

## Tuberculosis control in Papua New Guinea

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### Background

Papua New Guinea (PNG) has had tuberculosis control activities since the 1950s when a vertical program was established.

Despite long-standing control programs throughout the country, tuberculosis remains a serious infectious disease and a major public health problem in PNG. The current tuberculosis control program in PNG lacks focus and direction - in an environment where resources are seriously constrained, the program does not concentrate on patients with high infectivity, ie, smear-positive cases, who are the patients of greatest public health importance.

The current program is characterized by:

- poor diagnosis of cases,
- high defaulter rates, and
- very poor cure rates.

In November 1974 a pilot project was launched on the integrated approach to tuberculosis case-finding and domiciliary

treatment using existing basic health personnel. The pilot was conducted in an urban area of Port Moresby and Rigo Subdistrict. The program was to be extended to the whole country in two years (but was not) (1).

By 1975, sputum examinations for acid-fast bacilli were being performed at the Public Health Laboratory in Port Moresby and all base hospitals - Goroka, Lae, Mt Hagen and Rabaul. Expatriate technicians carried out all examinations. A plan had been devised, but not implemented, to train technicians for 19 hospitals and 34 health centres. The major problem therefore was the shortage of trained medical laboratory assistants to fill existing posts.

In 1977 tuberculosis control was integrated into the general health services. With the decentralization of functions to the provinces in 1983, responsibility for tuberculosis control was delegated to the provincial health offices.

Short-course chemotherapy (SCC) for children was introduced in 1984. In 1987 SCC was offered to adults, and extended to cover all provinces in 1989. Improved compliance with treatment was one of the immediate benefits (2).

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A study carried out in 1989 demonstrated high levels of tolerance to standard antituberculosis drug regimens among PNG patients (3).

### Epidemiology

A 1950 report, published later by Kaupa et al., noted that in the Goroka area Mantoux positivity was 56.0% among the population with 'coastal contact' while only 0.24% in 'distant villages' (4). A review of cases at Goroka Base Hospital during 1979-1981 noted that only 23% of patients were from the highlands, while 70% were from coastal areas. A report on the epidemiology of tuberculosis in 1983 noted that the disease was only then spreading to susceptible populations in the highlands (5).

The trend in annual notification rate for pulmonary tuberculosis has been almost flat since 1990 with about 6000 notifications per year (approximately 140/100,000 population). The rate for positive sputum smears is around 40/100,000 population. The proportion of sputum smear-positive cases among total pulmonary tuberculosis patients has been decreasing (37% in 1990, 30% in 1995). Increasingly, cases of pulmonary tuberculosis are diagnosed with no sputum smear examination being done (16% in 1991; 40% in 1995). Yet, it has been reported in 1990 as 'reliable' that there were at least 50,000 tuberculosis patients and that between 20% and 50% of the population were infected with *Mycobacterium tuberculosis*, implying a large pool of untreated, infectious cases and a larger pool of infected people throughout the country.

A measure of the seriousness of tuberculosis in PNG, and the lack of control, is the escalating mortality - 230 tuberculosis deaths in 1989 and 420 tuberculosis deaths in 1992 (an increase of 83%) (6).

Since 1987, the number of confirmed HIV-infected tuberculosis patients has been increasing. The burden of HIV on the health system is falling disproportionately on the tuberculosis control program. By 1990, the Tuberculosis Clinic at the Port Moresby General Hospital had identified 80% of the known HIV-positive individuals in PNG (7).

In one case series, tuberculosis was suspected in 69% of HIV-infected patients (8).

### Current situation

The World Health Organization (WHO) advocates a treatment model Directly Observed Treatment, Short-Course (called 'DOTS'), consisting of the following components:

- political commitment
- diagnosis of high-risk patients by sputum smear microscopy
- treatment with standardized regimens, directly observed
- training of staff
- recording and reporting for case management and assessment of treatment outcomes.

DOTS promotes diagnosis and treatment in the community, allowing integration of tuberculosis treatment into existing general health services. Despite widespread acceptance of ambulatory care in other countries with similar epidemiology and demographics to PNG, almost all PNG patients are still treated at general and provincial hospitals for at least the first two months of treatment.

