

# The epidemiology and clinical manifestations of human immunodeficiency virus-associated tuberculosis in Hong Kong

CME

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**Objective** To evaluate the epidemiology and clinical manifestations of human immunodeficiency virus-associated tuberculosis in Hong Kong.

**Design** Retrospective study.

**Setting** Tuberculosis and Chest Service and Special Preventive Programme, Public Health Services Branch, Centre for Health Protection, Department of Health, Hong Kong Special Administrative Region.

**Patients** Cases reported to the TB/HIV Registry jointly kept by the Tuberculosis and Chest Service and Special Preventive Programme from 1996 to 2006 were reviewed. The Registry includes cases of human immunodeficiency virus-associated tuberculosis diagnosed in the two services, and cases referred from regional hospitals under the Hong Kong Hospital Authority and the private sector.

**Results** Tuberculosis has become an increasingly important acquired immunodeficiency syndrome-defining illness in Hong Kong, and overtook *Pneumocystis jiroveci* pneumonia for the first time as the most common primary acquired immunodeficiency syndrome-defining illness in 2005 (accounting for 39% and 31% of all such illnesses, respectively in that year). The presentation of human immunodeficiency virus-associated tuberculosis is often atypical. In these patients moreover, there was a slightly higher rate of multidrug-resistant tuberculosis (2%) than in the general population (range, 0.7-1.5%).

**Conclusions** Programmes for the provider-initiated human immunodeficiency virus testing policy to reduce diagnostic delays should continue and be enhanced. Continual surveillance of both conditions is imperative, especially in view of a possible link between human immunodeficiency virus and multidrug-resistant tuberculosis.

## Key words

AIDS-related opportunistic infections;  
Anti-HIV agents; HIV infections;  
Tuberculosis, multidrug-resistant

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## Introduction

Tuberculosis (TB) and the human immunodeficiency virus (HIV) infection are two of the world's greatest public health concerns.<sup>1</sup> The intersection of the HIV and TB epidemics can have devastating effects.<sup>2</sup> Of the global population, a total of 33.2 million people were living with HIV/acquired immunodeficiency syndrome (AIDS) at the end of 2007; 1.3 million were in the Western Pacific Region.<sup>3</sup> Tuberculosis and HIV are endemic in many developing Asian countries. In 2004, the World Health Organization (WHO) developed a framework for TB-HIV control in the Western Pacific Region in order to address these intersecting epidemics, and in 2007 it was revised.<sup>4,5</sup> Yet data about HIV-associated TB in the Western Pacific Region remain rather limited.<sup>6-8</sup>

In Hong Kong, TB is a notifiable disease. The TB notification rate has shown an overall downward trend in the past few decades. The number of TB cases notified to the Department of Health (DH) was 5766 in 2006, and the corresponding TB notification rate was 84.1 per 100 000 inhabitants.<sup>9</sup> As regards HIV infection in Hong Kong, the first case was reported in 1984. The prevalence of HIV in Hong Kong has remained low. Under the voluntary HIV/AIDS reporting system, the DH has received a cumulative total of 3198 notifications by the end of 2006.<sup>10</sup> The overall prevalence of HIV infection in the general adult population has remained low (<0.1%).

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Since 1996, the Hong Kong DH has been conducting regular unlinked anonymous screening for HIV antibody among TB patients attending chest clinics, in accordance with WHO recommendations.<sup>11</sup> The HIV prevalence has remained rather low (range, 0.1-0.9%) according to unlinked anonymous screening.<sup>9,10</sup> The HIV positivity rate from voluntary blood tests, which have been routinely offered to TB patients by chest clinic doctors since 1993, has also been low, and has ranged from 0.7 to 1.0%.<sup>9,10</sup> At present, HIV-associated TB cases represent only a minority of the annual TB notifications in Hong Kong, with only around 30 cases reported annually. The high TB endemicity, however, means that HIV-infected persons in Hong Kong are prone to developing TB early during the course of their illness. In order to examine the epidemiology of HIV-associated TB in Hong Kong comprehensively, and make more informed programme decisions, we set out to retrospectively review the data on patients with HIV-associated TB reported to the TB/HIV Registry of the DH.

