TUBERCULOSIS IN NEW SOUTH WALES, 1991–2002

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BACKGROUND

Tuberculosis continues to be a disease of global public health significance. In 2001, 183 countries notified a total of 3.8 million cases of tuberculosis to the World Health Organization Global Surveillance Program.[1] Countries that surround Australia in the Western Pacific Region account for one quarter of these notifications. In contrast, Australia continues to have one of the lowest rates of tuberculosis in the world. Despite these low rates of disease, tuberculosis is an important public health challenge for Australia, and requires the continued commitment of multidisciplinary services and ongoing surveillance to monitor trends in presentation of the disease, its treatment, and the clinical outcomes for people identified with tuberculosis.

Tuberculosis is caused by infection with the bacteria *Mycobacterium tuberculosis*. The bacteria are spread when a person with pulmonary or laryngeal tuberculosis produces airborne droplets that carry the bacteria, which are expelled into the air and breathed in by another person. People with inactive tuberculosis, and people with tuberculosis disease in sites other than the lung or larynx, are generally not infectious to other people.

Of the people who become infected, most never develop active disease. Approximately 5–10 per cent go on to develop active disease over their lifetime,[2] half of these within the first two years following infection. Young children and immunosupressed people are at risk, as are those who have chronic renal failure, cancer, silicosis, or diabetes. Other causes for immunosuppression such as some medication, poor nutrition, HIV infection, or substance abuse, can also predispose to active disease. Tuberculosis disease can affect any organ, although the lung is most commonly involved. The standard treatment for tuberculosis involves a six-month course of multiple antibiotics. Preventive treatment for people who are infected but do not have active disease can significantly reduce the risk of progression to active disease.[3]

This article describes the epidemiological characteristics of patients reported with tuberculosis in New South Wales in 2001 and 2002, and updates a previous review of tuberculosis in New South Wales for the period of 1991–2000.[4]

METHODS

Tuberculosis is a notifiable disease in New South Wales under the *NSW Public Health Act 1991*; laboratories, doctors, and hospitals must notify cases of tuberculosis to their local public health unit. The details of tuberculosis cases are then entered onto the Notifiable Diseases Database, which is maintained by the Communicable Diseases Branch of the NSW Department of Health. The characteristics of cases of tuberculosis notified to public health units during 2001 and 2002 were analysed and compared with cases notified from the preceding 10-year period 1991–2000. Incidence rates for 2001 and 2002 were calculated using the Australian Bureau of Statistics estimated mid-year population for the relevant year. Rates for 1991–2000 were based on the mid-point population estimate for 1995.

RESULTS

Case notifications 2001–2002

In 2002, 447 cases of tuberculosis were notified in New South Wales (6.8 cases per 100,000); and in 2001, 415 cases were notified (6.4 cases per 100,000) (Table 1). For 1991 to 2000, 4,180 cases of tuberculosis were notified in New South Wales, an average of 418 cases per year (6.8 per 100,000).

TABLE 1

TOTAL NUMBERS OF NOTIFICATIONS OF TUBERCULOSIS, INCIDENCE RATE AND DEATHS, PER ANNUM, NSW, 1991–2002

Year	Notified cases *N*	Rate/ 100,000	Notified deaths *N*	% of cases
1991	430	7.3	9	2
1992	394	6.6	20	5
1993	389	6.5	28	7
1994	393	6.5	24	6
1995	443	7.2	22	5
1996	410	6.6	16	4
1997	419	6.7	16	4
1998	378	6.0	27	7
1999	481	7.5	25	5
2000	443	6.9	39	9
2001	415	6.4	33	8
2002	447	6.8	39	9

Source: Notifiable Diseases Database, Communicable Disease Branch, NSW Department of Health.

