Surveillance of tuberculosis in Malawian prisons

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Setting: The Malawi National Tuberculosis Programme (NTP) has collaborated with the Prison Health Services (PHS) on tuberculosis (TB) control in prisons since 1996. Information on case finding and treatment outcomes is routinely collected, but there has not been any recent countrywide review of these prison data.

Objectives: To determine 1) the number of prisoners registered for TB in 2007, 2) TB treatment outcomes in 2006 and 3) training of prison health care staff in all Malawian prisons.

Design: Descriptive study involving a review of 2006 and 2007 data collected by the NTP during surveillance in 2008.

Results: In 2007, 278 TB patients were registered in Malawian prisons, representing a TB case notification rate of 835 per 100 000 (higher than that in the general population, at 346/100 000). The treatment success rate for new smear-positive TB cases for 2006 was 73%, lower than the national average of 78%. In all, 52 prison health care staff had received 1 week of training in TB management, usually just after starting work in the prison.

Conclusions: TB case notifications in Malawian prisons were higher than in the general population and treatment outcomes less favourable. The NTP and PHS need better collaboration to improve TB control in Malawian prisons.

Tuberculosis (TB) remains a major public health problem in many sub-Saharan African countries,¹ and surveys have indicated that it is also a major problem in African prisons.²⁻⁴ In 1995, the National TB Programme (NTP) in Malawi conducted its first TB survey in the Zomba Central Prison, the largest prison in Malawi, and found a prevalence of pulmonary TB (PTB) of 5%.⁵ This prompted calls for action, and collaboration was initiated between the NTP and the Prison Health Services (PHS) to improve TB control in the prisons. In 2005, a similar cross-sectional survey was carried out in 18 prisons in Malawi, showing a lower prevalence of smear-positive PTB of 0.7%, with higher rates of TB in large urban prisons compared with district prisons (1.1% vs. 0.3%).⁶

Surveys involving prisoners and active case finding are time consuming and expensive. The collaborative TB control activities initiated in 1996 between the NTP and PHS included quarterly monitoring and evaluation of cases and treatment outcomes.⁷ Data on case finding and treatment outcomes are thus routinely collected using standardised monitoring tools. Despite this, there has been no recent countrywide review of TB data collected in prisons.

The NTP therefore conducted a countrywide TB prison survey between March and May 2008 and collected data previously documented in 2006 and 2007 on the TB burden in prisons. Information was also obtained during the survey on training undertaken by prison health care staff.

The current study aimed to use these data to 1) determine the number of prisoners registered for TB in 2007, 2) document TB treatment outcomes for patients registered in 2006 and 3) assess training undertaken and the training needs of prison health care staff.

METHODS

Study design

This was a retrospective descriptive study involving a review of prison TB data for 2006 and 2007 collected as a result of a survey conducted in Malawian prisons in 2008. Interviews about training were also conducted with prison health care staff.

Study survey and study setting

The survey was conducted between March and May 2008 to collect data on individuals incarcerated in all 27 prisons in Malawi in 2006 and 2007. Data variables included age, sex, imprisonment category (convict = a prisoner who had been sentenced; remandee = a prisoner awaiting sentence), history and duration of cough, diagnosis of TB, type and category of TB, human immunodeficiency virus (HIV) status and TB treatment outcome (see Table 1). For HIV-positive patients, information was also collected on the use of antiretroviral therapy (ART) or cotrimoxazole preventive therapy (CPT). Study teams comprised 12 health workers from the NTP and district health offices, who underwent 1 day's training on data collection.

TB control in prisons

In Malawi, new prisoners are screened for cough on admission by the prison warden, while those already incarcerated are asked to report any cough of >1 week. Prisoners with cough of >1 week are asked to submit sputum specimens according to national guidelines (morning, spot and morning specimen).⁸ In prisons with no health care staff, TB screening is done by the general wardens, who are trained in sputum collection. The screening processes for convicts and remandees are similar.