### Case finding

At the community level, a community health worker (CHW) at an aid post covers 500 to 2000 population. The health worker is responsible for providing basic health care services to the community, supported by the health extension officer (HEO) and other staff at the nearest health centre or subcentre in the district. The aid post would be the most effective site for identifying tuberculosis suspects, referring sputum specimens, receiving test results and conducting the treatment of cases from beginning to end using standardized drug regimens to the point of cure.

The only diagnostic test that is widely available in PNG is sputum smear microscopy.

Insufficient equipment and lack of qualified staff for sputum examination lead to low rates of smear-positive case-finding. Most cases diagnosed as pulmonary tuberculosis at district level are done so by symptoms alone (with the widespread use of score-charts for paediatric suspects). As a result, about one-third of pulmonary tuberculosis patients registered in peripheral health units are patients whose sputum status is never tested.

WHO recommends that, in a well-run program, new smear-positive cases should be at least 45% of all notified cases (and 65% of all new pulmonary cases) (9).

In the NCD in 1996, of 1885 cases registered, only 201 (11%) were sputum smear positive, while 1117 (59%) were sputum smear negative. At Port Moresby General Hospital, of 351 cases registered from 1 January to 20 February 1997, of which 248 cases were diagnosed as pulmonary tuberculosis:

- only 28 cases (11%) were smear positive; and
- 204 cases (82%) had no sputum examination, including 119 cases of children under 12 years of age (while children are often sputum negative, sputum examination is still recommended in this age group).

Furthermore, indications are that initial sputum smear examinations are not carried out optimally, as patients are not being instructed on how to collect the sputum specimen, and follow-up sputum smear examinations, to demonstrate smear conversion after treatment, are hardly ever done.

Chest X-ray alone is unreliable, as pulmonary tuberculosis has many radiographic presentations and many other chest conditions can mimic tuberculosis radiologically. However, used in conjunction with sputum microscopy and supporting symptoms, chest X-ray is useful in the clinical management of patients.

Few district health centres have X-ray machines. Even with X-ray facilities, a large number of patients are diagnosed as pulmonary tuberculosis by symptoms alone: eg, at one health centre in Madang Province there were

39 pulmonary tuberculosis cases diagnosed in 1996; 21 (54%) of these pulmonary tuberculosis patients had not had a sputum examination or a chest X-ray.

Currently, the levels of services able to be provided in PNG do not match all the needs of the community. Few life-threatening conditions can be diagnosed and cured, but tuberculosis is one of those that can - lung cancer, for instance, cannot. It is therefore understandable that a health extension officer, nurse or doctor, faced with a seriously ill patient, will diagnose tuberculosis (usually in the absence of confirmatory evidence). However, there are many causes of cough and even in PNG few of these will be tuberculosis. Persons having had a cough with purulent sputum, for 3 weeks or longer, but who are repeatedly negative to properly performed direct smear microscopy of sputum, are unlikely to suffer from tuberculosis. In fact, the more severe their symptoms and the worse the radiological signs, the higher the probability that they do not have tuberculosis.

If you are faced with a patient with no cough and no sputum, a sputum examination is pointless. In fact the suspect does not even meet the case definition for tuberculosis, so the probability of pulmonary tuberculosis is extremely small.

Despite the widespread use of score-charts (10), there has been no study correlating score-charts with sputum microscopy (the 'gold standard') - until this has been done, the use of score-charts should be seen as experimental.

Sputum culture is a more sensitive examination than sputum smear microscopy (sputum smear-negative, culture-positive cases will thus be detected). However,

- it is expensive,
- it needs to be performed in Port Moresby, and
- tests take up to 6 weeks to be conclusive.

Culture is never a substitute for poor microscopy. In fact, for suspects who fulfil the case definition for tuberculosis (prolonged cough, weight loss) and have never been

treated with antituberculosis medications, culture is half as cost-effective as sputum microscopy (11).

