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# Late presentation of HIV disease and its associated factors among newly diagnosed patients before and after abolition of a government policy of mass mandatory screening<sup>☆</sup>

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Accepted 1 May 2011  
Available online 8 May 2011

## KEYWORDS

HIV;  
AIDS;  
Late presentation;  
Risk factors;  
Screening

**Summary Objective:** To investigate the risk factors for late presentation in the Republic of Korea, where massive mandatory screening for HIV infection was conducted by the government until the late 1990s.

**Methods:** Data over the period 1987–2008 were analyzed from HIV patients for whom records of CD4 cell counts within 3 months of HIV diagnosis were available. Using multivariate logistic regression analysis including demographic and clinical variables, we examined factors associated with late presentation, defined as having a CD4 cell count of less than 200 cells/mm<sup>3</sup> at the time of diagnosis.

**Results:** Of a total of 994 patients with a new diagnosis of HIV infection, 405 (41%) were late presenters. As the proportion of patients diagnosed by mandatory screening decreased over time (31% in 1987–1998 versus 8% in 1999–2008,  $P < 0.001$ ), the proportion of late presenters increased (31% in 1987–1998 versus 43% in 1999–2008,  $P = 0.007$ ). The independent risk factors for late presentation were older age (adjusted odds ratio [aOR], per increase of 10 years, 1.31; 95% confidence interval [CI], 1.15–1.49;  $P < 0.001$ ), male sex (aOR, 1.74; 95% CI, 1.03–2.95;  $P = 0.040$ ), negativity for VDRL (aOR, 1.58; 95% CI, 1.16–2.14;  $P = 0.003$ ), and diagnosis after 1999 (aOR, 1.64; 95% CI, 1.05–2.56;  $P = 0.031$ ).

<sup>☆</sup> This study was presented in part at the 18th International AIDS Conference, Vienna, July, 2010 (Abstract No. 6503).

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*Conclusions:* Older age, male sex, negativity for VDRL, and diagnosis after 1999, were associated with late presentation, and the proportion of late presenters increased after the mandatory testing policy was abolished.

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## Introduction

While information about HIV is widely available to the general population, a substantial proportion of individuals with HIV infection are unaware of being infected.<sup>1</sup> Many of these individuals are diagnosed very late, often after developing serious AIDS-defining illnesses.<sup>2</sup> From an individual perspective, patients who present at an advanced stage of immune deficiency are at high risk of clinical disease and death,<sup>3</sup> as well as being more likely to achieve a poorer response when they receive antiretroviral therapy.<sup>4</sup> From a public health perspective, the costs of treating these cases are high,<sup>5</sup> and delay in diagnosis increases the risk of onward HIV transmission.<sup>6</sup>

In Korea, where the AIDS Prevention Act was enacted in 1987, mass mandatory screening for HIV was carried out among risk groups defined by the government, including overseas sailors, sex workers, and workers in "hygiene-related jobs" such as food factories, hotels, and inns. As a result, 2.3 million people were tested for HIV in 1990, and the number increased to 4.9 million in 1996.<sup>7</sup> Around 2000, because of human rights issues and a limited budget, the Korean government decided to reduce funding for testing and instead to increase funding for medical treatment and public education. The target population for compulsory HIV testing was minimized and voluntary testing at hospitals and anonymous testing at public health centers were encouraged.<sup>8,9</sup> In addition, following the AIDS Prevention Act, the government has provided HIV-infected patients in Korea with free medical care since 1987, including highly active antiretroviral therapy (HAART), which was introduced in mid-1998.<sup>10</sup>

Most previous studies of late presenters of HIV disease have been conducted in Western industrialized countries,<sup>11–18</sup> where mandatory screening for HIV has not been carried out. To our knowledge, few reports have focused on communities where HIV prevention policies of mass mandatory screening were in place for more than 10 years. Hence, we conducted this study to investigate the proportion of late presenters among newly diagnosed patients with HIV infection in the Republic of Korea, and its associated factors.

## Participants, materials, and methods

### Study design and participants

We conducted a retrospective review of medical records for all HIV-infected patients treated in Seoul National University Hospital between January 1987 and December 2008. The hospital is a 1600-bed, university-affiliated teaching hospital and is the largest referral center for HIV/AIDS in the Republic of Korea; a quarter of all HIV patients in the

Republic of Korea are seen at this hospital. To identify patients with newly diagnosed HIV infection, only patients who were diagnosed with HIV infection at the study hospital, and those who were referred to it within 3 months of HIV diagnosis, were included in the analysis.

A board-certified infectious disease specialist took a complete history for all patients with a new diagnosis of HIV infection, and carried out physical examinations to detect any clinical manifestations of AIDS-defining illness. Demographic data (sex, ethnicity, date of birth, and date of HIV test), HIV exposure category, reasons for HIV testing, initial CD4 cell counts, and syphilis serostatus (determined by a Venereal Disease Research Laboratory [VDRL] test), were recorded. Subjects were defined as "late presenters" if they had a CD4 cell count of less than 200 cells/mm<sup>3</sup> within 3 months of HIV diagnosis. The study protocol was approved by the Seoul National University Hospital Institutional Review Board.

### Statistical analysis

Descriptive results for continuous variables were expressed as median values and inter-quartile ranges (IQR). Differences in the distribution of demographic and clinical characteristics in different periods were assessed using the Chi-square test and Mann–Whitney test, for categorical and continuous variables, respectively. Logistic regression analysis was used to determine risk factors for late presentation. Variables in the models included age, sex, syphilis serostatus (determined by a VDRL test), period of HIV diagnosis (1987–1998 or 1999–2008), and HIV exposure category (men who have sex with men [MSM] or other). Variables that were not significant in univariate analyses ( $P > 0.20$ ) were excluded from the multivariate analysis. All significance tests were 2-sided, and data analyses were performed using SPSS software (version 17.0; SPSS Inc., Chicago, IL).

## Results

### Study participants

A total of 1254 patients with HIV infection were treated in the study hospital during the study period, of which 260 were excluded because they were referred to the study hospital more than 3 months after HIV diagnosis. Thus, 994 patients were included in the study. The epidemiological and clinical characteristics of the patients are shown in Table 1. All were Korean, with median age at time of diagnosis of 36 years (IQR, 29–45 years); 91% of the patients were male.

Over time, the median age increased from 33 years (1987–1998) to 37 years (1999–2008), and the proportion

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