TABLE 2

CHARACTERISTICS OF PATIENTS NOTIFIED WITH TUBERCULOSIS, NSW, 1991–2000, 2001 AND 2002

Case characteristics	Cases in 1991–2000 *N*	% Total	Rate/ 100,000	Cases in 2001 *N*	% Total	Rate/ 100,000	Cases in 2002 *N*	% Total	Rate/ 100,000
Residence *			#						
Sydney Metropolitan	3472	83	10.5	370	89	10.4	384	86	10.7
Outer Sydney	430	10	3.1	26	6	1.7	42	9	2.8
Other NSW	264	6	1.9	19	5	1.3	20	4	1.4
Sex									
Male	2196	53	7.2	221	53	6.8	225	50	6.9
Female	1972	47	6.4	194	47	5.9	221	49	6.7
Age Group (years)									
0–4	144	3	3.3	8	2	1.9	6	1	1.4
5–9	57	1	1.3	2	0	0.4	3	1	0.7
10–14	46	1	1.1	2	0	0.4	2	0	0.4
15–19	118	3	2.7	19	5	4.3	14	3	3.1
20–24	337	8	7.3	46	11	10.3	42	9	9.3
25–34	896	21	9.3	95	23	9.8	96	21	9.9
35–44	699	17	7.5	65	16	6.5	83	19	8.3
45–54	440	11	5.8	47	11	5.3	61	14	6.8
55–64	411	10	7.6	30	7	4.8	38	9	5.8
65–74	508	12	11.3	44	11	9.6	38	9	8.3
75–84	411	10	16.4	36	9	12.2	47	11	15.5
85+	113	3	16.4	21	5	23.5	16	4	17.4
Aboriginal or Torres Strait Islander	34	<1	3.1	1	<1	0.8	2	<1	1.6
Total	**4180**	**100**	**6.8**	**415**	**100**	**6.4**	**447**	**100**	**6.8**

* Residence by Area Health Service

\# Rates are calculated on 1995 population mid-year estimates.

Sydney Metropolitan = Central Sydney, Northern Sydney, South Eastern Sydney, Western Sydney, and South Western Sydney.
Outer Sydney = Wentworth, Illawarra, Central Coast, and Hunter.
Other NSW = Mid North Coast, Northern Rivers, Macquarie, Mid Western, Southern, Greater Murray, Far West, and Corrections Health.

Source: Notifiable Diseases Database, Communicable Disease Branch, NSW Department of Health.

TABLE 3

REGION OF BIRTH FOR PATIENTS NOTIFIED WITH TUBERCULOSIS, NSW, 1995–2000, 2001 AND 2002

Case characteristics	Cases in 1995–2000 *N*	% Total	Rate/ 100,000	Cases in 2001 *N*	% Total	Rate/ 100,000	Cases in 2002 *N*	% Total	Rate/ 100,000
			§						
Africa	61	2	19.0	10	2	12.9	20	4	25.8
Americas	31	1	8.5	8	2	13.1	7	2	11.5
Asia									
Southern and Central Asia	302	12	92.3	75	18	83.8	69	15	77.1
North East Asia	445	17	56.4	63	15	34.5	64	14	35.0
South East Asia	809	31	80.3	127	31	57.9	152	34	69.2
Total for Asia	1556	60	73.3	265	64	53.9	285	64	58.0
Australia	453	18	1.9	68	16	1.4	62	14	1.3
Europe	264	10	8.3	31	7	5.0	40	9	6.3
Middle East	47	2	9.0	11	3	9.8	12	3	10.7
Other Oceania	107	4	14.7	19	5	10.6	20	4	11.1
Not reported	55	2		3	1		1	0	
Total	**2574**	**100**		**415**	**100**		**447**	**100**	

§ Rates are calculated on 1997 population mid-year estimates.

Source: Notifiable Diseases Database, Communicable Disease Branch, NSW Department of Health.

TABLE 4

MAIN SITE OF INFECTION, CASE CLASSIFICATION AND MEANS OF LABORATORY CONFIRMATION OF PATIENTS NOTIFIED WITH TUBERCULOSIS, NSW, 1991–2002, 2001 AND 2002

