



The trend of tuberculosis cases over 60 years in Fiji's largest treatment centre: 1950–2010

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Setting: P J Twomey Hospital, National Tuberculosis Programme, Fiji.

Objectives: To review the trend in numbers of tuberculosis (TB) cases registered each year from 1950 to 2010 at P J Twomey Hospital, Fiji's largest TB treatment centre and central TB unit, and to consider trends in the context of key TB control events in Fiji.

Design: Descriptive study of data from medical records and TB registers, including age, sex, ethnicity, TB diagnosis and smear result.

Results: Between 1950 and 2010, 14616 cases were registered at P J Twomey Hospital. Of these, 58% were male, 70% were indigenous Fijians (*i-taukei*) and 64% were aged 15–49 years. The caseload dropped sharply in the 1960s, and has fallen steadily since 1990. Smear results were available for the majority of cases (91%). Between 1950 and 1985, smear-positive cases accounted for 19% of cases overall; this increased to 41% after 1985 following laboratory training. The numbers of sputum smear-positive cases recorded each year has been increasing in the last decade.

Conclusion: There have been marked changes in TB caseload over the last 60 years at Fiji's largest TB treatment centre. The recent increase in smear-positive cases while total TB cases have been falling needs further evaluation.

Tuberculosis (TB) is a major cause of morbidity and mortality globally, with an estimated 8.6 million incident cases of TB and almost 1.3 million deaths due to TB in 2012.¹ Fiji is classified as a low TB burden country, with 2012 estimates indicating a TB incidence of 24 (95% confidence interval [CI] 21–27) per 100000 population, a TB prevalence rate of 30/100000 (95% CI 10–61) and a TB mortality rate of 1.7/100000.¹

A National Tuberculosis Control Programme (NTP) was established in 1951 in Fiji. Important interventions in TB control in Fiji since then have included the introduction of bacille Calmette-Guérin (BCG) vaccination, the implementation of the mass radiography screening programme and the adoption of the DOTS strategy. Data on national TB caseload and trends in this caseload over time are useful for monitoring and evaluating purposes, especially in relation to interventions introduced to improve TB control. To date, historical data relating to TB caseload in Fiji have never been published.

The present study aims to document the annual caseload of TB cases registered at Fiji's largest TB treatment centre from 1950 to 2010, and to stratify data

on age group, sex, ethnicity and smear result by year of notification. We report trends in the caseload over this time period and consider the findings in the context of key events in the history of TB control in Fiji.

METHODS

Study design

This was a descriptive study involving a record review of TB cases.

Study setting and population

The Republic of Fiji Islands consists of 332 islands, with a total land area of 18333 km², located in the southern Pacific Ocean. The population of Fiji has doubled since the late 1950s and is now 837271. The population comprises 57% indigenous Fijians (known as *i-taukei*), 37% Fijians of Indian descent, and 6% other minorities, with around half of the total population living in rural areas. The majority of the population live on two main islands, Viti Levu and Vanua Levu. A small island in the northern division inhabited by I-Kiribati people has the highest TB notification rate, which is 15–20 times higher than Fiji's national notification figure.²

The Fiji NTP was formally established in 1951 and is based at P J Twomey Hospital in Suva. Two other TB treatment centres started operating in the 1950s, at Lautoka Hospital in 1951 and Labasa Hospital in 1954. TB patients were managed according to local guidelines until 1997, when the country adopted the DOTS strategy. The national TB technical guide was developed in 2004 and revised in 2011. TB patients are diagnosed, treated and managed at these three treatment centres, except for when there was an interruption of treatment services at Labasa Hospital between 1979 and 2011.

Between 1950 and 2000, the system used to record and store patient data at P J Twomey Hospital was an alphabetical index of patient names, displayed in hanging files containing patient name, date of birth and registration number. A parallel filing cabinet system had patient folders organised in chronological order according to the patient's registration number. These cabinets stored TB and non-TB patient folders, but a unique registration number for TB patients allowed them to be distinguished from non-TB patients. In 2000, P J Twomey Hospital ceased to use the hanging files and used cards stored alphabetically in boxes instead. A register for TB patients being treated in all three divisions was started in 1989.

