions** – Case ascertainment via the registry was complete. Most cases of TB were in nurses and doctors, more commonly in doctors. However, all but one of the doctors were foreign born and probably had reactivation of infection acquired abroad rather than infection occupationally acquired in the UK. All but one of the nurses, however, were UK born and may have had occupationally acquired disease, their incidence being higher than in the community. As most cases present with symptoms, there needs to be continued emphasis on prompt reporting of suspicious symptoms both before and during

**employment, and pre-employment BCG vaccination where appropriate.**

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**Keywords:** tuberculosis, National Health Service hospital staff, occupational surveillance.

Tuberculosis (TB) is a prescribed occupational disease for health care workers. In a health care setting infection usually arises from repeated close contact with patients who have sputum smear-positive pulmonary disease, or with infected laboratory specimens or necroscopic material. A study in England and Wales in the 1980s showed that the incidence of TB was similar to or lower than that of the general population for all occupational groups except mortuary attendants,<sup>1</sup> whilst a Scottish study showed similar findings with only medical laboratory technicians having an increased incidence.<sup>2</sup> The risk to mortuary workers was again highlighted more recently.<sup>3</sup> In contrast to previous reports, however, a recent study suggested that the incidence of TB is increased in all health service staff in England and Wales.<sup>4</sup>

In this study we have assessed the current incidence of tuberculosis in National Health Service hospital staff in the West Midlands region of England and evaluated the effectiveness of occupational health screening and surveillance procedures.

## Methods

A four year prospective study was undertaken from January 1992 to December 1995. During this period, through the Association of National Health Service Occupational Physicians, a system was in place for recording the occurrence throughout the West Midlands of TB in hospital staff. Because cases of TB in health care workers may not always be known to the Occupational Health Department, a backup case ascertainment system was set up using the Midland Thoracic Society rare diseases registry. All respiratory physicians in the region submit monthly returns of selected rare respiratory diseases, including TB in health care workers, during the study period. It was assumed that TB in health care workers would be treated by respiratory physicians and would thus be reported through the registry.

For the purposes of the registry TB in health care workers was defined as TB, pulmonary or otherwise, for which full chemotherapy was

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Table 1 Nurses with tuberculosis

Case no.	Specialty	Referral	Ethnic group	Age (years)	Sex	Prior BCG	Heaf grade pre-employment	Heaf grade at presentation	Diagnosis
1	Thoracic surgery	Symptoms	Black Caribbean	44	F	No	2	4	Hilar lymph nodes
2	Student nurse	Symptoms	White	28	F	Yes	2	Not done	Cervical lymph nodes
3	Hospice	Symptoms	White	40	F	No	1	Not done	SMCN PTB
4	Respiratory medicine	Symptoms	White	60	F	Yes	0	Not done	SMP PTB
5	Elderly care	Symptoms	White	30	F	Yes	0	4	SMCN PTB
6	General medicine	Symptoms	White	28	F	Yes	Not done	Not done	SMP PTB
7	Elderly care	Symptoms	White	44	F	Yes	Not done	0	SMCP PTB
8	Psychiatry	Occupational surveillance	White	43	F	Yes	1	4	Lung tuberculosis

SMP PTB = sputum smear positive pulmonary tuberculosis; SMCP PTB = sputum smear negative but culture positive pulmonary tuberculosis; SMCN PTB = sputum smear and culture negative pulmonary tuberculosis.