Prisoners suspected of active TB are registered in the prison chronic cough register, which is monitored regularly. Sputum specimens collected in the prison are examined at the prison itself (if the prison has smear microscopy facilities) or are sent to the nearest health facility for smear microscopy. Most sputum

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KEY WORDS

tuberculosis; prison; remandee; convict; Malawi

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TABLE 1 Definitions of anti-tuberculosis treatment outcomes used in Malawi

Treatment success	Patient who completes 6 or 8 months of treatment with or without sputum smear examination during and at the end of treatment
Death	Patient who dies during anti-tuberculosis treatment, regardless of cause
Failure	Patient found to be sputum smear-positive at 5 months or later during anti-tuberculosis treatment
Default	Patient who interrupts treatment for >2 months
Transfer out	Patient transferred to another treatment unit and whose treatment results are not known

smear examinations are performed at the district hospital, as only four prisons have microscopy facilities. Quality assurance of smear microscopy in the prisons is similar to that in district hospitals. Culture services for *Mycobacterium tuberculosis* are not routinely available. Prisons with health care staff are provided with TB patient registers (equivalent to the district TB registers) and TB treatment cards in which details of TB patients are entered. Prisoners diagnosed with smear-positive PTB at the prison are registered and treated in the prison according to national guidelines, including HIV treatment and care services.⁸ In prisons with no health care staff, prisoners diagnosed with smear-positive PTB are referred to and treated at the nearest prison with health care staff. Prisoners suspected of smear-negative PTB or extra-pulmonary TB are referred to the nearest district hospital for further investigations such as chest radiography. All patients diagnosed at each prison are also registered in the district hospital TB register so that the district can keep track of these patients.

Sampling, data variables and data collection during the survey

At each of the 27 prisons in Malawi, the study team reviewed the following documents: prison admission registers (documenting the number of prisoners incarcerated each year), chronic cough registers, TB patient registers and TB patient treatment cards. Information on the prison population for 2007 was retrieved from the prison admission registers. Data on prisoners suspected of and diagnosed with TB in 2007 were retrieved from the chronic cough registers and TB patient registers, respectively. Data on TB treatment outcomes for prisoners treated for TB in 2006 were retrieved from the TB patient registers and TB treatment cards. Data from the TB patient registers and TB treatment cards were cross-checked with data in the district hospital TB registers: cross-checked data were all consistent. TB data reported to the World Health Organization (WHO) by the NTP for the general population were used for the control arm.⁹ During the same visit, study teams asked prison health care staff to provide information on training. All data were collected onto a structured proforma during the prison visit.

Analysis and statistics

Data from the structured proforma were single-entered into Epi Info version 6.04 (Centers for Disease Control and Prevention, Atlanta, GA, USA) and analysed. Categorical variables between groups were compared using the χ^2 test, and odds ratios (ORs) with 95% confidence intervals (CIs) were calculated as appropriate. The level of significance was set at 5%.

Ethics review

Written permission was obtained from the prison authorities to conduct the survey. A formal submission was not made to the

National Health Science Research Committee, as this work was deemed to be part of routine TB control activities. Approval to use and report on the data collected during the survey were obtained from the Ethics Advisory Group of the International Union Against Tuberculosis and Lung Disease, Paris, France.

RESULTS

Prison population and TB case load in 2007

Prison admissions in 2007, and the number and proportion of prisoners who were TB suspects, who submitted sputum specimens and who were diagnosed with TB are shown in Table 2. About 10% of the TB suspects among the convicts failed to submit sputum specimens. Of those who did submit sputum, nearly one quarter were diagnosed with TB, of whom half had smear-positive PTB. A higher proportion of remandees than convicts were TB suspects (8% vs. 6%, OR 1.34, 95%CI 1.2–1.5, $P < 0.001$), and all submitted sputum specimens. Only 2% of remandee suspects were diagnosed with TB, significantly fewer than the proportion diagnosed in convicts (24%, $P < 0.001$). The majority of TB cases among remandees had smear-positive PTB.

In all, 278 convicts and remandees (mean age: 32 years) were diagnosed with TB in 2007, representing an annual TB case notification rate in prisons of 835/100 000, which was significantly higher than the WHO-reported TB case notification rate in the general population in 2007 (346/100 000, $P < 0.001$). The prison annual case notification rate for new smear-positive PTB was 442/100 000, which was again higher than the rate of 55/100 000 in the general population ($P < 0.001$). Case notifications among convicts, remandees and the general public for all forms of TB and for smear-positive PTB are shown in Table 3. While convicts had higher notification rates than remandees and the general public ($P < 0.001$) for all forms of TB and smear-positive PTB, for remandees the results were different, with all forms of TB being significantly less than in the general public ($P < 0.05$), and smear-positive PTB being significantly higher ($P < 0.001$).

The highest numbers of TB cases (71%) were recorded in the three central (urban) prisons, which also had 66% of the total prison health care staff. The number of TB cases diagnosed in those prisons with the remaining 34% of prison health care staff varied from 1 to 15 per prison. In 7/10 prisons with no health care staff, there was no reported TB case in 2007.

