



REVIEW

Tuberculosis in prisons in sub-Saharan Africa – the need for improved health services, surveillance and control

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SUMMARY

Prisons have long been associated with rapid transmission of infectious diseases. The HIV/AIDS epidemic in sub-Saharan Africa (SSA) has fuelled the spread of TB and HIV in prisons. The poor living conditions and ineffective health services in prisons in SSA are a major breeding ground of *Mycobacterium tuberculosis* (*Mtb*). The spread of TB between prisoners, prison staff and visitors and the emergence of drug-resistant TB in prisons now poses a threat to control efforts of national TB programmes in SSA. Accurate data required to develop appropriate interventions to tackle the ominous problem of TB in African prisons are scanty and unreliable. The health of prisoners is by default a neglected political issue. This article reviews the available literature on TB and drug-resistant TB in prisons from SSA countries, discusses the risk factors for acquiring TB and highlights the priorities for further translational research in prisons. Ethical issues pertaining to research on captive African populations are discussed. Scientific, political and funder attention is required urgently to improve prison health services.

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1. Introduction and background

Tuberculosis (TB) and HIV/AIDS cause high morbidity and mortality rates in adults in sub-Saharan Africa (SSA). World Health Organisation (WHO) recommendations for TB control are focussed on the early diagnosis and supervised treatment of people in the community. The ex-South African President and Nobel Prize winner, Nelson Mandela, developed TB whilst a prisoner on Robben Island, Cape Town. Prisons have long been known to be associated with rapid transmission of bacterial, viral, fungal and parasitic infectious diseases of the skin, gut, genitals and respiratory system. Prisons are recognised as reservoirs for TB transmission, and surveillance data from Eastern European prisons show that TB causes significant morbidity and mortality in prison inmates and staff.^{1–4}

In SSA, the average TB incidence and prevalence rates are 363/100,000 and 475/100,000⁵ respectively. The HIV/AIDS epidemic is fuelling the spread of TB and up to 70% of adults with TB are co-infected with HIV in many SSA countries.⁶ TB in prisons encompasses not only TB in prisoners, but TB in prison staff who ultimately interact directly with their families and community when they leave work. Emerging data show that multi-drug resistant TB (MDR-TB) is also increasingly being identified in prisoners and prison staff and poses a threat to National TB Programmes (NTPs).^{7,8} While there have been many comprehensive reports of TB in prisons from USA and Europe, there has been a paucity of literature on TB in African prisons. Accurate data of TB in prisons in SSA countries are not readily available since surveillance and data reporting mechanisms are poor or non-existent. This review summarises the available literature on epidemiology, diagnosis, treatment and control of TB in prisons from SSA countries highlighting key priority areas for research and associated ethical issues. A case is made for increased research on priority issues and attracting political and funder attention and investment to address the neglected problem of TB in SSA prisons.

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2. Methods

A review of all relevant English language publications on TB in prisons in SSA was performed of PubMed and Google Scholar databases. The search used the key words 'tuberculosis (TB)', 'prisons', 'prisoners', 'inmates', 'drug resistance', and 'Africa' linked with the words 'epidemiology, treatment, TB control, transmission, management, conditions, ethics, and prevention'. The search covered the period July 1st, 1990 up to July 1st, 2010. Review articles for TB in prisons in general with no geographical restrictions were collected via a PubMed search using the key words 'tuberculosis' and 'prisons'. In addition, the US Centres for Disease Control and Prevention (CDC) and World Health Organisation (WHO) websites were searched for relevant information. There were inherent differences in the methods used to conduct the various studies and they also varied in emphasis, presentation of data and study variables.

3. Published studies on TB in SSA prisons

Data of TB in prisons from SSA countries show high prevalence rates affecting upto 5% of inmates. Reports from Zambia, Cameroon, Tanzania, Malawi, Botswana, and Ivory Coast suggest that the TB prevalence in prisons is several fold higher than that of TB in the general population (Table 1). A cross-sectional study of TB in thirteen Zambian prisons conducted between 2000 and 2001, enrolled 1080 of a total of 6118 prison inmates, of which 245 (22.7%) had active TB (prevalence = 4005 per 100,000 inmates). Similar results were obtained from studies of prisons from Douala, Cameroon. A retrospective cohort study of 501 prison inmates with active TB at Butimba prison, Mwanza, Tanzania¹¹ conducted between January 1994 and December 1997 showed a high mortality (16.8%) with 84 deaths, and 112 of 501 inmates (25.9%) were HIV positive. Three hundred and forty three of the 501 inmates (68.4%) were clinically classified as malnourished. The majority of inmates (42.1%) were diagnosed with TB between 1 and 2 years after incarceration.

