Is there need for continued Donor Screening for Syphilis in Sokoto, North Western Nigeria

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Abstract

In this present study we investigated the prevalence of syphilis infection among 150 consecutively recruited blood donors aged 18 to 65 years and mean age 27.4 ± 6.6. Donors were made up of 133 (88.7%) male and 17 (11.3%) females. Blood donors were categorized based on the ABO blood group. A significant number of donors were group O ⁹² (61.3%), ³¹ (20.7%) were blood group B, ²⁴ (16%) were blood group A while ³ (2%) were blood group AB. The prevalence of syphilis was compared based on the age groups and marital status of blood donors. Among the blood donors tested, a significant number were in the ¹⁸-²⁸ years age group ¹⁰²(68%). Among the donors tested, ⁹³ (62%) were single while ⁵⁷ (38%) were married. The prevalence of syphilis was compared based on the occupational groups and type of blood donors. A significant number of blood donors were farmers ⁴⁸(32%). Majority of the donors were family replacement donors ¹²³(82%) while ²⁷ (18%) were voluntary non-renumerated donors. This study indicated a zero percent prevalence of transfusion-transmissible syphilis infection among blood donors in Sokoto, North Western, Nigeria. Concerted effort should be made to recruit and retain low risk voluntary non-renumerated donors. We recommend that blood banks in Nigeria in particular and Africa in general should continue to screen blood donors for syphilis in order to improve public health, blood safety and quality of blood transfusion service rendered in the area.

1. Introduction

Syphilis is a sexually transmitted disease (STD) caused by a spirochete bacterium Treponema pallidum. The causative organism of syphilis can be transmitted via accidental direct inoculation, transplacentally during pregnancy and via blood transfusion . In sub-Saharan Africa, syphilis remains a serious public health problem. Syphilis is still one of the infections transmitted through blood transfusion as shown by
high antibody detection in healthy African blood donors. Through the years, a great controversy had arisen over the need for syphilis testing of blood donors. Although refrigerated blood components are less infective for syphilis, transmissions however, still occur through the transfusion of refrigerated blood components. The American Association of Blood Banks (AABB) initially dropped its recommendation that donors be tested routinely for syphilis in 1978. However, the Food and Drug Administration (FDA) of the United States has maintained the requirement that blood donors be routinely screened for syphilis. The FDA decision was reinforced by the HIV epidemic. It is now recommended all over the world that surrogate testing for syphilis be carried out on all blood donors to prevent those at risk from donating blood.

There is paucity of data on transfusion-transmissible syphilis in Sokoto. The aim of this present study was to determine the prevalence of syphilis among blood donors and to determine the risk of transmission of syphilis to recipients through the transfusion of unscreened blood in Sokoto, North Western Nigeria.

2. Materials and Method

2.1. Study Design

This case study included 150 consecutively recruited blood donors visiting the blood transfusion unit of Usmanu Danfodiyo University Teaching Hospital in Sokoto, North Western Nigeria for blood donation purposes. Donors were tested for the presence of antibodies including IgG, IgM, and IgA to Treponema pallidum (Tp).

2.2. Study Area

The selected area for this study is Usmanu Danfodiyo University Teaching Hospital (UDUTH) which is located in Wamakko Local Government within Sokoto Metropolitan city in Sokoto State. Sokoto State is located in the extreme Northwest of Nigeria, near the confluence of the Sokoto River and Rima River. With an annual average temperature of 28.3 Degrees Celsius (0C) (82.9°F). Sokoto is, on the whole, a very hot area. However, maximum day time temperatures are for most of the year generally under 40 °C (104.0°F). The warmest months are February to April when daytime temperatures can exceed 45°C (113.0°F). The rainy season is from May to October during which showers are a daily occurrence. There are two major seasons, wet and dry which are distinct and are characterized by high and low malarial transmission respectively. Report from the 2007 National Population Commission indicated that the State had a population of 3.6 million. This study was carried out in Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto State. The teaching hospital is based in Sokoto State and was established in May 1980 as a second generation teaching hospital along with Port-Harcourt, Ilorin, Calabar, Jos and Maiduguri. The teaching hospital provides excellent tertiary health care services to the entire North-Western region and neighboring Niger Republic. The health institution is aimed at providing efficient tertiary care services which are affordable, accessible and equitable to the general public as well as offering training in medical education and conducting of relevant researches. The state has a landed area of 26.64km and is located between longitude 11.30° to 13.50° east and latitude 4° to 6° north. It is bounded to the north by Niger Republic, Kebbi State to the South-West and to the East by Zamfara state.