## Methods

In Hong Kong, the majority of patients with TB are managed at government chest clinics under the Tuberculosis and Chest Service (TB & CS) of the DH. Most HIV-infected persons receive medical care for their disease at either the Special Preventive Programme (SPP) of the DH, or one of the regional hospitals of the Hong Kong Hospital Authority (HA). To enhance surveillance of HIV-associated TB locally, since 1996 a TB/HIV Registry has been set up jointly by TB & CS and the SPP. The Registry logs all cases of HIV-associated TB diagnosed in the two services, and cases referred from regional HA hospitals and the private sector. Data collected include demographics, presenting symptoms, TB details collected using the standard programme record forms of the TB & CS,<sup>9</sup> and HIV data including diagnosis of AIDS-defining illness and laboratory test results at the time of co-infection. A total of 312 cases were reported to the TB/HIV Registry from 1 January 1996 to 31 December 2006, all of which were included in this analysis.

In Hong Kong, TB is considered an AIDS-defining illness when the disease is extra-pulmonary. Pulmonary TB and cervical lymph node TB are considered to be an AIDS-defining illness only when the CD4 count at the time of diagnosis of TB is less than 200/ $\mu$ L (as per recommendations of the Scientific Committee of the Advisory Council on AIDS).<sup>12</sup> The recommendation was based on the uniqueness of local disease epidemiology and was in line with expanded case definitions for AIDS referenced from the 1992 US Centers for Disease Control and Prevention. The number of cases with TB as a primary AIDS-defining illness and accepting TB

## 香港人類免疫缺乏病毒 (HIV) 合併結核病 (TB) 的流行病學及臨床表現

- 目的** 評估香港HIV合併TB的流行病學及臨床表現。
- 設計** 回顧研究。
- 安排** 香港特別行政區衛生署轄下的衛生防護中心公共衛生服務處內的胸肺科服務及特別預防計劃。
- 患者** 1996至2006年期間由胸肺科服務及特別預防計劃共同管轄的TB/HIV新症資料庫內的紀錄，包括於兩所部門確診的HIV合併TB個案，及由醫院管理局轄下醫院和私家醫生轉介的個案。
- 結果** TB已成為香港日漸重要的愛滋病界定疾病，甚至於2005年超越了卡氏肺囊蟲肺炎首次成為最普遍的原發性愛滋病界定疾病（同年TB佔愛滋病界定疾病中的39%，而卡氏肺囊蟲肺炎只佔31%）。HIV合併TB的病徵大多數屬非典型，患者的多重抗藥性TB為2%，高於一般人口的比率（0.7-1.5%）。
- 結論** 由醫護人員提供的HIV檢測服務能減低診斷延誤，應繼續執行並加強此政策。同時由於HIV可能與多重抗藥性TB有關，務必要繼續監察這兩種疾病。

as an AIDS-defining illness was evaluated using these definitions.

To further assess the clinical manifestations of HIV-associated TB locally, the medical records of 190 (61%) of the 312 patients with HIV-associated TB reported to the TB/HIV Registry between January 1996 and December 2006 were also reviewed retrospectively. All the data were imported into Epi-Info and exported into a statistical package (Statistical Package for the Social Sciences, Windows version 16; SPSS Inc, Chicago, US) for analysis. Continuous variables were compared using the Mann-Whitney test, and categorical variables by the Chi squared or Fisher's exact tests.

This study was an evaluation of the public health programme for HIV-associated TB in Hong Kong, and did not constitute research on human subjects. Throughout the reviewing process, we exercised care to protect the privacy of all patients by excluding personal identifying information from the electronic database.

## Results

In all, there were 74 376 TB cases notified to the DH within the period 1 January 1996 to 31 December 2006, of which 312 (0.42%) were reported to the TB/HIV Registry. Of these, 192 (62%) had TB as a primary AIDS-defining illness. The number (and proportion) of cases of the latter reported annually to the Registry is shown in Table 1, from which it is evident that TB has become an increasingly important AIDS-defining

TABLE 1. Tuberculosis (TB) as a primary acquired immunodeficiency syndrome (AIDS)-defining illness in Hong Kong among 312 cases reported to the TB/HIV Registry as of December 2006 (all sources)

Year	No. of cases with TB as primary AIDS-defining illness	Total No. of reported AIDS cases	% Of reported AIDS cases with TB as the primary AIDS-defining illness
1996	21	70	30%
1997	17	64	27%
1998	17	63	27%
1999	13	61	21%
2000	19	67	28%
2001	17	60	28%
2002	9	53	17%
2003	15	56	27%
2004	13	49	27%
2005	25	64	39%*
2006	26	73	36%†
<b>Total</b>	<b>192</b>	<b>680</b>	<b>28%</b>

\* TB overtook *Pneumocystis jiroveci* pneumonia as the most common AIDS-defining illness in 2005

† TB was second to *Pneumocystis jiroveci* pneumonia as the commonest AIDS-defining illness in 2006

illness in Hong Kong over the years. Of a total of 64 AIDS cases newly diagnosed in 2005, 25 (39%) had TB as a primary AIDS-defining illness, compared to 20 (31%) having *Pneumocystis jiroveci* (formerly termed *carinii*) pneumonia. Tuberculosis overtook *P. jiroveci* pneumonia for the first time as the most common AIDS-defining illness in 2005, whereas it was ranked second to this form of pneumonia in 2006.