In 1996 an active case finding study was performed in Zomba Central Prison, the largest prison in Malawi. Of 1315 inmates, 915 (70%) were screened for pulmonary TB of which 47 (5142 per 100,000 inmates) had active TB. Of 22 inmates with TB who agreed to have a HIV test, 16 (73%) were HIV positive. In most inmates the symptoms of TB had started after the study participant had entered prison.¹⁵ This study led to policy change in Malawi and the Malawi National Tuberculosis Control Programme was empowered to

develop a system that would lead to more accurate diagnosis and treatment of TB in prisons in the country.¹⁶

The USA Centres for Disease Control (CDC), in collaboration with Botswana government authorities, performed an active case finding study screening prison inmates and guards for TB at four prisons in Gaborone during 2002.¹³ A total of 1027 (88%) of 1173 prison inmates and 263 (91%) of 288 guards were interviewed. Of a total of 509 (50%) prisoners that reported cough, 371 (73%) provided sputum samples of which 39 had TB - a point prevalence of TB of 3797 per 100,000 inmates (3.8%). Prisons guards had a point prevalence of 2662 cases per 100,000 ($n = 7/263$). Six out of 20 (30%) study participants, who agreed to be HIV tested, were positive. Several CDC recommendations resulted from this study, although these measures have been slow to be implemented.

A prospective study of TB in Bouake prison camp, Ivory Coast from 1990–1992.¹⁴ showed the incidence of active TB to be 5803 per 100,000 inmates ($n = 108/1861$). In the majority of cases TB disease was associated with other conditions including malnutrition (75%), anaemia (70%) and dermatoses including scabies (64%). HIV co-infection was observed in 30% ($n = 9/30$) of the cases and alcohol and tobacco dependence in 50%. The 6-month treatment regimen was effective, with 97.6% of those who completed their treatment, cured.

4. Prisons – reservoirs of TB impacting on the general community

Prisons are regulated but not closed systems, due to the numbers of people who enter, leave and re-enter them. Prison health is a critical part of public health, as health problems within and outside prisons are interrelated.¹⁷ This has major health implications regarding the epidemiology of TB and other transmittable diseases within the community.^{18,19} Sub-standard health services and TB diagnostic and treatment practices in prisons compound the risk of MDR-/XDR-TB to the entire population.¹⁸ Successful TB control, in any country, requires effective TB control in prisons. Failure to control TB in prisons has the potential to disrupt community TB control programmes.¹⁸

5. Drug resistant TB data from SSA prisons

The 2010 WHO MDR-TB and extensively drug-resistant TB (XDR-TB) report²⁰ estimates that 440,000 MDR-TB cases occurred in 2008 (3.6% of the total incidence of TB), of which 150,000 deaths occurred worldwide. Accurate data on drug-resistant TB from SSA

Table 1
Summary of TB in prison studies from sub-Saharan Africa.

Country	Reference	Study site(s) and year(s) of study	Main findings (TB prevalence, incidence and HIV co-infection)
Zambia	Habeenzu C <i>et al.</i> , 2007 ⁹	TB screening in 13 prisons across Zambia (2000–2001)	Minimum TB prevalence was 4005 per 100,000 based on a total prison population of 6118 (245/1080 recruited patients were positive for TB) and the authors speculate that true TB prevalence rates may approach 15–20%. Resistance to at least one anti-tuberculosis drug was detected for 40 (23.8%) isolates, while MDR-TB was identified for 16 (9.5%) isolates (MDR-TB prevalence of 262 per 100,000).
Cameroon	Noeske J <i>et al.</i> , 2006 ¹⁰	TB screening in the central prison in Douala (2003–2004)	TB point prevalence of 3516 per 100,000 ($n = 87/2474$) with 6/24 (25%) of patients tested co-infected with HIV.
Tanzania	Rutta E <i>et al.</i> , 2001 ¹¹	TB patients in Butimba prison in Mwanza (1994–1997)	Of 501 TB patients, 40.7% were smear positive, 25% were co-infected with HIV and the majority of inmates were diagnosed with TB between 1 and 2 years after incarceration
Malawi	Banda H <i>et al.</i> , 2009 ¹²	TB screening in 18 (of 22) prisons across Malawi (2005)	Average prevalence of smear-positive pulmonary TB was 705 per 100,000 ($n = 54/7661$) but prevalence was higher in large urban prisons (1080 per 100,000).
Botswana	CDC Report, 2003 ¹³	TB screening in 4 prisons in Gaborone (2002)	A point prevalence of TB of 3797 cases per 100,000 population ($n = 39/1024$) in prison inmates and 2662 cases per 100,000 ($n = 7/263$) in prison guards with 30% (6/30) of patients tested co-infected with HIV
Ivory Coast	Koffi N <i>et al.</i> , 1997 ¹⁴	TB screening in Bouake prison camp (1990–1992)	Smear positive TB incidence of 5803 per 100,000 inmates ($n = 108/1861$) with HIV co-infection observed in 30% ($n = 9/30$) of cases.
Malawi	Nyangulu D <i>et al.</i> , 1997 ¹⁵	TB screening in Zomba Central Prison (1996)	TB prevalence of 5142 per 100,000 inmates ($n = 47/914$) with 73% of those tested co-infected with HIV ($n = 46/62$).

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