Of the 278 TB patients, 269 (97%) were tested for HIV, and 176 (65%) were HIV-positive; 169 (96%) co-infected TB patients were

TABLE 2 Prison admissions and TB case load in Malawi prisons, 2007

	Convicts <i>n</i> (%)	Remandees <i>n</i> (%)	Total <i>n</i>
Admissions to Malawi prisons, <i>n</i>	18 683	14 593	33 276
TB suspects identified	1 152 (6)	1 180 (8)	2 332
TB suspects who submitted sputum	1 037 (90)	1 180 (100)	2 217
Prisoners diagnosed with TB			
All forms	253 (24)	25 (2)	278*
Smear-positive PTB†	126 (50)	21 (84)	147
Smear-negative PTB†	78 (31)	3 (12)	81
Extra-pulmonary TB†	49 (19)	1 (4)	50

*Including 4 female TB patients; all were convicts.

†Number in parentheses indicates percentage of the patients with TB.

TB = tuberculosis; PTB = pulmonary TB.

TABLE 3 Calculated TB case notification rates for convicts, remandees and the general public in 2007

	Case notification rates per 100 000 population		
	Prison convicts	Prison remandees	General public
All forms of TB	1354	171	346
New smear-positive PTB	674	144	55

TB = tuberculosis; PTB = pulmonary TB.

offered CPT and 75 (42%) were started on ART. HIV testing and counselling, CPT and ART use were significantly higher in TB prisoners than in TB patients in the general public in 2007, where rates of respectively 86%, 89% and 17% were recorded ($P < 0.001$).

TB treatment outcomes for patients registered in Malawian prisons in 2006

In 2006, there were 242 prisoners with TB all forms, including 154 (64%) with smear-positive PTB. Of the 154 new smear-positive PTB cases started on anti-tuberculosis treatment, 112 (73%) were successfully treated (Table 4). The treatment success rate was lower than the national treatment success rate in 2006, reported at 78% (OR 0.61, 95%CI 0.4–0.9, $P < 0.01$). Differences in death and default rates between prisoners and the general population were not significantly different, but transfer-out rates were significantly higher in prisoners, at 7%, vs. 2% in the general population ($P < 0.001$).

Training received and training needs among prison clinical staff

Of the 27 prisons, 17 (63%) had at least one health care staff member, while 10 had no health care staff. In total, there were 52 health care staff in the Malawian prisons. These consisted of patient attendants ($n = 23$), HIV testing/counselling personnel ($n = 12$), paramedical staff ($n = 10$), laboratory microscopists ($n = 5$) and nurses ($n = 2$). There was no qualified medical officer working in the PHS. Only four prisons had trained microscopists, who had undergone 3 weeks of TB microscopy training. All 52 prison health care staff had undergone 1 week's basic training in TB management, usually just after starting work at the prison, and which had been conducted by the NTP more than 3 years previously. All prison health care staff stated a need for refresher training in TB and TB-HIV management.

DISCUSSION

This was the first countrywide TB prison survey in Malawi involving visits to all 27 prisons and collection of data recorded in prison registers and treatment cards. Although a TB control system has

been in place in the prisons for 15 years, the TB case notification rate among prisoners, particularly for new smear-positive PTB, was still much higher than in the general population. Although not strictly comparable, these case notification rates were rather similar to the prevalence rates found in the last prison survey conducted in 2005.⁶

Case notification rates for all types of TB, including new smear-positive PTB, were much higher in convicts than in remandee prisoners. For remandees, only a small proportion of those identified as TB suspects were diagnosed with TB. The TB case notification rate per 100 000 population was therefore low compared with that of the general population, although it was higher when assessed in relation to new smear-positive PTB alone. The reasons for this low TB diagnostic pick-up rate in remandee prisoners are unclear. It is possible that sputum collection was poorly performed in this group of prisoners. The fact that very few were diagnosed with smear-negative PTB or extra-pulmonary TB might also indicate a lack of follow-up once sputum specimens had been returned as smear-negative, either due to difficult access to district hospital facilities or because the remandees, who are usually in prison for short periods, were discharged from prison before investigations such as chest radiography could be performed.