The criterion for TB as an AIDS-defining illness was examined among a subgroup of patients (n=190) reported from the chest clinics and the SPP. Of the 137 (72%) patients with TB as the AIDS-defining condition, the criterion was extra-pulmonary TB (other than cervical lymph node) in 50 (36%). The remaining 87 (64%) had pulmonary and/or cervical lymph node TB with CD4 counts of less than 200/ $\mu$ L. The demographics and mode of presentation of these 190 patients with HIV-associated TB are shown in Table 2. Fever, cough, and weight loss were the most common presenting symptoms. Notably, 169 (89%) of these 190 patients were males, and most were either Chinese (80%) or non-Chinese Asians (17%). In all, 154 (81%) of these 190 patients had pulmonary disease with or without extra-pulmonary involvement, and 119 (63%) had extra-pulmonary TB. The commonest site of extra-pulmonary involvement was lymphadenopathy in 59 (31%) patients, followed by the pleura (17%) and the abdomen (12%). Some patients had multiple sites affected and disseminated disease. One hundred and twenty-two other patients managed in HA hospitals were not analysed from this perspective as their data were deemed to be incomplete.

TABLE 2. Demographics and mode of presentation of 190 cases reported from chest clinics and the Special Preventive Programme (1996-2006)

Demographics and mode of presentation*	Data <sup>§</sup>
Median (range) age (years)	38 (19-81)
Sex (male/female)	169/21
Ethnicity	
Chinese	152 (80%)
Non-Chinese Asians	33 (17%)
Caucasians	5 (3%)
Residential status	
Permanent resident	144 (76%)
Imported worker	30 (16%)
Illegal immigrant	5 (3%)
Tourist	1 (0.5%)
Unknown	10 (5%)
Drug addiction	
Yes	7 (4%)
No	183 (96%)
Primary source of care	
Hospitals and clinics under HA	131 (69%)
Chest clinics, SPP and other DH clinics	45 (24%)
Private doctors	11 (6%)
Mainland or overseas doctors	3 (2%)
Case category	
New case	175 (92%)
Relapse case	10 (5%)
Re-treatment after default	4 (2%)
Other	1 (0.5%)
Presenting symptoms	
Fever	105 (55%)
Cough and/or sputum	98 (52%)
Weight loss	58 (31%)
Lymphadenopathy	52 (27%)
Shortness of breath	23 (12%)
Abdominal symptoms	23 (12%)
Haemoptysis	9 (5%)
Other symptoms <sup>†</sup>	22 (12%)
No symptoms	9 (5%)
HAART at TB diagnosis <sup>‡</sup>	
Yes	23 (21%)
No	87 (79%)

\* HA denotes Hospital Authority, SPP Special Preventive Programme, DH Department of Health, HAART highly active anti-retroviral therapy, and TB tuberculosis

† The other symptoms were generalised malaise and loss of appetite (n=9), genito-urinary symptoms (4), joint pain (2), headache and neck stiffness (1), confusion (3), convulsion (1), yellowing of sclera (1), parotid swelling (1)

‡ Among 110 patients with HIV infection diagnosed before TB

§ Data are shown as No. (%) of patients, except otherwise indicated

The radiographic features of 161 patients with abnormal chest radiographs (including those with isolated pleural effusion and hilar lymphadenopathy) are shown in Table 3. Atypical X-ray features

for TB, including lower lobe involvement, hilar lymphadenopathy, pleural effusion, and miliary pattern were common, and were present in 32%, 16%, 20%, and 14% of the patients, respectively. A normal chest radiograph was uncommon in our patients. Patients with HIV-associated TB who were not receiving highly active anti-retroviral therapy (HAART) at the time of TB diagnosis tended to have atypical radiographic features more frequently than those receiving it (49% vs 35%), although the difference did not reach statistical significance.