At the outset of the study, it was intended to report

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TABLE Burden and characteristics of tuberculosis cases registered at P J Twomey Hospital, 1950–2010

Years	Cases <i>n</i>	Age groups, years			Male sex† <i>n</i> (%)	Ethnic <i>i-taukei</i> <i>n</i> (%)‡	Smear result available <i>n</i> (%)	Smear-positive§ <i>n</i> (%)
		0–14 <i>n</i> (%)*	15–49 <i>n</i> (%)*	≥50 <i>n</i> (%)*				
1950–1955	2530	466 (18)	1731 (68)	316 (12)	1493 (59)	1712 (68)	1928 (76)	557 (29)
1956–1960	2588	627 (24)	1647 (64)	310 (12)	1469 (57)	1862 (72)	2172 (84)	429 (20)
1961–1965	2158	380 (18)	1411 (65)	367 (17)	1228 (57)	1594 (74)	1977 (92)	569 (29)
1966–1970	1230	112 (9)	827 (67)	291 (24)	680 (55)	946 (77)	1182 (96)	266 (23)
1971–1975	786	33 (4)	516 (66)	237 (30)	503 (64)	540 (69)	785 (99.8)	118 (15)
1976–1980	727	82 (11)	426 (59)	219 (30)	422 (58)	475 (65)	726 (99.8)	73 (10)
1981–1985	519	54 (10)	295 (57)	170 (33)	309 (60)	335 (65)	490 (94)	115 (23)
1986–1990	868	90 (10)	547 (63)	227 (26)	511 (58)	594 (68)	833 (96)	322 (38)
1991–1995	1054	121 (11)	620 (58)	313 (29)	618 (58)	732 (69)	1049 (99.5)	339 (32)
1996–2000	849	87 (10)	517 (60)	244 (28)	504 (59)	584 (68)	842 (99.2)	319 (38)
2001–2005	743	74 (10)	451 (61)	256 (34)	471 (63)	513 (69)	741 (99.7)	327 (44)
2006–2010	564	34 (6)	370 (65)	160 (28)	319 (56)	394 (69)	561 (99.5)	365 (65)
Total	14 616	2160 (15)	9358 (64)	3072 (21)	8527 (58)	10 281 (70)	13 286 (91)	3799 (29)

*26 cases without age recorded.

†52 cases without sex recorded.

‡41 cases without ethnicity recorded; *i-taukei* = indigenous Fijian.

§Percentage positive is of those with smear result available.

all notified cases of TB in Fiji, and it was assumed that they would be all registered at the P J Twomey Hospital, as it has been functioning as the central unit of the NTP.

Data collection

All TB patients registered at P J Twomey Hospital between 1950 and 2010 were included in this study. TB patient data were sourced from P J Twomey Hospital, with data collection undertaken by three data collectors: data from 1950 to 1988 were collected by allocating each data collector a block of filing cabinets (25 filing cabinets per block), while data from 1989 to 2010 were collected from the TB registers. The following variables were collected for each year of registration: age group, sex, type of TB and smear microscopy result. All patient data were collected onto a standardised paper proforma and then the total numbers for each year and for each variable were entered into a Microsoft Excel database (Microsoft, Redmond, WA, USA) by research assistants under the supervision of the principal investigator.

Data entry did not include patient identifiers. Data were not double-entered and no additional data sources were available to validate the data. Data were reported according to smear result rather than TB type, as discrepancies were noted between sputum smear result and the type of TB recorded, and there was no additional data source to clarify these discrepancies.

Data on significant events in the history of TB control were obtained through personal communication with current and previous NTP staff and a review of NTP reports. These data included information on the timing of the introduction of BCG vaccination, the establishment of the NTP, the implementation of the mass radiography screening programme, laboratory training and the start of the DOTS strategy.

Data analysis

Data were stratified and proportions were calculated for subgroups.

Ethics approval

Ethics approval was granted by the Fiji National Health Research Ethics Committee, Suva, Fiji, and the Ethics Advisory Group of the International Union Against Tuberculosis and Lung Disease, Paris, France.