Case characteristics	Cases 1991–2000 *N*	%Total	Cases in 2001 *N*	% Total	Cases in 2002 *N*	% Total
Main site of infection						
Lung	2113	63	235	57	268	60
Lymphatics	548	16	97	23	94	21
Pleura	161	5	31	7	30	7
Bone–Joint	107	3	14	3	13	3
Kidney–genitourinary	117	4	8	2	14	3
Miliary	§		8	2	2	0
Brain–Central Nervous System	42	1	5	1	10	2
Gastrointestinal	47	1	5	1	6	1
Other	192	6	9	2	10	2
Unknown–Not reported	853		3	1	0	0
Case Classification						
New Active	3152	75	394	95	440	98
Reactivated	232	6	19	5	7	2
Unknown–Not reported	796	19	2	0	0	0
Laboratory confirmed (total)#	2969	71	307	74	325	73
Culture	2043	49	285	69	310	69
Polymerase Chain Reaction	29	1	19	5	15	3
Clinical	1196	29	111	27	122	27
Unknown–Not reported	912	22	0	0	0	0
Pulmonary cases only*	2164	52	241	58	268	61
Direct smear results						
Direct smear positive	711	33	98	41	114	43
Direct smear negative	730	34	127	53	143	53
Direct smear not reported	723	33	16	7	11	4
Culture results						
Culture positive	1004	46	178	74	204	75
Culture negative	437	20	47	20	56	21
Culture not reported	723	33	16	7	11	4
Total number of cases	**4180**	**100**	**415**	**100**	**447**	**100**

* Pulmonary cases refer to the number of cases where the primary site of disease is lung.

§ Included in other

Some infections confirmed by more than one method.

Source: Notifiable Diseases Database, Communicable Disease Branch, NSW Department of Health.

Demographic characteristics of cases

In the two years 2001 and 2002, the incidence of tuberculosis was much higher among people living in the Sydney area than in other parts of NSW (Table 2). This pattern is consistent with that for the period 1991–2000.

The incidence of tuberculosis was similar for males and females but varied with age. It was highest among people aged 75 years and older and lowest among children and adolescents. Children aged under five years had a higher rate than older children aged 5–14 years.

The rate of disease was lowest in people born in Australia and highest among people born in southern and central Asia. Eighty-three per cent of cases were born overseas and 64 per cent in Asia. A similar pattern was seen for the decade 1991–2000. The proportion of patients with tuberculosis who were born in Australia declined slightly in the last eight years, from 18 per cent between 1995–2000 to 14 per cent in 2002. The rate of tuberculosis among people born in Australia declined from 1.9/100,000 in 1991–2000, to 1.3/100,000 in 2002 (Table 3).

In 2001 and 2002, Aboriginal and Torres Strait Islander people accounted for less than one per cent of cases in New South Wales.

Site of infection

In 2001 and 2002, the major reported site of disease was lung (60 per cent), followed by lymphatic system (21 per cent) and pleura (seven per cent) (Table 4).

TABLE 5

CLINICAL OUTCOME OF TUBERCULOSIS CASES, NSW, 1991–2000, 2001 AND 2002

Case outcomes	Cases 1991–2000		Cases in 2001		Cases in 2002	
	Number	%	Number	%	Number	%
Completed	1703	41	334	80	314	70
Cured	210	5	8	2	10	2
Defaulted	38	1	9	2	6	1
Died (total)	165	4	32	8	39	9
Died with TB	not reported		26	6	31	7
Died from TB	not reported		6	1	8	2
Failure	12	0	0	0	0	0
Incomplete	547	13	4	1	58	13
Transferred overseas	114	3	27	7	20	4
Unknown–Not reported	1391	33	1	0	0	0

Source: Notifiable Diseases Database, Communicable Disease Branch, NSW Department of Health.

Case classification

In 2002, 98 per cent of cases were notified as episodes of new disease and two per cent as reactivated–relapsed episodes of disease. This is a similar pattern to that seen in 2001; however, it is an increase compared with the proportion of new active cases reported in 1991–2000. This is explained by better reporting of tuberculosis disease classification in recent years.

Laboratory confirmation

Nearly three-quarters of the cases in 2002 (73 per cent) were confirmed by a laboratory (Table 4), a similar proportion as in the preceding 11 years.

Of the 268 cases reported to have pulmonary disease in 2002, sputum microscopy and culture results were reported for 96 per cent (260 cases). Of these 260 cases, 43 per cent had acid-fast bacilli identified on direct sputum smears, and 75 per cent were reported to have *Mycobacterium tuberculosis* cultured in the sputum. The percentage of cases without smear or culture results has fallen from 33 per cent in the period 1995–2000 to four per cent in 2002. This may reflect improved reporting of test results (Table 4).

Clinical outcomes for patients

Reporting the clinical outcomes of cases of tuberculosis has improved over the last two years. Seventy per cent of patients diagnosed in 2002 had completed treatment at the time of reporting, compared with 80 per cent of these diagnosed in 2001. Delays in reporting outcomes are due to the length of time required (sometimes over 18 months) to complete curative therapy (Table 5).

