

# TUBERCULOSIS CO-MORBIDITY AND PERCEPTIONS ABOUT HEALTH CARE AMONG HIV-INFECTED PLASMA DONORS IN RURAL CHINA

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**Abstract.** Limited community-based data exist about pulmonary tuberculosis (TB) co-morbidity among HIV-infected individuals in China and no data exists about the TB burden in key high risk groups. We recruited 195 known HIV-infected plasma donors in one central China county and identified 9 (4.6%) active TB cases based on clinical assessment, including chest radiography. The low percentage of TB may be explained by improved immunity due to antiretroviral therapy.

## INTRODUCTION

The burden of disease and death caused by tuberculosis (TB) and HIV/AIDS in developing countries is immense. The HIV epidemic has exacerbated the TB problem in many countries, driving up incidence rates (WHO, 2006). As the most populous country in the world, China has the second larg-

est burden of TB disease, with an estimated prevalence of 4.5 million cases and 130,000 TB-associated deaths each year (WHO, 2006). China also has seen a rapid expansion in the HIV/AIDS epidemic during the past decade. While the interaction between TB and HIV infection has been studied extensively in sub-Saharan Africa (Cantwell and Binkin, 1997; Williams *et al*, 2005), relatively little is known about China. Studies among hospitalized AIDS patients have found TB to be one of the most common opportunistic infections in China (Wang *et al*, 2007), however, there are no community-based studies of TB co-morbidity.

China had more than 223,000 HIV/AIDS cases reported through 2007, though the estimated number of people living with HIV/AIDS is 700,000 (State Council AIDS Working Committee Office, 2007). HIV/AIDS epidemic data are collected through passive HIV/AIDS case reporting, active HIV sentinel surveillance and special epidemiologi-

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cal studies (Jia *et al*, 2007). Though voluntary testing is encouraged and more than 6,000 laboratories provide HIV screening tests across China, about three-quarters of the screening tests are done by blood banks and many infections are identified via provider-initiated tests and epidemiological surveys (Shao and Lv, 2007). All cases confirmed by Western blot test are required to be reported through a confidential name-based internet reporting system from the local Centers for Disease Control (CDC) to the central CDC.

Contaminated plasma collection in the early 1990s caused many HIV infections and other bloodborne diseases in rural areas of central China (Qian *et al*, 2006; Zhang *et al*, 2006). Antiretroviral (ARV) therapy has been available since 2004 through the China Comprehensive AIDS Response (China CARES), which provides free antiretroviral therapy for infected plasma donors. A recent analysis of national data showed that the percentage of patients with AIDS who were receiving HAART increased from 0% in 2001 to 70.5% in 2006. Meanwhile, the mortality rate decreased from 27.3 deaths per 100 person-years in 2001 to 4.6% in 2006 (Zhang *et al*, 2008). Directly Observed Treatment, short-course (DOTS) was introduced in the mid-1990s and has expanded across the country. A county-level CDC is the basic health administration unit in rural areas. Free TB service, including TB screening and treatment, are provided in the TB center of each county-level CDC. The purpose of this study was to evaluate co-infection with HIV and pulmonary TB and the health care perceptions among HIV-infected plasma donors in rural China.

## MATERIALS AND METHODS

In 2007, we conducted a cross-sectional survey in one county in Shanxi Province,

China (population 380,000), where the vast majority of HIV/AIDS patients acquired their infections through contaminated plasma during the mid-1990s (Qian *et al*, 2005, 2006). In the study, we expected to recruit 300 eligible participants and identify 22 to 41 active TB cases (95% confidence interval) giving a TB prevalence of 10%. Two hundred thirty-five HIV-infected residents age 18 years or older registered by the local county CDC were found to be eligible, of which 195 (83%) participated in the study. Interviews were conducted to collect information about socio-economic status, antiretroviral therapy, smoking and alcohol use, TB history, and current symptoms of disease. Data about CD4<sup>+</sup> cell counts and ARV regimens were obtained from the local CDC. Participants received a tuberculosis skin test (Purified Protein Derivative, PPD test, 0.1 ml intradermal injection, reading the reaction between 48-72 hours), chest radiography, and sputum smear examination for those reporting TB-related symptoms ( $n=43$ ). Culture for *Mycobacterium tuberculosis* was not available. Diagnosis of TB was made following the agreement of two experienced physicians based on their clinical assessment after consideration of the PPD test, sputum smear examination, and chest radiography. All active TB cases were subsequently invited to participate in focus group discussions (FGD) about their perceptions of the stigma surrounding seeking health care for TB and experiences of seeking care for HIV/AIDS. The TB clinic physicians were trained to moderate the FGD following pre-tested interview guidelines. Participants were assured that refusing to participate in the FGD and any personal disclosures during the FGD would not affect their clinical treatment and that the information collected was confidential. Informed consent was obtained before participating in the interview and focus group

Table 1  
 Characteristics of 195 HIV patients with TB, positive PPD test and without TB.

