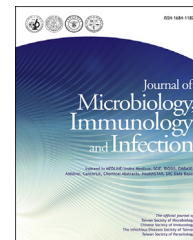




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ORIGINAL ARTICLE

Prevalence and associated factors for HIV-1 transmitted drug resistance in voluntary clients for counseling and testing in Southern Taiwan



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KEYWORDS

Drug resistance;
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Background: According to the World Health Organization, HIV-transmitted drug resistance (TDR) is increasing. We analyzed voluntary counseling test data from a hospital in Southern Taiwan to investigate the TDR pattern in Southern Taiwan, the potential relationship between sexual behavior and HIV transmission, and HIV drug-resistant strain transmission.

Methods: Genotypic resistance assays were performed on treatment-naïve HIV patients recruited from voluntary counseling testing (VCT) in Southern Taiwan from 2007 to 2011. Drug resistance-associated mutations were interpreted with Stanford University HIV Drug Resistance Database HIVdb program. Socio-demographics and sexual activity were recorded from the VCT questionnaire. Logistic regression analysis was used to analyze the risk factors for TDR, and a phylogenetic tree was constructed to elucidate the pattern of HIV drug-resistant strains.

Results: Among the 161 treatment-naïve HIV-infected patients, most were men who reported having sex with men. The overall TDR rate was 10.6%. Patients with a history of sexually transmitted diseases had a 7.8-fold higher risk of becoming infected with genotypic resistant strains.

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Conclusion: In Southern Taiwan, the HIV TDR rate was 10.6% among those receiving VCT. Our findings suggest that sexual behavior may play an important role in HIV drug-resistant strain transmission.

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Introduction

With the widespread use of antiretroviral therapy, the emergence of drug-resistant human immunodeficiency virus (HIV) has started to compromise successful clinical outcomes in both treatment-naïve and -experienced patients.^{1,2} According to the World Health Organization's (WHO) HIV Drug Resistance Report in 2012, an increasing number of countries are classified as having a moderate prevalence of resistance.³ Drug-resistant HIV is therefore an important public health concern.

In Taiwan, HIV infection is a notifiable disease. Since the first HIV-1 infected patient was diagnosed in Taiwan in 1984, the number of cases reported has increased every year. A total of 26,475 adults were reported as being infected with HIV-1 by the end of 2013, most of whom (14,162; 53.49%) were men who have sex with men (MSM) or were bisexual. HIV continues to spread among this group in Taiwan and globally.⁴ In Taiwan, facilities offering voluntary counseling testing (VCT) at no cost at the point of delivery were established in 1997, and have been sponsored continuously by the Taiwan Center for Disease Control since then as a key strategy to promote access to an early diagnosis, to prevent infection with HIV and other sexually transmitted diseases (STDs), and to stimulate referral to treatment. Taiwanese citizens have access to free and anonymous HIV testing. After reactive HIV enzyme-linked immunosorbent assay (ELISA) or rapid test results have been received, the patients are referred for confirmation, treatment, and follow up. The treatment and follow-up strategy are guided by Taiwan guidelines for HIV/AIDS management. The Taiwanese government has provided anti-retroviral therapy free of charge since its introduction in April 1997. With more people becoming infected in Taiwan, larger numbers of patients are starting anti-HIV-1 treatment and the risk of emerging drug-resistant HIV-1 is increasing.

The primary HIV drug resistant rate is around 4–12% across Asia, including 3.8% in China,⁵ 7.7% in Japan,⁶ 12% in South Korea,⁷ 4.9% in Thailand,⁸ and 8% in Northern Taiwan.⁹ The difference in rates of resistance from the previously-mentioned studies is probably due to the differences in stages of infection in the patients at the time of enrollment and different HIV transmission routes in these studies. There are, however, no data on the prevalence of local HIV drug resistance in Southern Taiwan, especially in those receiving VCT.

Lai et al.⁹ reported the epidemiology and impact of HIV-transmitted drug resistance in Northern Taiwan; however, the prevalence and pattern of HIV transmitted drug resistance in Southern Taiwan remains uncertain. Because drug-

resistant HIV strains may graduate stepwise to back-mutate certain drug-resistance mutations *in vivo* in the absence of ongoing drug selection pressure,¹⁰ patients who are diagnosed with HIV infection from VCT are more likely to be in an early stage of HIV infection, and the mutation pattern from them is more likely to reflect the true drug resistance pattern. Thus, we undertook the present study to investigate the recent HIV drug resistance pattern in Southern Taiwan, especially in those diagnosed with HIV from VCT, other than patients infected with HIV-1 who present with opportunistic infections. Furthermore, we aimed to assess the roles of sexual behavior, STDs, and viral hepatitis in accelerating the spread of the HIV infection or even a HIV drug-resistant strain.

Methods

Ethics statement

All participants were informed about the study procedures and gave written informed consent. This study was approved by the Institutional Review Board of Kaohsiung Veterans General Hospital, Kaohsiung, Taiwan.

Study population

During the period 2007–2011, 8,866 patients who accessed the VCT at Kaohsiung Veterans General Hospital completed a questionnaire interview and underwent a 30-minute session of integrated pre- and post-testing counseling. The clients provided 3–5 mL of blood specimens for HIV and syphilis serology tests. Of these, 327 (3.69%) samples were reactive on HIV ELISA or rapid test. Those who tested positive for HIV were referred to clinical care for confirmation, treatment, and follow up. In total, 199 patients who tested positive on HIV ELISA or rapid test returned to our hospital to receive treatment and were then enrolled in our study. Data on HIV sequence and genotypic resistance were available for 161 patients. The sequence results were unavailable for 38 patients due to low viral load, insufficient plasma, or interfering substances in the blood. Tests to determine CD4 cell count, plasma viral load, serological markers for syphilis, hepatitis B and C, toxoplasmosis, and amebiasis, as well as the cortisol level, liver, and renal function were performed when the client returned to the clinic after HIV infection was confirmed.

All survey questions in the questionnaire were self-reported and included information regarding the following items. Socio-demographics: age, sex, sexual orientation, occupation and education levels; and sexual activity:

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