TABLE 6

RISK FACTORS FOR PATIENTS NOTIFIED AS HAVING TUBERCULOSIS,NSW, 2001 AND 2002

Risk factor	Cases in 2001 (*N* = 415)		Cases in 2002 (*N* = 447)	
	Number	%	Number	%
Residence in high risk country	312	75	360	81
Born in high risk country	217	52	247	55
Immunosuppressive health status–therapy *	81	20	99	22
Contact of another notified case	30	7	35	8
Previously diagnosed with tuberculosis	24	6	23	5
Born in Australia, parent born in high risk country	15	4	15	3
Health care setting	12	3	14	3
HIV test completed	19	5	12	3
HIV test positive	9	2	7	2
Other	9	2	10	2
Institutional care #	12	3	7	2
Homelessness	1	0	2	0

* Immunosuppressive health status–therapy = diabetes, silicosis, chronic renal failure, gastrectomy, other immunosuppressive illness, alcoholism, injecting drug use, and immunosuppressive drugs.

\# Institutional care = residence in long-term care including aged care and residence in prison.

Source: Notifiable Diseases Database, Communicable Disease Branch, NSW Department of Health.

TABLE 7

NATIONAL PERFORMANCE INDICATORS FOR THE CONTROL OF TUBERCULOSIS, DATA FOR NSW AND AUSTRALIA FOR 2001 AND 2002

National TB Performance Indicator	Performance Criteria	2001		2002	
		Australia	NSW	Australia	NSW
Annual Incidence of TB (per 100,000 population)					
Crude incidence		5.1	6.4	5.1	6.8
Indigenous Australians	<1	9.8	0.8	8.5	1.6
Non-indigenous Australian-born	<1	1.0	1.4	1.1	1.2
Overseas-born persons*	**	10.2	17.4	11.5	19.2
Relapse cases initially treated in Australia	<2% of total treated cases	NA	<1%	NA	<1%
Incidence in children <15 years, by risk group					
Indigenous Australian children	<0.1	2.4	0.0	4.3	0.0
Non-indigenous Australian-born children	<0.1	0.5	0.7	0.5	0.7
Overseas-born children*	**	1.0	5.7	0.1	4.3
All cases					
Collection of HIV status in TB cases (% of cases)	100% over next 3 years	4.2	2.7	27.3	4.6
Treatment outcome measures (%)					
Cases evaluated for outcomes#	100	76.9	99.8	78.0***	100.0
Cases that have treatment completed and are cured	>90	83.6	82	80.0	71.0
Cases recorded as treatment failures#	<2	0.9	0.0	0.1	0.0

* The performance criteria for overseas born patients are applied to people who have been living in Australia for more than five years.
The denominator for this rate is the total overseas born population living in Australia in 2002.

** Performance criterion currently under review.

*** Evaluated September 2003.

NA = not available (data incomplete).

Denominator used for both 2001 and 2002 was the number of cases evaluated for treatment outcome.

Source: National Strategic Plan for Tuberculosis Control in Australia Beyond 2000. Communicable Diseases Network Australia.[5]

During 2002, 39 patients (nine per cent) were reported to have died, and two-thirds of these deaths occurred in people aged 70 years of age or older. The majority of these people died of a cause other than tuberculosis (31 cases) and eight died as a result of tuberculosis. This is a similar pattern to 2001. For the decade 1991–2000, five per cent of all cases were reported to have died but details on the underlying cause of death was not available (Table 5).

HIV co-infection

HIV co-infection was reported in seven patients in 2002 and in nine patients in 2001. For the period 1991–2000, HIV co-infection was reported in 64 patients (an average of just over six cases per year). There is a potential for rates of tuberculosis and HIV co-infection to increase over time as survival for people with HIV infection continues to improve and this population grows.

Multi-drug resistance

Multi-drug resistant tuberculosis is defined as resistance to at least isoniazid and rifampicin, two antibiotics commonly used to treat tuberculosis. There has been a total of 25 cases of multi-drug resistant tuberculosis reported in New South Wales from 1999 to 2002, including four cases reported during 2002.