The mode of diagnosis was bacteriological in 88 (46%) patients, followed by clinical and radiological (28%) and histological (25%). Of 180 patients with sputum smear examination performed at the time of TB diagnosis, 76 (42%) had a positive smear for acid-fast bacilli. Of 173 patients with sputum cultures performed, 109 (63%) had *Mycobacterium tuberculosis* organisms isolated. A total of 138 (73%) patients had a positive culture (either sputum or other specimens) at the time of TB diagnosis. Drug susceptibility tests were performed in 134 of them. The *M tuberculosis* organisms were susceptible to all first-line anti-TB drugs in 108 (81%) of these patients (Table 4). Twenty-six (19%) patients had resistance to one or more anti-TB drugs and three (2%) had multidrug-resistant tuberculosis (MDRTB). None of the patients had extensively drug-resistant tuberculosis. Of the three patients with MDRTB, all were new cases and gave no history of previous anti-TB treatment; one was a worker from Nepal and two were local patients and did not have other risk factors for MDRTB (intravenous drug addiction or a known history of contact with patients having MDRTB).

A total of 110 (58%) of the patients had HIV infection diagnosed before TB, with a median CD4 count of 123/ $\mu$ L (range, 3-1039/ $\mu$ L) at HIV diagnosis. Fifty-six (29%) of the patients had TB diagnosed before HIV infection was reported, and 24 (13%) had TB presenting together with HIV (ie the diagnosis of TB was within 1 month of the date of reporting the HIV infection). Of 110 patients with HIV infection diagnosed before TB, 23 (21%) were receiving HAART at the time. Tuberculin skin tests, with 2 units of purified protein derivative (PPD) RT23, were performed in 28 (25%) of the patients. A positive tuberculin skin test, defined as an induration of greater than 5 mm diameter at 48 to 72 hours after the test, was noted in 12 patients. Only two had undergone previous treatment (with isoniazid) for latent TB infection. Of the 10 other patients, five had TB diagnosed within 6 weeks of the PPD examination and positivity date. Of the 190 patients in the special subgroup with HIV-associated TB, a significant proportion had relatively advanced HIV disease at the time of TB diagnosis, as evidenced by a median CD4 count of 78/ $\mu$ L (range, 3-981/ $\mu$ L). The median

TABLE 3. Radiographic features of 161 patients with human immunodeficiency virus-associated tuberculosis who had abnormal chest radiographs\*

X-ray features	No. (%) of patients
Lung parenchymal lesion	148 (92)
Site of lesion	
Predominant upper lobe involvement	72 (49)
Predominant lower lobe involvement	48 (32)
Both upper and lower lobe involvement	28 (19)
Extent of disease <sup>†</sup>	
I	83 (56)
II	29 (20)
III	36 (24)
Presence of cavity	9 (6)
Hilar and/or mediastinal lymph nodes enlargement	26 (16)
Pleural effusion ( $\pm$ lung parenchymal lesion)	33 (20)
Miliary shadows	23 (14)

\* Excluding 3 patients who had a positive sputum bacteriology but X-ray results were unknown and 1 patient who had a positive sputum smear but apparent normal chest radiograph; but including patients with isolated pleural effusion, who were considered as having extra-pulmonary tuberculosis

<sup>†</sup> Extent I: total radiographic extent smaller than the equivalent of right upper lobe; extent II: total radiographic extent greater than the equivalent of right upper lobe but smaller than the equivalent of right lung; extent III: total radiographic extent greater than the equivalent of right lung

TABLE 4. Sensitivity results from 134 patients with positive cultures of sputum and/or other specimens and drug susceptibility tests performed

Sensitivity pattern	No. (%) of patients
No resistance	108 (81)
Any resistance	26 (19)
Resistant to streptomycin	20 (15)
Resistant to isoniazid	10 (8)
Resistant to rifampicin	3 (2)
Resistant to ethambutol	1 (1)
Resistant to pyrazinamide	1 (1)
Resistant to ofloxacin	0 (0)
Multidrug-resistant*	3 (2)
Extensively drug-resistant <sup>†</sup>	0 (0)

\* Defined as bacillary resistance to at least both isoniazid and rifampicin

<sup>†</sup> Defined as multidrug resistance plus resistance to ofloxacin and at least one of the anti-tuberculosis injectable agents

CD4 count was lower in those with extra-pulmonary TB than in patients with only pulmonary involvement (73.0/ $\mu$ L vs 97.0/ $\mu$ L), although the difference did not reach statistical significance. The median viral load was 142 619 copies/mL (range, 226-7 300 000 copies/mL). Thirty (16%) patients had other AIDS-defining illnesses at the time of TB diagnosis. The clinical stages of HIV infection prior to TB diagnosis (for cases with HIV infection diagnosed before TB) and at or within 3 months after the TB diagnosis are shown in Table 5.