2.3. Study Subjects

A total of 150 consecutively recruited blood donors aged 18 to 65 years and mean age 27.4 ± 6.6 years visiting the blood bank in Usmanu Danfodiyo University Teaching Hospital Sokoto North Western Nigeria for blood donation purpose constituted the subjects for this case study.

2.4. Inclusion Criteria

Inclusion criteria included; age (18-65), no history of long-term medication use, no history of blood transfusion within the last 3 months, willingness to give oral informed consent after counselling and non-menstruating (in case of women donors).

2.5. Exclusion Criteria

All consecutively recruited blood donors who did not meet the inclusion criteria were excluded from study.

2.6. Sample Collection

Three milliliters of venous blood samples were taken from each blood donor into a clean dry tube. Blood samples were allowed to stand at room temperature for clotting and retraction. Thereafter, the samples were centrifuged to give a clear serum. The serum was separated and stored at -20°C prior to testing.

2.7. Methods

The OnSite Syphilis Ab Rapid Test (CTK Biotech, USA) was used for testing of blood donors for syphilis. The test is a lateral flow chromatographic immunoassay for the qualitative detection of antibodies including IgG, IgM, and IgA to Treponema pallidum (Tp) in human serum or plasma. It is intended to be used as a screening test and as an aid in the diagnosis of infection with Treponema pallidum. Both IgM and IgG antibodies are detected in sera from patients with primary and secondary syphilis. The IgM antibody may be detectable towards the second week of infection, while IgG antibody appears later, at about 4 weeks. These antibodies could last for several years or even decades in the serum of a patient with untreated latent syphilis. The manufacturer’s standard operating procedures were followed strictly. The lateral flow chromatographic immunoassay is used routinely for the screening of donors for syphilis in Nigeria. We did not carry out
any confirmation test because of the significant cost implications.

2.8. Statistical Analysis

The data collected was recorded on an Excel spreadsheet and later subjected to statistical analysis using a statistical software SPSS Version 18.0 (Chicago Illinois). Statistical analysis included descriptive statistics of percentages, mean and bivariate analysis of t-test and chi-square. Correlation was compared using linear regression analysis. Differences were considered significant when \( p \leq 0.05 \).

3. Result

In this present study we investigated the prevalence of syphilis among 150 consecutively recruited blood donors aged 18 to 65 years and mean age 27.4 ± 6.6. Among the donors tested, none was positive for syphilis. Table 1 show the prevalence of syphilis among blood donors.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Number Tested</th>
<th>Number (%) positive for Syphilis</th>
<th>Number (%) negative for Syphilis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syphilis</td>
<td>150</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Donors were made up of 133 (88.7%) male and 17 (11.3%) females. Blood donors were categorized based on the ABO blood group. A significant number of donors were group O 92 (61.3%), 31 (20.7%) were blood group B, 24 (16%) were blood group A and 3 (2%) were blood group AB. Table 2 show the prevalence of syphilis among donors based on ABO blood group and gender.

<table>
<thead>
<tr>
<th>Blood Group</th>
<th>Number (%) of donor tested</th>
<th>Number (%) positive for syphilis</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>92 (61.3)</td>
<td>0</td>
</tr>
<tr>
<td>A</td>
<td>24 (16)</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>31 (20.7)</td>
<td>0</td>
</tr>
<tr>
<td>AB</td>
<td>3 (2)</td>
<td>0</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>133 (88.7)</td>
<td>0</td>
</tr>
<tr>
<td>Female</td>
<td>17 (11.3)</td>
<td>0</td>
</tr>
</tbody>
</table>

The prevalence of syphilis was compared based on the age groups and marital status of blood donors. Among the blood donors tested, a significant number were in the 18-28 years age group 102 (68%). Among the donors tested, 93 (62%) were single while 57 (38%) were married. Table 3 shows the distribution of syphilis infection among blood donors based on age group and marital status.