The TB case burden varied from prison to prison. The three central prisons with two thirds of the total prison health care staff had high numbers of prisoners diagnosed for TB. This has also been found in previous studies in Malawi.^{6,7} It is intuitive to think that the availability of prison health care staff is an important determinant for TB screening and TB diagnosis in the prison setting. It is important therefore that Malawi prison authorities deploy health care staff in all prisons and consider having a medical officer appointed as head of the PHS. The Zambian Prison Services employed the services of a medical officer in 2009.¹⁰

TB-HIV services were well integrated within the PHS. The uptake of HIV testing and referral to HIV care and treatment was higher among TB prisoners than in the general population, and this may be due to the comparative advantage of co-location of TB and HIV services within the same institution, which is not necessarily the case within the general health services of the country as a whole. Co-location of TB and HIV services is regarded as key to improved collaboration on the ground.¹¹

TB treatment outcomes in prisoners in 2006 were unfavourable. The treatment success rate was low, while the transfer-out rate was high. This was mainly due to patients whose prison sentence had expired being asked to complete their anti-tuberculosis treatment outside the prison, or patients who had been transferred from one prison to another. Transfers are impossible to control, but it is essential that information flows back to the initial registration centre for ascertainment of true outcome status. It is therefore important to strengthen communications between prison health care staff and district health staff on all prisoners who have been discharged from prison while on TB treatment or who have

TABLE 4 Anti-tuberculosis treatment outcomes for new smear-positive PTB cases in prisons and in the general population for 2006

	New smear-positive PTB cases notified and registered <i>n</i>	Treatment success <i>n</i> (%)	Treatment failures <i>n</i> (%)	Deaths <i>n</i> (%)	Defaulters <i>n</i> (%)	Transfer out <i>n</i> (%)	Not evaluated <i>n</i> (%)
Prison*	154	112 (73)	1 (1)	22 (14)	8 (5)	11 (7)	0
General population	8166	6406 (78)	79 (1)	994 (12)	279 (3)	197 (2)	211 (3)

*Data from Malawian National Tuberculosis Programme.

PTB = pulmonary tuberculosis.

moved from one prison to another. Despite the 1-week training in basic TB control undertaken by prison health care staff, most lacked updated knowledge in TB control and monitoring activities. It is therefore important that the NTP, in liaison with the PHS, organises relevant refresher training in TB.

The strengths of this study were that it was nationwide and involved a review of the primary data source. However, the survey relied on routinely collected data and these might be inaccurate. The study had the following limitations: 1) 10% of convicts with cough of >1 week failed to submit sputum specimens, which may have led to underdiagnosis of TB; 2) prison admission numbers were not collected in 2006, thus preventing TB case notification rates from being calculated for that year; 3) it has been recommended that prison disease burden estimates should take into consideration the duration of imprisonment when calculating incident cases;¹² however, this was not done; and 4) although double-entry and validation of data are gold standards for quality-assured data,¹³ data in this survey were single-entered into the electronic software package and mistakes were possible.

CONCLUSION

This survey shows that there are still high TB case notification rates in Malawian prisons, and TB treatment outcomes are worse than in the general health services. To further improve TB control in Malawian prisons, the NTP and the PHS need to strengthen collaboration in TB diagnosis and management and human resource development and deployment.

References

- 1 World Health Organization. Global tuberculosis control: surveillance, planning, financing. WHO/HTM/TB/2010.393. Geneva, Switzerland: WHO, 2010.
- 2 World Health Organization. Tuberculosis control in prisons: a manual for programme managers. WHO/CDC/2001.281. Geneva, Switzerland: WHO, 2001.
- 3 O'Grady J, Hoelscher M, Atun R, et al. Tuberculosis in prisons in sub-Saharan Africa—the need for improved health services, surveillance and control. *Tuberculosis* 2011; 91: 173–178.
- 4 O'Grady J, Mwaba P, Bates M, Kapata N, Zumla A. Tuberculosis in prisons in sub-Saharan Africa—a potential time bomb. *S Afr Med J* 2011; 101: 107–108.
- 5 Nyangulu D S, Harries A D, Kang'ombe C, et al. Tuberculosis in a prison population in Malawi. *Lancet* 1997; 350: 1284–1287.
- 6 Banda H T, Gausi F, Harries A D, Salaniponi F M. Prevalence of smear-positive pulmonary tuberculosis among prisoners in Malawi: a national survey. *Int J Tuberc Lung Dis* 2009; 13: 1557–1559.
- 7 Harries A D, Nyirenda T E, Yaladi A E, Gondwe M K, Kwanjana J H, Salaniponi F M. Tuberculosis control in Malawian prisons: from research to policy and practice. *Int J Tuberc Lung Dis* 2004; 8: 614–617.
- 8 Government of Malawi, Ministry of Health. Manual for the National Tuberculosis Control Programme of Malawi. 6th ed. Lilongwe, Malawi: Ministry of Health, 2007.
- 9 World Health Organization. Global tuberculosis control: surveillance, planning, financing. WHO/HTM/TB/2009.411. Geneva, Switzerland: WHO, 2009.
- 10 Moszynski P. Zambian prisons 'threaten public health' because of high rates of TB and HIV. *BMJ* 2010; 340: c2225.
- 11 Harries A D, Zachariah R, Corbett E L, et al. The HIV-associated tuberculosis epidemic—when will we act? *Lancet* 2010; 375: 1906–1919.
- 12 Rieder H L, Anderson C, Dara M, et al. Methodological issues in quantifying the magnitude of the tuberculosis problem in a prison population. *Int J Tuberc Lung Dis* 2011; 15: 662–667.
- 13 Rieder H L, Lauritsen J M. Quality assurance of data: ensuring that numbers reflect operational definitions and contain real measurements. *Int J Tuberc Lung Dis* 2011; 15: 296–304.