TABLE 5. Human immunodeficiency virus (HIV) clinical staging in 190 patients attending both the chest clinics and the Special Preventive Programme prior to and within 3 months from the diagnosis of tuberculosis (TB)

HIV clinical staging*	No. (%) of patients
Patients with HIV infection diagnosed before TB (n=110)	
First recorded stage†	
A1-3	39 (35)
B1-3	21 (19)
C1-3	22 (20)
Unknown	28 (25)
Total	110 (100)
Last recorded stage before TB diagnosis	
A1-3	13 (12)
B1-3	24 (22)
C1-3	45 (41)
Unknown	28 (25)
Total	110 (100)
HIV stage at or within 3 months after TB diagnosis	
A1-3	5 (5)
B1-3	16 (15)
C1-3‡	86 (78)
Unknown	3 (3)
Total	110 (100)
All patients at or within 3 months after TB diagnosis (n=190)	
A1-3	5 (3)
B1-3	21 (11)
C1-3‡	161 (85)
Unknown	3 (2)
Total	190 (100)

\* Classification system largely adopted from the US Centers for Disease Control and Prevention (CDC) 1993 classification but with the following modifications: (a) disseminated penicilliosis added as one of the AIDS-defining illnesses, (b) pulmonary or cervical lymph node TB is included only if CD4 <200/μL, and (c) CD4 <200/μL without any AIDS-defining illness is not counted as AIDS

† For patients with HIV infection before TB, the median time interval between first-recorded CDC stage and TB diagnosis was 635 days

‡ Taking into account all AIDS-defining illnesses, including the present TB episode if fall under AIDS classification criteria, that have developed since the last staging

## Discussion

This is the first comprehensive review of the epidemiological features and clinical manifestations of a large series of patients with HIV-associated TB in Hong Kong. Notably, TB has become an increasingly important AIDS-defining illness in Hong Kong. This phenomenon has also been observed in some western countries, probably in relation to HAART and an increasing proportion of migrants from areas with a high prevalence of TB.<sup>13,14</sup> Data from the ART Cohort Collaboration, which includes patients from 13 cohorts in Europe and North America, showed that oesophageal candidiasis, TB, and non-Hodgkin's lymphoma were the most commonly occurring

events by the third year of such therapy.<sup>15</sup> The reason for TB to become an increasingly frequent primary AIDS-defining illness in Hong Kong is unclear, but may be related to the high burden of latent local TB. The increase in the proportion having TB as a primary AIDS-defining illness in Hong Kong may also be associated with increased HIV testing, increased use of HAART, and increased prophylaxis for *P jiroveci* pneumonia. All in all, *P jiroveci* pneumonia and TB remain the most common AIDS-defining illnesses in Hong Kong.

The finding that TB is an important primary AIDS-defining illness lends support to the WHO recommendation that all people living with HIV should be screened for TB disease at diagnosis, prior to starting anti-retroviral therapy, and at regular intervals thereafter.<sup>16</sup> Conversely, all patients newly diagnosed with TB should be counselled about HIV infection and offered HIV antibody testing. Surveillance and early intervention are the best approaches to the management of TB with HIV infection and vice versa. Interestingly, pulmonary TB and cervical lymph node TB with low CD4 counts accounted for over 60% of the HIV-associated TB cases attending chest clinics and the SPP with TB as the primary AIDS-defining condition. The propensity of pulmonary TB and cervical lymph node TB as an AIDS-defining criterion in our locality is obviously influenced by the expanded case definition for AIDS adopted in Hong Kong, and reflects the uniqueness of local TB and HIV epidemiology.

Tuberculosis has been reported to occur at a relatively early stage in the course of HIV infection when the CD4 count is moderately low.<sup>17</sup> Thus, a median CD4 count of 78/μL in our patients with HIV-associated TB is noteworthy. It not only provides further evidence of an association between low CD4 counts and the risk of acquiring TB, but also suggests that TB often presents in advanced HIV infection, even in a setting with a high prevalence of TB in the community. Tuberculosis should be considered a differential diagnosis in an HIV-infected person with lung shadows and appropriate symptoms at all strata of CD4 cell counts. In our studied patients, TB presenting at a rather advanced stage of HIV infection may have been partly due to patients' risk perception and health-seeking behaviour. This may have a negative impact on management as simultaneous initiation of TB and HIV treatment is best avoided, because of the increased risk of immune reconstitution inflammatory syndrome, the burden of polypharmacy, and the difficulty in identifying culprit agents in the event of hypersensitivity and other adverse reactions.