<table>
<thead>
<tr>
<th>Age group (Years)</th>
<th>Number (%) of donor tested</th>
<th>Number (%) positive for Syphilis</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-28</td>
<td>102 (68)</td>
<td>0</td>
</tr>
<tr>
<td>29-38</td>
<td>39 (26)</td>
<td>0</td>
</tr>
<tr>
<td>39-48</td>
<td>7 (4.67)</td>
<td>0</td>
</tr>
<tr>
<td>49-58</td>
<td>2 (1.33)</td>
<td>0</td>
</tr>
<tr>
<td>59-68</td>
<td>0 (0%)</td>
<td>0</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>57 (38%)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Married</td>
<td>93 (62%)</td>
<td>3 (100)</td>
</tr>
</tbody>
</table>

The prevalence of syphilis was compared based on the occupational groups and type of blood donors. A significant number of blood donors were farmers 48 (32%). Majority of the donors were family replacement donors 123 (82%) while 27 (18%) were voluntary non-remunerated donors. Table 4 show the distribution of syphilis infection based on occupational groups and type of blood donors.

<table>
<thead>
<tr>
<th>Occupational groups</th>
<th>Number (%) of donor tested</th>
<th>Number (%) positive for Syphilis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers</td>
<td>48 (32)</td>
<td>0</td>
</tr>
<tr>
<td>Trader</td>
<td>24 (16)</td>
<td>0</td>
</tr>
<tr>
<td>Civil servants</td>
<td>35 (23.3)</td>
<td>0</td>
</tr>
<tr>
<td>Students</td>
<td>43 (28.7)</td>
<td>0</td>
</tr>
<tr>
<td>Voluntary Non-remunerated</td>
<td>27 (18)</td>
<td>0</td>
</tr>
<tr>
<td>Family Replacement</td>
<td>123 (82)</td>
<td>0</td>
</tr>
</tbody>
</table>

4. Discussion

Blood transfusion particularly in sub Saharan Africa currently faces interesting challenges. The high incidence of transfusion transmissible infections has provoked a greatly heightened emphasis on safety with significant implications on complexity and cost. In this study we investigated the prevalence of transfusion-transmissible syphilis among our cohort of 150 consecutively recruited blood donors. We observed a zero percent prevalence among blood donors tested. The zero percent prevalence of syphilis observed in this study is in agreement with a previous report among Iranian blood donors 13 which indicated a zero percent prevalence. It is however at variance with a 0.1% reported in Port Harcourt by Ejele and colleagues 14, a 12.4% prevalence reported in Ilorin by Nwabuisi and colleagues 15, 3.6% seroprevalence reported in Maiduguri 16, 0.9% prevalence reported in Jos 17, 1.1% reported by Buseri and colleagues in Oshogbo 18, 7.5% seroprevalence reported in Ghana 4, 15.0% reported by Elfaki et al 19 among Sudanese donors, 12.8% and 12.7% reported in Ethiopia and Dares Salaam, Tanzania 20-21. In Ethiopia, report by Tessema and colleagues observed a 1.8% prevalence of syphilis 22.
Out of 1,290,222 volunteer blood donors tested in a 5-year period in Israel, 33.2% of the seropositive donors had evidence of recent infection and 66.8% had past infections of Syphilis. In many parts of the World, the incidence and prevalence of syphilis still remain particularly high among family/replacement blood donors. There are numerous reports in high-risk groups in the literature, both from developed and developing countries, indicating a rising prevalence and incidence of syphilis. Out of 801,511 donations screened in China, there was a significant increase in syphilis serologic markers among first-time donors with 0.41, 0.45, and 0.57% positivity over 3 years. Out of a total of 21,716 units of blood tested in Kathmandu, Nepal for the presence of anti- Treponema pallidum IgG/IgM/IgA using commercial ELISA kits following standard protocols, the seroprevalence of syphilis were observed to be 0.48%. The reason for the low prevalence of syphilis observed in this present study is unclear but it could be due to cultural, religious and environment factors.