### Case holding

Case holding has always been low - treatment completion rates of 25% were reported from Port Moresby and Lae and even lower from Rabaul (12). For the period 1990-1995, there was a total of 28,474 tuberculosis patients registered in PNG. Of these, 18,882 (66%) completed treatment, 1136 (4%) died, 6676 (24%) defaulted and 1780 (6%) transferred out. This situation is dangerous, potentially creating drug-resistant *Mycobacterium*. Even those cases that were classified as 'treatment completed' did not satisfy the WHO definition since initial and follow-up sputum examinations were rarely done.

For patients registered in the NCD during the period January-September 1995 (201 new smear-positive cases), only 28 (14%) completed the full course of chemotherapy and 167 (83%) defaulted.

A common scenario is for the patient to be admitted to the hospital for the initial (intensive) phase of treatment (2 months) and then be discharged home for the continuation phase (4-6 months), but without any formal transfer for treatment supervision. It is not surprising that so many patients interrupt or stop treatment prematurely. Insufficient transport for supervision of patients is a reason often given for the high defaulter rate among tuberculosis patients. Overburdening the hospital system with low-priority patients (sputum not tested, or sputum smear negative) must be another.

### Case treatment

According to national policy, tuberculosis patients should receive initial (intensive) phase chemotherapy as inpatients in a general hospital. In reality, this is far beyond the capacity of the hospitals. Most pulmonary tuberculosis cases can be treated outside the hospital from diagnosis to cure. Early transfer of cases to the community places added responsibility on peripheral health care

workers, and enhances continuity of care. Additionally, this then frees up existing bed capacity for those patients with serious clinical disease (eg, meningitis, osteomyelitis), previous treatment defaulters and patients who cannot be supervised by peripheral health unit staff.

### Laboratory services

The quality of sputum smear examination is of the utmost importance to the proper diagnosis of tuberculosis. Technical supervision and quality control for sputum smear examination have not yet been given much importance.

### Recording and reporting

The current system of recording tuberculosis notifications and treatment at district and provincial levels is poor and inconsistent with WHO standards. Accordingly, international comparisons are not possible. Case definitions, based on sputum smear status, are not applied. Changes to the National Health Information System are proposed to support the revised tuberculosis control program.

### Community education

Patient education has been inadequate, even for patients in general hospitals, and is therefore not a justification in itself for putting newly diagnosed patients in hospital.

There are still widespread misconceptions about tuberculosis, both in the general community and among health care workers (13). Unfortunately, while tuberculosis control achieves such poor outcomes, the rumours and misconceptions will be difficult to refute. With improved program results (ie, accurate diagnosis and curative treatment), more realistic attitudes to the disease will be developed and sustained.

### Training

The Department of Health has produced excellent materials, based on WHO documents, for community health workers and district level staff. Training of a new generation of laboratory assistants for peripheral health units

still remains a problem, even after 23 years. Programs for locally trained laboratory technicians have recently been curtailed.

## BCG

There has been a heavy reliance on BCG in the past. BCG, while giving important protection to infants against disseminated disease, has no role to play in the control of tuberculosis, as paediatric disease is rarely infectious.

PNG still has a multiple-dose regimen for BCG despite a WHO recommendation that it be given once in the neonatal period.

### The future

Before PNG can begin to control tuberculosis a number of steps will need to be implemented:

1. Case finding of pulmonary tuberculosis will need to be based on the diagnosis of infectious cases by sputum smear microscopy at the district level laboratories.
2. Training of health workers and laboratory assistants to work at district and aid post levels needs to be greatly enhanced.
3. Treatment of patients with tuberculosis should be carried out as close as possible to their homes through the closest aid post, according to the principles of DOTS.
4. Achievement of cure of infectious tuberculosis cases to prevent further spread of disease should be the focus of diagnosis, treatment and patient management.
5. Case holding should be improved through emphasis on health education, focusing on prevention of defaulting and support of observed and recorded treatment.

The pilot program in Lae District has recorded early encouraging results. If the program can be successfully expanded through Morobe Province and to NCD, the core of an effective tuberculosis control program will be established.

There have been too many false starts in tuberculosis control in PNG in the past. The burden of disease is still very high. The threat of drug-resistant *M. tuberculosis* is real and the encroachment of HIV into PNG makes the need for a successful tuberculosis control program urgent.

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