Our observation that TB may present atypically in HIV-infected persons corroborates findings from other studies.<sup>18-20</sup> Of the 190 patients specifically examined, a rather high proportion (63%) had extra-

pulmonary involvement. Radiographic features of TB were often atypical, and lower lobe involvement was common. Similar findings were also reported in an earlier local study that examined the clinical manifestations of 60 HIV-associated TB patients.<sup>21</sup> Notably, patients with HIV-associated TB not on HAART tended to have atypical chest radiographs. Given the common occurrence of atypical chest X-ray features in patients with HIV-associated TB, and that HAART may modify the radiographic appearance of TB, a high index of suspicion for TB is necessary. Depending on clinical circumstances, in addition to sputum tests, gastric aspiration, blood culture, bone marrow biopsy, and lumbar puncture may be required to reach a definitive diagnosis. Failure to diagnose TB can be lethal.

Approximately 42% of our studied patients with HIV-associated TB had a positive sputum smear, which is somewhat higher than the 32.9 to 38.0% generally encountered in our local population diagnosed to have TB.<sup>9</sup> The proportion of our studied patients with HIV-associated TB with positive sputum smears was in accordance with the 30 to 60% reported in other studies.<sup>22-24</sup> The rate of MDRTB among the reported HIV cases with positive cultures remained rather low (2%), and was only somewhat higher than that in our local TB-infected population (which ranges from 0.7-1.5%). This low figure was probably related to the use of directly observed therapy at our chest clinics. The absolute number of MDRTB cases associated with HIV, however, was small, and the data have to be interpreted with caution. Data in the literature regarding the link between HIV and MDRTB are conflicting.<sup>25</sup> Infection of HIV has been reported to be associated with institutional outbreaks of MDRTB as a result of poor infection control and delays in diagnosis. Population-based assessments of the determinants of MDRTB, however, have not confirmed a clear association with HIV. Surveillance data suggest that HIV infection and MDRTB may converge in several countries.<sup>26,27</sup> Due to the low number of HIV-positive cases diagnosed with MDRTB in most settings, the data have not been sufficiently robust to examine an association between HIV and MDRTB. Infection with HIV has been associated with acquired resistance to rifamycins, possibly due to inadequate dosing schedules, co-administration of other medications, and malabsorption of anti-TB drugs. It is important that practising doctors be alert to the possibility of multidrug resistance whenever an HIV-infected person with TB is not responding well to anti-TB treatment. In which case, rapid diagnostic confirmation of anti-TB drug resistance can facilitate appropriate infection control measures and alternative therapy. Periodic surveillance for anti-TB drug resistance among HIV populations should be conducted by public health professionals, as for other populations at risk of anti-TB drug resistance.

As with any other reporting system, one limitation of our study may be the under-reporting of cases. The number not being reported, however, should be small because the majority of HIV-infected persons who develop TB attend either the SPP or one of the medical units of HA hospitals and there is a well-established channel of reporting from these institutions. The data on epidemiology were therefore likely to be relatively complete. Clinical data related to HIV are generally less readily available for patients who received medical care for HIV solely in HA hospitals. These cases were not analysed for their clinical manifestations, and so the results from our subgroup may not be generalisable to all HIV-associated TB in Hong Kong. Finally it may not be possible to examine all factors that may influence clinical manifestations in these patients due to the retrospective nature of the review.

In conclusion, our study showed that TB has become an increasingly important AIDS-defining illness locally, although HIV-associated TB represents only a minority of the annual TB notifications in Hong Kong at present. In addition, TB may present atypically in HIV-infected persons. Programmes for provider-initiated HIV testing policies to reduce diagnostic delays, and treatment algorithms to diagnose and treat TB (including latent TB infection) in HIV-infected persons, are recommended by the WHO. These are already in place in Hong Kong and should be enhanced, especially for the treatment of latent TB infection. Hitherto this has not been widely accepted by tuberculin test-positive TB contacts (both HIV infected and non-infected) in the local population. Continual surveillance of TB and HIV is imperative, especially as some overseas reports and preliminary data indicate a higher percentage than in overall TB patients; a link between HIV and MDRTB is considered possible. Finally, further epidemiological and clinical research is needed to better understand the interaction between TB and HIV and to institute better control of both these conditions.

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