



Prevalence of Human T-Lymphotropic Virus Type 1 in Brain-Dead Organ Donors

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Abstract

Background: This study aimed to assess the prevalence of human T-lymphotropic virus type 1 (HTLV-1) among brain-dead organ donors at Masih Daneshvari Hospital in Tehran, Iran.

Methods: By enzyme-linked immunosorbent assay (ELISA), 54 organ donors were screened for HTLV-1 virus in this descriptive cross-sectional study. Following that, Western blot confirmation was performed to confirm the HTLV-1 infection.

Results: Anti-HTLV-1 antibodies were detected in 2 (3.4%) cases out of 54 patients tested by ELISA. A western blot was performed in cases of positive results, but none of the subjects tested positive for HTLV-1 infection.

Conclusions: The results of the present study indicated rare cases of HTLV-1 infection in brain-dead organ donors. However, it is recommended that organ donors be investigated for the prevalence of this virus.

Keywords: HTLV-1, Organ Donors, ELISA, Western Blot

1. Background

Human T-lymphotropic virus type 1 (HTLV-1) is an RNA-coated virus of the retroviral family that has infected about 15 - 20 million people globally (1). There are high HTLV-1 prevalence areas in southwestern Japan, the Caribbean, Africa, South, and Central America, the Middle East, and Oceania (2). Based on a study conducted in Iran in 1996, Mashhad had the highest prevalence of HTLV-1 (2.12%), followed by Sabzevar (1.66%) and Golestan (0.3%) (3-6). In endemic areas, mother-to-child transmission, especially breastfeeding, is the most common route of transmission (7), followed by transfusions, blood transfusions, sexual contact, and organ transplantation (8). This virus has been associated with some diseases, including uveitis, infectious dermatitis, polymyositis, synovitis, bronchoalveolar pneumonia, and autoimmune thyroiditis (9, 10). In most cases, the virus is asymptomatic, and the host remains a carrier throughout its lifetime. The

virus causes adult T-cell lymphoma/leukemia (ATLL) and HTLV-1-associated myelopathy/tropical spastic paraparesis (HAM/TSP) in fewer than 5% of people (2). The following lactation after a long incubation period (7) and injection of rare blood products (11) are common ways of acquiring ATLL. The injection of blood products, however, causes HAM/TSP (12). Human T-lymphotropic virus type 1 associated myelopathy/tropical spastic paraparesis has been detected in a few cases after organ transplantation, mainly in Japan and Spain (2). Two years after liver and kidney transplantation, HAM/TSP has been reported in these countries (13, 14). As a result of the elimination of high-risk donors, there is a low prevalence of the virus in European countries due to screening questions in blood transfusion organizations (15). Numerous cases of HTLV-1 infection have been reported in European countries following transfusions, compared with only one case following organ donation in 2002 (13). Furthermore, similar reports have been

reported in Spain (three cases) and Venezuela (390 cases out of 100,000) (16). It has been reported that migration from endemic areas is the leading cause of virus transmission to non-endemic areas (17-19). In Spain, screening for the virus has been mandatory for organ donors from endemic or high-risk areas since 2005 (20). It is not mandatory in Germany to screen blood and organ donors due to its low prevalence (7 cases per 10,000) (21-24). Virus screening has been recommended for organ transplants in the United States since 2009 (25, 26). Zidovudine and raltegravir have been recommended for use after transplantation in organ recipients from HTLV-1 carriers; however, clinical studies have not supported antiviral prophylaxis (2). A western blotting test is used to confirm the virus' presence after the initial screening with antigen-based methods and antibodies based on the enzyme-linked immunosorbent assay (ELISA).

2. Objectives

Iranian blood donors have not been screened for HTLV-1, and no comprehensive study has been conducted on organ donors. Due to these issues, the current study aimed to identify virus carriers in transplant donors and obtain a comprehensive profile of their geographical distribution. Therefore, brain-dead organ donors were screened by ELISA and finally confirmed by Western blotting to obtain new information about the carriers of the virus and its prevalence in Iran.