RESULTS

A total of 14 616 cases were registered at P J Twomey Hospital between 1950 and 2010. Characteristics of the cases are presented in the Table by 5-year time intervals. Of the 14 564 cases with sex recorded, 58% were male. Children (aged <15 years) accounted for 15% of the total caseload, and 64% were aged 15–49 years. The majority (70%) of cases were *i-taukei*. The proportions of cases by sex and ethnicity did not vary over time.

Figure 1 shows the trend in TB cases registered at P J Twomey Hospital between 1950 and 2010, and in relation to key TB control interventions in Fiji. While it would be prudent not to infer causality, it should be noted that the establishment of the NTP in 1951 and the implementation of mass radiography screening were followed by an increase in cases recorded during the 1950s, followed by a decreasing trend in TB cases during the 1960s which coincided with the introduction of BCG immunisation. Training of laboratory technicians in diagnosis was followed by an increase in cases registered at a time when mass radiography was phased out. Since 1990, there has been a steady fall in overall cases.

Figure 2 shows the number of TB cases recorded as smear-positive during the study period, before and after laboratory training. Smear results are available for the majority (91%) of cases, and for almost all cases since 1965. The number of smear-positives increased sharply in 1985 following laboratory training, peaking at 170 in 1992. Between 1950 and the end of 1985, a total of 2027 cases were recorded as smear-positive,

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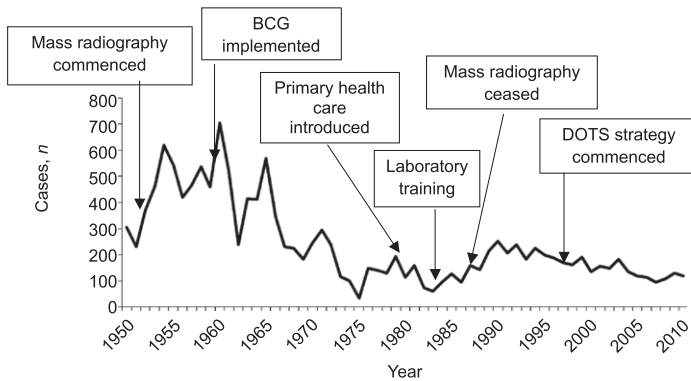


FIGURE 1 Trend in total numbers of tuberculosis cases registered at P J Twomey Hospital, Suva, Fiji, 1950–2010. BCG = bacille Calmette-Guérin.

which represented 19% of all 10 538 total cases during that period, at an average of only 56 smear-positive cases per annum (Table). Since 1985, 1672 smear-positive cases have been registered at P J Twomey Hospital, representing 41% of the 4078 total cases registered for that period, at a higher average of 67 smear-positive cases per annum between 1986 and the end of 2010. Comparing the same time periods, the number of TB cases in children (aged 0–14 years) fell from an average of 49 per annum (17% of all cases) between 1950 and 1985 to an average of 16 per annum (10% of all cases) between 1986 and 2010.

DISCUSSION

This study reports original data for the TB caseload in Fiji's largest treatment centre from 1950 to 2010. The data are unique in that they include all TB cases registered in P J Twomey Hospital since the country's NTP was first established. The data show an initial rise in TB caseload in the 1950s, a sharp fall during the 1960s, and a steady reduction since 1990 that has slowed over the last decade. An increase is noted in the average number of smear-positive cases recorded each year over the last 25 years compared to before 1986. This coincides with the observation that an increasing proportion of total cases are smear-positive at a time when total TB cases are trending downwards. These observed trends and

their relationship to various key events aimed at improving TB control in Fiji raise a number of interesting points for consideration.

It is acknowledged that any interpretation of data trends in relation to the introduction of specific TB control activities is speculative. First, although P J Twomey Hospital was supposed to be functioning as the central NTP unit, it was not possible to verify to what extent the actual numbers and trends over time of cases registered at P J Twomey Hospital were representative of the national TB caseload since 1950. Comparison with NTP data reported to the World Health Organization (WHO) since 1990 showed that the number of cases registered at P J Twomey Hospital represented two thirds of the reported national caseload.² It thus seems likely that case detection rates and practices of reporting detected TB cases to P J Twomey Hospital have changed over time. Second, the impact of other determinants that are likely to have changed over time, such as socio-economic development, case detection rates, treatment coverage and success rates, make it impossible to attribute changes to any one event.