Table 2 Doctors with tuberculosis

Case no.	Specialty	Referral	Ethnic group	Years in UK	Age (years)	Sex	Prior BCG	Heaf grade pre-employment	Heaf grade at presentation	Diagnosis
9	Geriatrics	Symptoms	ISC	NK	31	F	Yes	Not done	3	Hilar lymph nodes
10	Radiotherapy	Symptoms	ISC	15	57	M	NK	Not done	Not done	Laryngeal
11	Medicine	Symptoms	ISC	3	28	M	No	Not done	Not done	SMP PTB
12	Obstetrics	Symptoms	ISC	4	26	M	Yes	2	3	Pleural
13	Geriatrics	Symptoms	Malaysian	11	39	F	Yes	2	Not done	SMP PTB
14	Ophthalmology	Symptoms	ISC	2	30	F	No	Not done	Not done	Mediastinal glands
15	Orthopaedics	Symptoms	ISC	3	30	M	NK	3	4	Mediastinal glands
16	NK	Symptoms	ISC	3	47	M	Yes	2	Not done	Mediastinal glands
17	Surgery	Symptoms	White	36	36	M	Yes	"Pos"	Not done	Finger ulcer
18	Medicine	Symptoms	ISC	2	30	M	Yes	Not done	Not done	Nodes in axilla
19	Paediatrics	Community contact screen	ISC	2	30	M	NK	Not done	3	Mediastinal glands
20	Surgery	Symptoms	ISC	<1	29	M	No	4	Not done	Cervical lymph nodes
21	Surgery	Symptoms	ISC	1	28	M	Yes	Not done	Not done	Pleural
22	Anaesthetics	Symptoms	Egypt	3	34	M	Yes	3	Not done	Mediastinal glands

ISC = Indian subcontinent; NK = not known; SMP PTB = sputum smear positive pulmonary tuberculosis.

Table 3 Other staff groups with tuberculosis

Case no.	Specialty	Referral	Ethnic group	Age (years)	Sex	Prior BCG	Heaf grade pre-employment	Heaf grade at presentation	Diagnosis
23	Mortuary attendant	Symptoms	White	62	M	Yes	Not done	1	SMCP PTB
24	Radiographer	Contact screen	White	21	F	Yes	Not done	3	SMCP PTB
25	Physiotherapist	Symptoms	Anglo-Indian (born UK)	22	F	NK	2	1	SMCP PTB
26	Theatre technician	Symptoms	ISC (UK 33 years)	44	M	Yes	Not done	Not done	Pleural

NK = not known; SMCP PTB = sputum smear negative culture positive pulmonary tuberculosis

given, or presumed tuberculous infection for which chemoprophylaxis was given. A health care worker was defined as anyone working in a National Health Service hospital whether employed by the National Health Service or by contracting agencies. Details of the cases were extracted from occupational health records, questionnaires sent to clinicians reporting on the registry, and from hospital case notes.

The size and composition of the hospital workforce in the West Midlands for non-medical staff was obtained from the statistical information unit in the Department of Health.<sup>5,6</sup> Information on hospital doctors in the West Midlands was obtained from personal communication (D Hubbard, statistical information unit in the Department of Health, Leeds). Mid-period data were available (1993 for non-medical staff and 1994 for medical staff).

The incidence of TB by age, sex, ethnicity, and social class in adults of working age in the West Midlands was calculated using numerator data from the 1993 national TB notification survey database and denominator data from the 1993 labour force survey (André Charlett, PHLS Communicable Disease Surveillance Centre, London). A wide age range (20–64 years) was used and there was no analysis of narrower age bands because of small numbers.

The ethnic groups were split into white, those from the Indian subcontinent (ISC) and other, and social class was in accordance with the Standard Occupational Classification.<sup>7</sup> Health care workers were compared with a matched socioeconomic group rather than with the whole population, which would include poor and unemployed people who are likely to be at higher risk of tuberculosis.

Workforce and community incidences are reported per 10<sup>4</sup> with 95% confidence intervals. The incidence rate ratios were calculated comparing the incidence of TB in health care workers with the incidence of TB in the general population restricted to the relevant age, ethnicity, social class, and sex where appropriate. The incidence rates were compared and the 95% confidence intervals were computed based on the incidence rates being Poisson distributed. A p value of less than 0.05 was considered significant.

