

Epidemiologic Modeling for Hiv Epidemic among Intravenous Drug Abusers in Taiwan

Abstract:

Background: A new wave of HIV epidemic occurred in intravenous drug users (IVDUs) in Taiwan since 2003. The HIV virus isolated from IVDU patient was found to be belonged to CRF01_AE subtype rather than the B subtype isolated from men having sex with men (MSM) patients. Needle sharing is considered the cause of this new epidemic, but there has been a lack of mathematical modeling study.

Methods: We used mathematical modeling to analyze the national HIV surveillance data. Cases were stratified according to risk factors to IVDUs, sexually transmitted and others, which were treated differently in the modeling.

Results: The nationwide surveillance data from May 2002 to August 2005 indicate an exponential process ($R^2=0.96$) of HIV epidemic among Taiwanese IVDUs with an average transmission rate of 1.839 ± 0.123 new cases/prevalent case per year, which is 10-fold higher than that of sexually transmitted HIV epidemic. The proportion of patients with AIDS at presentation is only 0.95%, which is equivalent to an interval distribution of $F(t)=1-\exp(-2.56*t^{2.286})$ between infection and detection. The median interval from infectio to detection is only 0.56 years. The first case in this epidemic should acquire HIV in the time period from late 2001 to early 2002. After September 2005, the epidemic ran out of exponential phase with a continuously decrease in new identified cases per month. The transmission rate became less than 0.322 in October 2006, with an at least 82% decrease from that in the exponential phase. The corresponding value of R_0 also decreased from 27.9 to less than 4.9.

Conclusion: Harm reduction programs are effective. However, current measures still cannot suppress R_0 to less than 1. The effort need be strengthened and consolidated as widely as possible in order to control this epidemic.

Keyword: HIV infections; harm reduction; disease transmission; Taiwan