Characteristic variable	TB patients (n=9)	PPD+ subjects (n=14)	Non-TB subjects (n=172)
Males	5	5	109
Age (year, mean±95% CI)	46.9±6.8	43.9±8.5	46.2±8.2
Ever had ART therapy	7	10	130
Have symptoms suggesting pulmonary TB <sup>a</sup>	1	4	14
History of TB	2	1	8
PPV value ≥10 mm	2	14	0
Abnormal chest radiography	9	0	0
CD4 count (mean±95% CI)	297.2±115.2	375.6±149.8	335.2±170.3

<sup>a</sup>Symptoms include cough, weight loss, chest pain, and night sweats.  
 CI=confidence interval; PPD=purified protein derivative.

discussions. The study protocol was approved by the institutional review boards of the University of Alabama at Birmingham and the National Center for AIDS/STD Control and Prevention of the Chinese Center for Disease Control and Prevention.

## RESULTS

Among 195 participating villagers, nine active TB cases were detected, representing a prevalence rate of 4.6% (Table 1). Two cases had been detected prior to the study and were still in treatment when asked to participate. As the Bacille Calmette Guerin (BCG) vaccination is widely used in the study site, a PPD test result with an induration diameter of ≥10 mm was defined as positive. Sixteen (8.2%) participants had a positive PPD, of which two were determined to have active TB; no positive sputum smears were found among the participants reporting symptoms. More than half (51.3%, 100/195) had CD4 cell counts <350, which is the threshold for initiating antiretroviral (ARV) treatment according to WHO guidelines (WHO, 2003); no statistically significant differences in CD4 counts existed among the

three groups. The vast majority of participants were on ARV treatment.

The eight participants with active TB reported in the focus group discussion that they were receiving free ARV therapy and prophylaxis for opportunistic infections from several designated hospitals in the study area. The study county is covered by the China CARES program, which was launched by the Chinese government in 2003 to provide community-based HIV care and prevention services in some regions with heavy AIDS epidemics. Participants generally felt that AIDS was a more severe disease than TB, as AIDS was more likely to frighten people away from accessing care.

"We don't go to other hospitals other than the designated hospitals. If we went there, no patients would go there."

All participants with TB preferred to be referred (and were successfully referred) by the study team to the local government-run TB treatment program managed by the local CDC. Nonetheless, some participants expressed concerns about going to the local CDC to obtain TB treatment:

"I am afraid of being seen by acquaintances

when I go to the CDC office, they would think I must have AIDS."

The study participants stated they would comply with treatment, regardless of whether it lasted six months or longer. However, the two participants who were already under going TB treatment said they sometimes missed doses, as they forgot to refill their medications or could not refill their drugs when they left their villages for extended periods of time.

### DISCUSSION

Our study showed a moderate prevalence of undetected TB in patients who had been placed on ARV treatment in rural China. Unfortunately, confirmation by culture was not available. These cases were diagnosed on the basis of the PPD result and chest radiography findings. For those regions which are not covered by China CARES, HIV-infected individuals may be more likely progress to AIDS, and where routine TB screening and early detection is not available, higher TB-related morbidity and mortality rates are likely. This prevalence of TB is lower than in most developing countries (Lawn *et al*, 2006; Solomon *et al*, 2008). Though the cause of HIV infection in our study population (blood contamination) is different from the other two studies (IV drug use in India and sexual contact in Africa), the lower risk in our study sample may be partially explained by restored immunity by ARV treatment (average CD4 count=336.3). This conclusion is also supported by a recent study that ARV has significantly reduced mortality among HIV-infected Chinese plasma donors (Zhang *et al*, 2008). ARV are becoming increasingly more available in Africa and other developing countries; however, only 31% of people worldwide who needed HIV treatment had access to it by the end of 2007, according to

WHO estimates. Being in the national CARES program with enough support for ARV may explain the better access to HIV care in our sample (75%) than in others.

Of the 40 non-participant HIV-infected villagers, 80% had left villages for seasonal jobs in the cities. As migrant workers, they are not able to obtain ARV or TB therapy in these cities and must return to their villages to access care; therefore, they are likely to miss doses or default on therapy. The issue of access to care for rural migrants is an increasingly important public health issue in China, as elsewhere. Providing these treatments in cities with migrant populations will not only reduce morbidity/mortality but also avoid inadequate therapy that may lead to both TB and HIV drug resistance with the potential for further transmission. Therefore, a comprehensive strategy for integrated care with these high-risk populations is necessary and should be modeled on the World Health Organization guidelines for integration of TB and HIV/AIDS programs (WHO, 2004).

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