While limitations to data interpretation are acknowledged, a number of trends were observed. The TB caseload at P J Twomey Hospital increased over the first decade after the establishment of the NTP in 1951, followed by the introduction of mass radiography screening, and then fell sharply over the subsequent decade. This may reflect improvements in case detection and concurrent improvements in availability of effective anti-tuberculosis regimens during this period. Second, there was a marked fall in caseload following the introduction of BCG immunisation. This is likely to be coincidental, given that the short- and medium-term impact of immunising infants is reducing the numbers of disseminated TB cases in the immunised population,³ which would result in only a small reduction in total caseload.

Third, a marked increase was noted in the average annual numbers and proportion of smear-positive TB cases registered at the P J Twomey Hospital over the last 25 years. This is unlikely to have reflected a worsening in TB control at the time, with an increase in the true incidence of new smear-positive cases, especially as the proportion of the caseload represented by children actually fell during this time period. TB rates in children reflect recent ongoing transmission.⁴ The increase is far more likely to reflect the increased utilisation of microscopy for TB diagnosis in

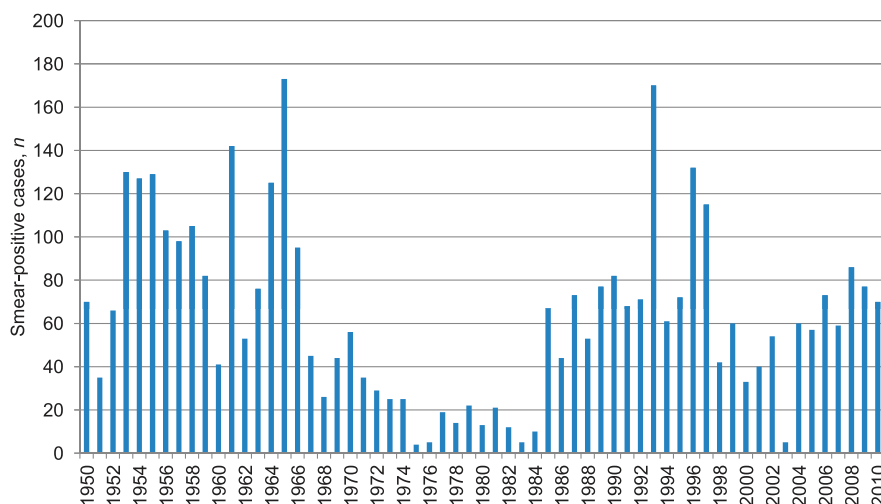


FIGURE 2 Trend in the number of tuberculosis cases recorded as smear-positive at P J Twomey Hospital, Suva, Fiji, before and after laboratory training.

Fiji since 1985, following intensive training of senior Fijian laboratory technicians in Japan between 1980 and 1985, concurrent with the decrease and then the cessation of mass radiography screening during the 1980s.

Smear-positive cases have accounted for 41% of all TB cases registered at P J Twomey Hospital over the last 25 years, and the highest proportion, of 65%, was recorded in the most recent period from 2006 to 2010. This compares to an average of 50%, as reported to the WHO by the Fiji NTP for 2009–2011, and of 54% (range 38–71) for the Western Pacific Region.¹ There are a number of potential reasons for the current high proportion of smear-positive cases at P J Twomey, including a potential bias to report smear-positive cases to the central NTP unit more consistently than other cases, but the data in this study do not allow us to evaluate potential explanations. The trend seen in national data and at P J Twomey Hospital of an increasing number of smear-positive cases in recent years is therefore a concern that requires further evaluation.

The proportion of TB cases by sex and ethnicity did not vary over time. Case notification rates for these variables could not be derived, as background population data for these subgroups were not available. TB is usually reported as being more common in males than females.⁵ TB is more common in *i-taukei* than other ethnic groups, and the proportions reflect the demographics of the general population.