## Results

The relevant workforce in the West Midlands comprised 5840 doctors (1914 of ISC and other non-white ethnic origin), 39 848 nurses, and 9683 staff in professions allied to medicine, scientific and technical departments.<sup>4,5</sup> Of the

Table 4 Staff in whom tuberculosis or tuberculosis infection was detected by occupational surveillance

Job	Ethnic group	Sex	Occupational surveillance	Outcome
Nurse (case 8)	White	F	Seen as contact*	Tuberculoma (lung)
Nurse (case 27)	White	F	Seen as contact**	Heaf seroconversion (0 to 4)
Doctor (case 20)***	ISC	M	Pre-employment Heaf test	Grade 4 Heaf
Tuberculosis health visitor (case 28)	White	F	Pre-employment Heaf test	Heaf seroconversion (1 to 4)

\* In error as not in fact a contact of known case; \*\* "index case" later shown not to be tuberculosis; \*\*\* given chemoprophylaxis, later presented with TB lymphadenitis (table 2).

Table 5 Incidences and rate ratios of TB in health care workers compared with the general population restricted to the relevant age, ethnicity, social class, and sex where appropriate.

Occupation	No	Ethnic group	Social class	Sex	Incidence TB per 10 000/year (95% CI)		
					Health care worker	General population	Rate ratio (95% CI)
Nurses	8	White and others (excluding ISC)	2	F	0.6 (0.2 to 1.0)	0.5 (0.4 to 0.6)	1.3 (0.6 to 2.7)
Nurses	7	White	2	F	0.6 (0.2 to 1.0)	0.2 (0.1 to 0.3)	2.4 (1.1 to 5.5)*
Doctors	13	ISC and others (excluding white)	1	M & F	17.0 (7.8 to 26.2)	11.8 (8.5 to 15.1)	1.4 (0.8 to 2.7)
Others	4	All	2	M & F	1.0 (0.02 to 2.0)	0.6 (0.5 to 0.7)	1.6 (0.6 to 4.4)

\*  $p < 0.05$ .

nurses, 88.9% were white and 88% were women.

There were 28 cases meeting the definition of TB in hospital health care workers (tables 1–3). Case ascertainment in this study was probably as complete as is reasonably possible. The occupational health department recording system yielded 22 cases, all of whom were also known to the Midland Thoracic Society rare respiratory diseases registry. The registry yielded a further six cases not known to an occupational health department (five doctors and a theatre technician). There were 26 cases of active TB requiring full chemotherapy and three cases with presumed tuberculous infection for which chemoprophylaxis was given, including one case (case 20) in both categories (table 4).

Of the 26 cases of active TB, 24 presented with symptoms. Occupational surveillance detected only one case of active TB and an additional three subjects who received chemoprophylaxis for presumed tuberculous infection (table 4).

The 26 cases of active TB comprised eight nurses, 14 doctors, and four others (tables 1–3). The annual incidence of TB in the workforce is summarised in table 5. There were 13 men and 13 women, and their mean age was 36 years (range 21–62). Ethnic groupings were as follows: 10 white, 12 ISC, one Black Caribbean, one Malaysian, one Anglo-Indian, and one Egyptian. Of the 26 cases, 17 had had prior BCG, five had not, and in four cases we had no information.

Of the 26 cases, 11 were pulmonary and 15 extrapulmonary. Of the three pulmonary cases that were smear and culture negative, all had the diagnosis confirmed by histological examination of the excised tissue. Of the 15 extrapulmonary cases, five were diagnosed clinically whilst the others had bacteriological (seven cases) and/or histological (10 cases) confirmation of the diagnosis. All mycobacterial cultures isolated were fully sensitive to first line antituberculous drugs.

No health care worker was known to be HIV positive and none had AIDS. Five were infectious (four smear positive pulmonary and

one laryngeal) and all except case 10 (radio-therapist) worked with general medical and elderly patients but not with children or known immunosuppressed patients. Screening of staff in contact with infectious health care workers yielded no secondary cases of TB or presumed tuberculous infection. No patient in contact with an infectious health care worker is known to have developed tuberculous infection or disease. We have no information as to the outcome of screening of community contacts.

