Declining Trends in HTLV-I Prevalence among Blood Donors in Japan

Key words: ATL, HTLV-I carrier

Antibodies against human T cell lymphotropic virus type I (HTLV-I) have been found in over one million individuals, and more than 700 cases of ATL have been diagnosed each year in Japan. The cumulative (life span of 70 years) incidence of ATL among HTLV-I carriers in Japan is estimated at 2.5% (3–5%) in males and 1–2% in females if competing risks for other diseases are disregarded. The pattern of HTLV-I transmission is through one of three modes. HTLV-I infected mothers can transmit the virus to newborns mainly via breast milk. The virus also can be transmitted through blood transfusion and from male to female by sexual intercourse (1).

Routine screening of donated blood for HTLV-I by gelatin particle agglutination assay has been conducted in all blood centers in Japan since 1986. Inaba et al reported the effectiveness of screening in preventing transmission of HTLV-I through blood transfusion and the current status of patients with confirmed seroconversion due to transfusions given before the implementation of screening. They confirmed that the present donor screening program for HTLV-I can almost completely prevent virus transmission by transfusion and complications of HTLV-I transmission were at lower rates than expected (2).

Blood donations in the United States have also been screened for antibody to HTLV-I/II since November 1988. Antibodies to HTLV-I and II were measured in 1.7 million donors at five US blood centers during 1991–1995. Among those tested, 156 were HTLV-I seropositive and 384 were HTLV-II seropositive. In contrast to monotonously increasing age-specific HTLV-I seroprevalence, HTLV-II prevalence rose until age 40–49 years and declined thereafter, suggesting a birth cohort effect (3, 4). From January 1989 to December 1996, 59,426 blood donors in Guadeloupe (French West Indies) were screened for antibodies to HTLV-I (5). Of the screened blood donors, 195 were confirmed as seropositive, for an overall HTLV-I prevalence of 0.33%. A marked decrease in overall HTLV-I prevalence with time (from 0.47% in 1989 to 0.13% in 1996) was observed, which can be explained mainly by the decreasing percentage of recruited new donors during the study period.

In Japan, we had followed gender- and age-specific cross-sectional HTLV-I seroprevalence among blood donors in Kumamoto Prefecture, which includes moderately prevalent areas of HTLV-I (6, 7). The data showed that 16 to 19 year olds in 1986 and 20 to 29 year olds in 1993 represented nearly the same cohort, because the median age in both groups was 24.5 years in 1993. Therefore, comparison of the HTLV-I positive rate for the two groups gave an estimate of the change in the rate over 7 years within the cohort. In males, 265 of 22, 143 donors (1.20%) were seropositive for HTLV-I among 16 to 19 year olds in 1986, and 214 were seropositive among 20,076 (1.07%) donors in 20 to 29 year olds in 1993. In females, the seropositivity rates were 0.98% in 16 to 19 year olds in 1986, and 0.83% in 20 to 29 year olds in 1993. Thus, the seropositive rates declined in both sexes. However, the average annual rate of immigration to Kumamoto was 2.37%. If seropositive rates for 20 to 29 year olds in 1993 are adjusted for the dilution effect due to immigration, the adjusted carrier rate for males is 1.26% and that for females is 0.98%. The adjusted carrier rates for both sexes are almost the same as those for 16 to 19 year olds in 1986. This indicates that horizontal transmission was negligible for those in the cohort who were in their early reproductive period. The best goodness of fit model indicated that the HTLV-I carrier rate will decline exponentially, and that the rate will decrease by 50% approximately every 10 years for both sexes. It is probable that in recent years southwest Japan has lost the conditions that are favorable for HTLV-I endemicity and the virus will be virtually non endemic within a few generations.

The annual age-and sex-specific HTLV-I carrier rate of blood donors in Kumamoto revealed that the carrier rates of all the age groups below 50 years declined linearly in both sexes. Although several factors, such as a notification program at obstetric clinics, methodological and technical improvement of the assays, wider knowledge of HTLV-I infection, and immigration of individuals from a non endemic area, might cause an absolute decline of the carrier rate of the blood donors, these factors could not explain the acceleration of the relative declining rate among younger donors. Recent drastic ameliorations of sanitary environment and changes in lifestyle in Japan must in part have altered the HTLV-I prevalence, as is seen in the hepatitis B virus infection rate. Above all, the shortening in the period of breast feeding is regarded as a critical factor in the account for the unvarying downward trends in the HTLV-I seropositivity. A decrease in the birth rate, which parallels the declining number of infected babies born to mothers who eluded vertical transmission but would later acquire infection from their carrier husband, may be another factor. A reduction in horizontal transmission from males to females by common use of condoms for contraception may play a supplemental role. Thus, these data are consistent with the hypothesis that there
exists a birth cohort effect in the prevalence of HTLV-I.

In this issue of Internal Medicine, Chiyoda et al also report the decline in positive rate of HTLV-I among blood donors in Nagasaki (8).

See also p 14.

We quantified HTLV-I provirus load among blood donors using the Amplisensor system, which utilizes fluorescence to measure PCR products (9). Samples from 256 donors were analyzed, showing that provirus load ranged from less than 0.1% to 56% among carriers. Among 18 donors with high provirus load (more than 10%), Southern blotting detected monoclonal integration of HTLV-I in infected cells in 2 cases, both of them showing high soluble interleukin-2 receptor levels. It will be important to carefully follow these donors with a high HTLV-I provirus load. Blood donors notified of HTLV infection report negative psychological and social effects following notification in the United States (10).

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References