In addition to the aforementioned limitations to data interpretation, there are a number of study limitations to consider. Data collection was retrospective and could not be validated. As previ-

ously mentioned, the data do not represent the total TB caseload for Fiji. At the time of the study, all notified cases in Fiji were assumed to be registered at P J Twomey Hospital, as the central unit. However, this has not been the case. The Fiji NTP needs to ensure consistency and completeness of recording and reporting practices in Fiji, as these are crucial for ongoing monitoring to inform improvements in TB control. Finally, no data were available on treatment outcome, which is an important indicator of TB control.

In conclusion, data from Fiji's largest TB treatment centre show a marked decline in total numbers of registered TB cases over the last 60 years despite an increasing population size. The trend over recent decades of increases in the numbers and proportions of sputum smear-positive cases needs careful evaluation as to whether it reflects a deterioration in TB control or rather changes in case detection, smear microscopy or reporting practices.

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Contexte : Hôpital P J Twomey, Programme National contre la Tuberculose, Fidji.

Objectifs : Revoir les tendances des nombres de cas de tuberculose (TB) enregistrés chaque année de 1950 à 2010 à l'Hôpital P J Twomey, le plus grand centre de traitement de la TB et l'unité centrale du pays. Les tendances sont interprétées en fonction des différentes étapes de la lutte contre la TB.

Schéma : Etude descriptive des données des dossiers médicaux et des registres de TB, notamment l'âge, le sexe, l'origine ethnique, le diagnostic et le résultat du frottis.

Résultats : Entre 1950 et 2010, 14 616 cas ont été enregistrés à l'Hôpital P J Twomey. Parmi eux, 58% étaient de sexe masculin, 70% étaient des indigènes des îles Fidji (*i-taukei*) et 64% étaient âgés entre

15 et 49 ans. Le nombre de cas a chuté de façon brutale dans les années 1960 et a poursuivi sa descente progressive depuis 1990. Des résultats de frottis étaient disponibles dans 91% des cas. Entre 1950 et 1985, 19% des cas avaient un frottis positif ; cette proportion est passée à 41% après 1985 à la suite du recyclage des laborantins. Le nombre de cas à frottis de crachats positifs enregistré chaque année a augmenté au cours de la dernière décennie.

Conclusion : Il y a eu des changements marquants du volume des cas dans le plus grand centre de traitement de la TB au Fidji au cours des 60 dernières années. L'accroissement récent des cas à frottis de crachats positifs alors que le nombre total de cas a diminué requiert de plus amples investigations.

Marco de referencia: El Programa Nacional contra la Tuberculosis de Fiji y el Hospital P J Twomey.

Objetivos: Analizar la tendencia del número de casos de tuberculosis (TB) registrados cada año entre 1950 y el 2010 en el Hospital P J Twomey, que representa el principal centro de tratamiento antituberculoso y la unidad central de atención de la enfermedad en Fiji, y considerar las tendencias en el contexto de las actividades clave en el control de la TB en el país.

Métodos: Se llevó a cabo un estudio descriptivo con datos provenientes de las historias clínicas y los registros de TB, entre ellos la edad, el sexo, la etnia, el tipo de TB y el resultado de la baciloscopia.

Resultados: Entre 1950 y el 2010, se registraron 14 616 casos en el Hospital P J Twomey; de estos casos, el 58 % eran de sexo masculino, el 70% eran indígenas fijianos (i-taukei) y el 64% pertenecía al

grupo entre los 15 y los 49 años de edad. En los años sesenta disminuyó de manera drástica el número de casos de TB y a partir de 1990 ha disminuido constantemente. La mayoría de los casos contaba con resultados de la baciloscopia (91%). Entre 1950 y 1985, los casos con baciloscopia positiva representaron el 19% de todos los casos y esta proporción aumentó a 41% después de 1985 tras la capacitación en técnicas de laboratorio. El número de casos con baciloscopia positiva registrados cada año ha ido aumentando en el último decenio.

Conclusión: En los últimos 60 años se han observado cambios notables en la carga de morbilidad por TB en el principal centro de tratamiento de la enfermedad en Fiji. El aumento reciente de los casos con baciloscopia positiva, pese a una disminución en el número total de casos, precisa una consideración más detallada.