Despite the fact that Treponema pallidum cannot survive optimally in properly stored blood and the fact that screening of blood donors for syphilis has a significant cost implications particularly in resource-poor settings, a previous report emphasized that blood donors should continue to be tested for syphilis to facilitate the fundamental objectives of blood transfusion which include, that it is beneficial, will not cause harm, is safe and facilitates the protection of human lives.

Early diagnosis of syphilis and justification for treatment can be achieved by demonstration of Treponema pallidum-specific IgM antibodies using rapid kits. This is the mainstay of syphilis screening in sub Saharan Africa. The most frequent dilemmas and the relevance of serological tests in congenital syphilis and neurosyphilis, as well as the quality (standardization and reproducibility) of laboratory testing. Microbiologic tests are essential in the diagnosis, management of patients with syphilis and for blood transfusion safety. Apart from the very early stage of disease (when Treponema pallidum may be detected in the lesions of patients with primary syphilis before an antibody response is detectable), serology is the mainstay of laboratory testing. Screening with cardiolipin antigen tests detects early stage disease, but treponemal antigen tests are required for the reliable detection of late-stage infection and the exclusion of syphilis in HIV-infected patients. EIA tests using treponemal antigen are sensitive and specific and fit well into current laboratory practices. Although the FTA-abs test is often considered the “gold standard” confirmatory test, its sensitivity is slightly lower than that of certain other treponemal antigen tests. A reactive anti-treponemal IgM test correlates well with untreated or recently treated early infection, but specific IgM tests are often negative in untreated late-stage disease. Serial quantitative cardiolipin antigen tests remain the method of choice for monitoring the efficacy of treatment. The role of the laboratory in aiding a diagnosis of neurosyphilis and congenital infection cannot be over emphasized particularly with the introduction of newer technologies, such as PCR and immunoblotting. A cross-sectional seroprevalence analysis was performed on 4,878,215 allogeneic blood donations from 19 American Red Cross Blood Services regions from May 1993 through September 1995. Differences in seroprevalence were compared in RPR and PK-TP tests for; unconfirmed and confirmed tests, first-time and repeat donors and recent versus past infections. Result indicated that donors screened by PK-TP were more likely to be confirmed as positive than were donors screened by RPR, but these rates became comparable. Reactive rates were lower but the positive predictive values were higher for the PK-TP test than for the RPR test.

The majority of donors tested in this study were family replacement donors rather than safe voluntary non-remunerated blood donors. The number of voluntarily donated blood has continued to fall over years in Nigeria due to logistic and organizational problems associated with the Nigerian National Blood Transfusion Service. The net result of this failure in the stewardship of blood and blood products is that commercial and family replacement donors continues to predominate and blood transfusion takes place in hazardous conditions, its life saving purpose subverted by a lack of effective control.

Transfusion-transmissible infection is higher among family replacement donors. The World Health Organization (WHO) recommends that blood drawn from voluntary non-remunerated blood donors who give blood out of altruism is the safest source of blood. Family replacement donors are often under pressure to donate blood when their relation are admitted in hospital and in need of blood transfusion even when they know that they are potentially at risk for syphilis from high risk behaviours. They are more likely to conceal medical history and be involved in high risk behaviour that can potentially predispose them to infection with syphilis and thus pose a great threat to the safety of blood supply.

There are several confounding factors militating against blood transfusion safety in Nigeria in particular and sub Saharan Africa in general. There is a high prevalence of transfusion-transmissible infections in the general and blood donor populations; inadequate screening facilities, and lack of infrastructure, political will and capacity to ensure sustainable quality operations. There is high rates of transfusion in some groups of patients (particularly women and children) resulting from malnutrition, malaria infection, hookworm infestation, high incidence of road traffic accident, trauma from communal and religious crisis, high incidence of ante and post-partum haemorrhages and other pregnancy-related complications.

**5. Conclusion and Recommendations**

This study demonstrates a zero percent prevalence of transfusion-transmissible syphilis infection in Sokoto, North Western, Nigeria. Concerted effort should be made to recruit and retain low risk voluntary non-remunerated donors. We recommend that blood banks in Nigeria in particular and the World in general should continue the screening blood donors for syphilis in order to improve public health, blood safety and quality of blood transfusion service rendered in the area.
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References