3. Methods

This descriptive cross-sectional study was performed using information about brain death patients in Masih Daneshvari Hospital, Tehran, Iran, within 2017 - 2018. Several demographic characteristics were recorded, including age, gender, type of organ donation, and marital status. Tehran (n = 45), Markazi (n = 3), Lorestan province (n = 2), Hamedan, Isfahan, West Azerbaijan, and Mazandaran provinces were also sampled. According to the manufacturer's instructions, HTLV-1 anti-virus antibodies were tested (HTLV-1 ELISA; Genelabs Diagnostic, Singapore). The samples with reproducible positive results were tested by western blotting (Genelabs 2.4, Singapore) according to the manufacturer's instructions. The data were recorded using Microsoft Excel 2007 (Microsoft Corp.) and analyzed using SPSS. Statistical significance was defined as a P value less than 0.05.

4. Results

From 2017 - 2018, 54 brain-dead organ donors were tested for HTLV-1 anti-virus antibodies by ELISA at Masih Daneshvari Hospital in Tehran. There were 33 (61.11%) male cases and 21 (38.89%) female cases. According to the participants' marital status, 34 (62.96%) were married, and 20 (37.04%) were single. It was reported that the median age of patients was 43 (the range was 7 - 62 years old). Two (3.64%) organ donors tested positive for the ELISA screening test. HTLV-1 virus infection was not detected in any of the subjects with positive Western blot results.

5. Discussion

Despite the relatively low incidence of ATLL among individuals with HTLV-1 infection, ranging from 5% - 10%, the diseases are severe and progressive. Of 54 organ donors, two were positive for ELISA but negative for western blot. According to Yoshizumi et al. out of five living donor liver transplant recipients, two were HTLV-1 positive, and three were HTLV-1 negative (27). Following HTLV-1 transmission from HTLV-1-positive donors in 2013, two of three recipients developed cutaneous T cell lymphoma after delayed seroconversion and rapid onset of the lymphoproliferative disease. While HTLV-1-DNA was detected in blood donor samples, seroconversion occurred after a delay of 2 years, and the confirmatory test was positive after six years. Germany does not require blood and organ donors to be screened due to the low prevalence of HTLV-1 infection (28). Human T-lymphotropic virus type 1-associated myelopathy was reported in a kidney transplant recipient in 2014. After receiving a kidney from a Dominican Republic donor who immigrated to the United States at the age of 12, a 56-year-old Cuban man developed IgA nephropathy and kidney failure. Human T-lymphotropic virus type 1 myelopathy developed after five months of transplantation (29). From 2009 to 2013, 1,864,489 blood donors in seven Iranian blood transfusion centers tested positive for HTLV-1. North Khorasan (Bojnourd) had the highest number of HTLV-1 positive cases, followed by Khorasan Razavi (Mashhad) (30). The HTLV rate isolated from blood donors in some regions of Iran was as follows: Tehran: 0.42%, Tabriz: 0.4%, Kerman: 0.14% (31), Bushehr: 0.013% (32), Chaharmahal Bakhtiari: 0.62% (33), Urmia: 0% (34) and Hormozgan: 0.18% (35). Based on the results of this study, the absence of HTLV-1 in transplant patients was promising for reducing the virus.

For this reason, further studies are necessary depending on the geographic location of the samples in order to make more sensible decisions about the need for diagnostic HTLV-1 tests before organ transplantation. The results of

the present study indicated that HTLV-I infection was rare among brain-dead organ donors. Nevertheless, it is recommended that the prevalence of this virus be investigated among organ donors.

5.1. Summary Points

In Tehran, Iran, out of 54 organ donors, 2 cases of HTLV-I infection in brain-dead donors were positive for ELISA but negative for Western blot.

We recommend that brain-dead organ donor monitoring should continue as an essential strategy by checking HTLV-I infection.

Further Epidemiological studies will also clarify HTLV-I infection in organ donors.

Footnotes

Authors' Contribution: Study concept and design: E. N., M. R., and H. F.; drafting of the manuscript: E. N., A. J. S., and H. B. B.; revision of the manuscript for important intellectual content: A. V., M. R., P. T., and H. F.

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Data Reproducibility: The corresponding author can provide the data set when the study is submitted or published.

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