Patients with multi-drug resistant tuberculosis ranged in age from 14 to 73 years and half were male. Nineteen were born in Asia (southeast Asia and India), three in the Pacific Islands, two in Australia, and one in the United Kingdom.

The majority of these cases had no previous treatment for tuberculosis and were therefore thought to have been newly infected with a strain that was multi-drug resistant (18 cases) compared with seven cases who developed or acquired resistance following a history of previous treatment, either full or partial. Four people were resistant to isoniazid and rifampicin alone, six were resistant to isoniazid, rifampicin and rifabutin, and 15 were resistant to these and other drugs (that is, to between 4–6 drugs). The clinical and public health management of all multi-drug resistant cases was reviewed by the New South Wales Multi-Drug Resistant Tuberculosis Advisory Committee.

Risk factors

Information on risk factors was only available for cases reported in 2001 and 2002. More than one risk factor can be reported for each case. For cases reported in 2002, being born in (55 per cent) or residing in (81 per cent) a high risk country for tuberculosis was the most frequently recorded risk factor for tuberculosis. Twenty-two per cent had an

immunosuppressive disease or had been treated with immunosuppressive therapies (Table 6). The recorded risk factors were similar for cases of tuberculosis reported in 2001.

Performance indicators

In 2002, the National Tuberculosis Advisory Committee developed national performance indicators for tuberculosis.[5] Table 7 compares New South Wales and Australian data for each indicator over the last two years. New South Wales has higher rates of tuberculosis than those observed nationally, and higher rates in most subgroups of the population. For example, the annual incidence rate of tuberculosis in the overseas-born population in New South Wales (17.4/100 000) is higher than the overseas born population across Australia (10.2/100 000), perhaps reflecting the differing places of origin (and associated prevalence of tuberculosis) and length of time in Australia of migrants living in different parts of the country. New South Wales reports lower rates of tuberculosis in indigenous Australians compared to the national rate (Table 7).

DISCUSSION

Tuberculosis in New South Wales mostly affects people who were born in countries with high prevalence of tuberculosis. The elderly population have the highest rates of disease, followed by a secondary peak in those aged 20–35 years. Most patients with tuberculosis in New South Wales reside in the Sydney region, largely reflecting population density and migration settlement patterns.

The incidence of tuberculosis in New South Wales has remained steady over the past decade. The steady decline in overall tuberculosis rates seen before the 1970s subsequently plateaued due to a change in the New South Wales population base to include relatively more people who are at risk of tuberculosis because they have lived in high-prevalence countries. Rates among people born in Australia have continued to decline. There are a number of potential explanations for this. The decline in rates of tuberculosis among Australian-born people may reflect the decreasing risk of exposure to tuberculosis and subsequent infection in this population, and the decreasing risks of progression to active disease once infected, thanks to contact tracing programs and preventive therapy, and improvements in the general health of that population.

Globally, tuberculosis presents an enormous challenge to public health. Although New South Wales experiences some of the lowest incidence rates of tuberculosis in the world, vigilance is still required in the areas that threaten tuberculosis worldwide, particularly in areas with increasing rates of multi-drug resistance and HIV infection.

There are some limitations to the data, particularly in reporting the site of disease, specimen results, clinical outcome, HIV co-infection, and other risk factors. NSW Health continues to work towards improving the flow of data describing tuberculosis and to improve the completeness and quality of the data. Specifically, proposed changes to the reporting process will allow better determination of principal and other sites of disease. There will also be more emphasis on reducing the delay in the reporting of outcome data once treatment lengths have been taken into consideration.

The collection of HIV status of cases of tuberculosis is one area that requires significant improvement at both the state and national levels. As this study was the first formal description of risk factor information for tuberculosis in NSW, we believe the definitions and categories used for risk factor information should be considered in future. Changes to the Notifiable Diseases Database will include these changes in data collection.

For the NSW Tuberculosis Program to continue to co-ordinate the surveillance, treatment, and prevention of tuberculosis, it requires effective collaboration among general practitioners and specialist doctors, laboratories, the staff of chest clinics, public health units, and NSW Health, and partnerships with populations at increased risk.

ACKNOWLEDGEMENTS

We acknowledge the important role of the staff of chest clinics, public health units, laboratories, doctors, and the surveillance team of the Communicable Diseases Branch, NSW Department of Health, in collecting and reporting the data on describing cases of tuberculosis in New South Wales.

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