## Discussion

The annual incidence of TB in nurses was not significantly greater than that of a mixed ethnic group in the social class 2 working age population of the West Midlands (table 5). However, all except one of the eight nurses was white and born in the UK; the other came from the West Indies but had lived in the UK for over 20 years. The annual incidence of TB in white nurses was significantly greater than that of white females in the local social class 2 working age population. In addition, among the social class 2 working age population in the West Midlands, most cases of TB (74%) are in non-whites, strikingly different from the ethnic composition of our group of nurses with TB. We therefore speculate that the nurses may have contracted TB in the course of their work. All, in various specialities, could have been exposed to patients with infectious TB and, indeed, five out of nine reported contact with sputum smear positive patients.

The annual incidence of TB in doctors was much higher than in nurses. However, all but one of the doctors were foreign born, principally in the Indian subcontinent (ISC), and their incidence was not significantly greater than in the ISC and non-white ethnic group social class 1 working age population in the West Midlands. We therefore feel that we are dealing with a high ethnic rather than an occupational risk and that these doctors had probably acquired infection abroad and developed reactivation, rather than acquired infection occupationally in the UK, although it is impossible to be certain about this. In addition, most of the

doctors were fairly recent entrants to the UK and therefore in the period of maximum risk for development of TB.<sup>8</sup> We have no information as to return visits abroad, another risk factor.<sup>9</sup> The single case in a white doctor was that of a surgeon in whom DNA fingerprinting confirmed that his mycobacterial strain matched that of a patient with TB on whom he had operated.

Other staff groups with TB comprised a small heterogeneous group (tables 3 and 5). Some previous surveys found mortuary attendants and laboratory workers to be at increased risk.<sup>13</sup> There was only one case of a mortuary attendant with TB in our study, but no laboratory workers. It is of note, however, that case 24 was a close domestic contact of a sputum smear positive case and case 25 had been in India one year before presenting with symptoms.

Pre-employment screening was particularly lax in doctors, with seven of the 14 doctors being unscreened. Had these seven been screened according to the present code of practice,<sup>10</sup> four cases (10, 11, 14 and 19), of which two were infectious (cases 10 and 11), might have been detected earlier. On the other hand, most of the nurses had satisfactory pre-employment screening. Despite this, no case was detected in nurses at the pre-employment stage. However, this is not unexpected since the pre-employment check serves mainly to identify subjects for BCG vaccination and to give appropriate advice to those previously infected. Since most cases of TB present with symptoms, there should be more emphasis on reporting of suspicious symptoms and a continued policy of BCG vaccination in Heaf negative previously unvaccinated subjects.

There has been a policy of BCG vaccination in schools in the UK for many years so most of the people entering employment in the health service will have been vaccinated. Hence it is not surprising that cases of TB occurred in previously vaccinated subjects, serving to remind us that BCG vaccination is less than 100% efficacious.<sup>11</sup>

In conclusion, case ascertainment via the Midland Thoracic Society rare diseases registry was considered to be as complete as is reas-

onably possible. Most cases of TB were in nurses and doctors, more commonly in doctors. All but one of the doctors were foreign born and probably had reactivation of infection acquired abroad rather than infection occupationally acquired in the UK. All but one of the nurses, however, were UK born and may have had occupationally acquired disease, their incidence being higher than in the community. The other health care workers were a small heterogeneous group and their incidence was similar to that of the general population. In nurses with TB, pre-employment screening had been satisfactory but in other staff groups, particularly doctors, such screening was patchy and, had it been carried out to currently recommended standards, might have led to earlier diagnosis in two (of a total of five) cases who were infectious at the time of presentation. As most cases present with symptoms, there needs to be continued emphasis on prompt reporting of suspicious symptoms both before and during employment, and a continued policy of offering BCG vaccination to previously unvaccinated subjects who are Heaf negative before employment.

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