Contexte : Depuis 1996, le Programme National de Tuberculose (PNT) du Malawi a collaboré avec les Services de Santé des Prisons (PHS) dans la lutte contre la tuberculose (TB) dans les prisons. Les informations concernant le dépistage et les résultats du traitement sont colligées en routine, mais les données des prisons n'ont pas fait jusqu'ici l'objet d'une révision récente au niveau du pays.

Objectifs : Déterminer, dans l'ensemble des prisons du Malawi : 1) le nombre de prisonniers enregistrés comme TB en 2007, 2) les résultats du traitement de la TB en 2006 et 3) la formation du personnel de soins de santé des prisons.

Schéma : Etude descriptive comportant une revue des données de 2006 et 2007 qui ont été rassemblées par le PNT au cours de la surveillance en 2008.

Résultats : Dans les prisons du Malawi, en 2007, on a enregistré

278 patients TB, ce qui représente un taux de déclaration des cas de TB de 835/100.000 (supérieur à celui de la population générale, qui se situe à 346/100.000). Le taux de succès du traitement pour les nouveaux cas TB à bacilloscopie positive a été de 73% en 2006, inférieur à la moyenne nationale de 78%. Parmi le personnel de soins de santé, 52 personnes ont bénéficié d'une formation d'une semaine sur la prise en charge de la TB, habituellement juste après avoir commencé à travailler dans les prisons.

Conclusions : Les taux de déclaration des cas de TB dans les prisons du Malawi sont supérieurs à ceux de la population générale et les résultats finaux des traitements y sont moins favorables. Le PNT et les PHS doivent mieux collaborer afin d'améliorer la lutte antituberculeuse dans les prisons du Malawi.

Marco de referencia: Desde 1996, el Programa Nacional contra la Tuberculosis (PNT) en Malawi ha colaborado con los Servicios de Salud de las Prisiones (PHS) en el control de esta enfermedad en los centros de reclusión. La información sobre la búsqueda de casos y los desenlaces terapéuticos se recoge en forma sistemática, pero no se ha llevado a cabo ninguna evaluación reciente de estos datos a escala nacional.

Objetivos: Determinar, en todas las prisiones de Malawi: 1) el número de reclusos inscritos en los registros de tuberculosis (TB) en el 2007; 2) los desenlaces del tratamiento antituberculoso en el 2006; y 3) la capacitación del personal sanitario de las prisiones.

Método: En el presente estudio descriptivo se evaluaron los datos correspondientes al 2006 y el 2007 y los datos recogidos por el PNT contra la TB durante la vigilancia en el 2008.

Resultados: En el 2007 se inscribieron en el registro malawi de TB de las prisiones 278 pacientes, lo cual corresponde a una tasa de notificación de 835 por 100 000 personas (más alta que la tasa de la población general: 346/100 000). La tasa de éxito terapéutico de los casos nuevos con baciloscopia positiva fue 73% en el 2006, inferior al promedio nacional de 78%. Los 52 miembros del personal sanitario de las prisiones habían recibido una semana de capacitación en materia de tratamiento de la TB, en general al comienzo de su trabajo en los establecimientos penitenciarios.

Conclusiones: La tasa de notificación de casos de TB en las prisiones malawis fue más alta que la tasa de la población general y los desenlaces terapéuticos menos satisfactorios. El PNT y los PHS deben intensificar su trabajo conjunto a fin de mejorar el control de la TB en las prisiones del país.