Prevalence of Blood-Borne Infectious Diseases in Blood Donors in Ghana

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Received 11 June 2001/Returned for modification 14 August 2001/Accepted 13 June 2002

Although blood transfusion saves millions of lives worldwide each year, recipients of transfusions risk becoming infected with blood-borne pathogens. Each year, up to 4 million blood donations worldwide are not tested for human immunodeficiency virus (HIV) and few are tested for hepatitis B and C viruses (HBV and HCV, respectively). Virtually none are screened for human T-cell lymphotrophic virus type 1 (HTLV-1), which causes leukemia (6, 19), was reported to be associated with HIV-1-seropositive individuals in Ghana (4–7). HCV is recognized as the primary cause worldwide of transfusion-associated non-A–non-B viral hepatitis (12) and is endemic in West Africa (13). However, information on HCV seroprevalence in Ghana is limited, and blood donors are not routinely screened for HCV (21). T. pallidum, the etiologic agent of syphilis (11), is prevalent in many African countries (16), but in Ghana, data on T. pallidum seroprevalence are scanty, with antibodies thought to occur as frequently as HBV antibodies (4). This study was therefore carried out to determine the current prevalence of HTLV-1, T. pallidum, and particularly HCV in Ghanaian blood donors in order to provide information for appropriate policies.

The National Blood Transfusion Service of Ghana currently selects blood donors on the basis of a health check questionnaire and prescreening for HBsAg; donated blood is then tested for the presence of HIV antibodies. We studied 3,131 individuals who presented at the National Blood Transfusion Service, Accra, Ghana, between June and August 1999 and who were routinely tested for HBsAg with a latex agglutination test kit (Biotech Laboratories Ltd., Suffolk, United Kingdom). Of these donors who were seronegative for HBsAg, 808 were randomly adopted as study subjects. Five milliliters of blood was collected from each of the 808 donors, labeled, and transported in coolers to the Virology Unit at the Noguchi Memorial Institute for Medical Research. Sera were then analyzed for antibodies to HIV, HTLV-1, HCV, and T. pallidum with SERODIA passive-particle agglutination assay kits (FUJIREBIO Inc., Tokyo, Japan). Qualitative testing protocols were applied according to the manufacturer’s instructions, and serum dilutions were 1:16 for HTLV-1, 1:32 for HIV and HCV, and 1:80 for T. pallidum. Supplementary tests were deemed necessary to confirm HCV infection, as the samples were from healthy, asymptomatic individuals. Therefore, 68 samples shown by the SERODIA assay to be anti-HCV positive at a 1:32 serum dilution were retested at a 1:400 serum dilution, subjected to the HCV-SPOT assay (Genelabs Diagnostics Ltd., Singapore), and examined by an enzyme-linked immunosassay (IMUCHECK-HCV C50Ab; International Reagents Corporation, Kobe, Japan). Furthermore, a third-generation recombinant immunoblot assay (RIBA 3; Ortho Diagnostic Systems, Roissy, France) was applied. RIBA 3 detects antibodies to five structural and nonstructural HCV proteins (c100, c33c, c22p, NS5, and superoxide dismutase), enabling the determination of a full immunoblot profile (18). Test sera were considered positive when at least two of these antibodies were detected. Reverse transcription-PCR (RT-PCR) was also performed to confirm the presence of the HCV genome. HCV RNA in the sera was identified by a nested RT-PCR method using primers derived from the 5’ untranslated region as previously described (14).

The majority of the 808 blood donors lived in or around Accra, Ghana. Thirty (3.7%) of the donors were regular voluntary donors, and 778 (96.3%) were replacement donors who were family members of blood recipients. As shown in Table 1, the 21-to-25-year age group, which included 212 (26.2%) of the donors, was the largest, followed by the 26-to-30-year age...
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The 15% HBV seroprevalence level indicated by the HBsAg prescreening data for the 3-month duration of the investigation is similar to the previously reported HBsAg seroprevalence of 15.8% (15). The current transfusion transmission risk potential in Ghana for HTLV-1, HCV, and T. pallidum is illustrated by the data presented in Table 1. Total seroprevalence levels were highest in the age groups (21 to 36 years) corresponding to those described as the most sexually active (17). The highest seroprevalence observed was for anti-T. pallidum (13.5%). This corresponds with the results of previous studies of sexually transmitted diseases in Ghana, where T. pallidum and HBV were noted as the most frequently occurring pathogens (5). The seroprevalence of the anti-HTLV-1 antibody was found to be 0.7%, and the antibody was detected in male blood donors under 40 years of age. The low HTLV-1 seroprevalence obtained by our study con

<table>
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<tr>
<th>Sample</th>
<th>RIBA 3</th>
<th>PCR</th>
<th>PA 1:400&lt;sup&gt;b&lt;/sup&gt;</th>
<th>HCV-SPOT</th>
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<sup>a</sup> RIBA 3 results were reported as positive when at least two antibodies were found and indeterminate when a single antibody was present (when antibodies were absent, samples were declared negative).

<sup>b</sup> PA 1:400 indicates serum dilution at 1:400 in the particle agglutination assay.

<sup>c</sup> This sample was also positive by the IMUCHECK-HCV enzyme-linked immunosorbent assay.
prevalence of HIV was estimated to be 3% in 2001 (17). HIV was involved in 59% of the multiple infections recorded and was a major dual infection with T. pallidum.

Use of the SERODIA or HCV-SPOT assay resulted in a high rate of anti-HCV false-positive results, which were resolved by supplementary assay (especially RIBA 3), and overall, HCV seroprevalence was 0.9%. Other reports on anti-HCV seroprevalence in Ghana, determined by screening assays, found seroprevalence rates of 5.4% in children (15), 2.8% in adults (21), and 5.2% in blood donors (2). Supplemental tests such as RIBA 3 are necessary to confirm the presence of HCV infection in asymptomatic Ghanaians. The presence of HCV in the blood is indicated by positive detection by RTPCR (10), and our data showed two active cases of HCV infection among the blood donors.

In conclusion, this study illustrates the current transfusion-transmissible risk of T. pallidum, HTLV-1, and HCV in Ghana. It is recommended that routine blood screening prior to transfusion should include tests for anti-HCV and anti-T. pallidum antibodies. Developing appropriate methods for HCV diagnosis will require an evaluation of the cost-effectiveness of general screening and/or supplementary assays of donated blood. Periodic studies to investigate transfusion-transmissible infectious diseases are required to enable safety reviews of the blood supply.

We are grateful to the staff of the National Blood Transfusion Service, Korle Bu, for their cooperation and assistance. For technical and clerical support, we thank J. Barnor, J. Arthur-Quarm, Aba Hayford, J. Kumi, Peace Gb红楼kpor, and K. Dumedah, all of whom are from the Virology Unit, Noguchi Memorial Institute for Medical Research.

This work was funded by the Human Science Foundation of Japan and supported by the Infectious Diseases Project of the Japanese International Co-operation Agency at the Noguchi Memorial Institute for Medical Research, Legon, Ghana.

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