Risk of transfusion-transmitted syphilis in a tertiary hospital in Nigeria

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Abstract

**Background:** Every year, millions of people are exposed to avoidable, life-threatening risks through the transfusion of unsafe blood. **Aim:** To determine the sero-prevalence of Syphilis among pre-transfused blood in the University of Benin Teaching Hospital, Benin-City, Nigeria. **Material and Methods:** The detection of Treponema pallidum IgG/IgM was based on the principle of double antigen sandwich immunoassay, in which purified recombinant antigens are employed sufficiently to identify antibodies to Syphilis. The outcomes of interest included the proportion of Syphilis positive units of pre-transfused donor blood, the source of blood and the total number of units of blood processed in the hospital blood bank. **Results:** Two hundred proportionally selected commercial and targeted donors’ blood samples were screened for Treponema pallidum, and 8% (n = 16) were found to be positive (95% confidence intervals 9.21-22.79). Syphilis seropositivity was found to be significantly higher in commercial donors (p<0.05). The likely risk of iatrogenic transfusion related Treponema pallidum infection was estimated to be 384 cases/year at the present rate of utilization of donor blood at the University of Benin Teaching Hospital. **Conclusion:** There is a risk of iatrogenic transfusion-transmitted Treponema pallidum in the study hospital. **Keywords:** Syphilis, treponema pallidum, seroprevalence, blood donors.

Introduction

Blood transfusion is a life-saving intervention that has an essential role in patient management within health care systems [1]. The provision of safe and efficacious blood and blood components for transfusion or manufacturing use involves a number of processes, from the selection of blood donors and the collection, processing and testing of blood donations to the testing of patient samples, the issue of compatible blood and its administration to the patient. There is a risk of error in each process in this “transfusion chain” and a failure at any of these stages can have serious implications for the recipients of blood and blood products. Thus, while blood transfusion can be life-saving, there are associated risks, particularly the transmission of blood-borne infections [1].

Every year, millions of people are exposed to avoidable, life-threatening risks through the transfusion of unsafe blood. As per a global database, 6 million of 81 million units of blood collected annually in 178 countries are not screened for transfusion-transmissible infections [2].
transfusion and can cause morbidity and mortality in recipients. In order to be transmissible by blood, the infectious agent or infection usually has the following characteristics: presence in the blood for long periods; sometimes in high titres, stability in blood stored at 4°C or lower, long incubation period before the appearance of clinical signs, asymptomatic phase or only mild symptoms in the blood donor, hence not identifiable during the blood donor selection process [3].

Donated blood is tested by many methods, but the core tests recommended by the World Health Organization are these four: Hepatitis B Surface Antigen, antibody to Hepatitis C, antibody to HIV; usually subtypes 1 and 2, serologic test for Syphilis. WHO reported in 2006 that 56 out of 124 countries surveyed did not use these basic tests on all blood donations [4].

Syphilis is a sexually transmitted infection (STI) caused by the Treponema pallidum spirochete. The route of transmission of syphilis is almost always by sexual contact, although there may be congenital syphilis via transmission from mother to child in-utero. Syphilis may also be transmitted via blood and blood products, and intravenous drug use [5]. If not treated, syphilis can cause serious effects such as damage to the aorta, brain, eyes, and bones. In some cases these effects may be fatal. More recently, there has been a resurgence of syphilis [5]. Syphilis has also acquired a new potential for morbidity and mortality through association with increased risk for HIV infection [5]. This will make it increasingly difficult to get safe blood because of this blood borne infection.

The aim of this study was to determine the sero-prevalence of Syphilis among pre-transfused blood in the University of Benin Teaching Hospital, Benin City, Nigeria with the objective of evaluating the risk of probable iatrogenic Treponema pallidum infection following transfusion of donor blood that has not been screened for Syphilis.

Materials and Methods

This study was hospital-based and conducted at the University of Benin Teaching Hospital (UBTH), one of the largest health institutions located in Benin-City the capital city of Edo State, South-southern Nigeria. UBTH Benin City sees an average of 3,327 out patients every month with over 30% of the patients coming from outside of the city including other neighbouring South-southern states of Nigeria. The approval of this study was obtained from the hospital management.

Screening for Human Immunodeficiency Virus 1 and 2, Hepatitis B Virus Surface Antigen and Hepatitis C Virus is routine in the University of Benin Teaching Hospital. Treponema pallidum screening was performed on 200 units of pre-transfused bags of donor blood proportionally selected over six months duration (April 2010 to September 2010). Selection was equal among commercial donors and targeted donations, i.e. 100 units each of donated blood from commercial donors and targeted donors. The outcomes of interest included the proportion of Syphilis positive units of pre-transfused donor blood, the source of blood and the total number of units of blood processed in the hospital blood bank (Table 1).

### Table 1 Syphilis seropositivity among donor blood

| Month   | No. donors | No. screened | Seropositive donors (%) |
|---------|------------|--------------|-------------------------|
| April   | 906        | 33           | 3                       | 1.5                     |
| May     | 824        | 33           | 5                       | 2.5                     |
| June    | 1002       | 33           | 2                       | 1                       |
| July    | 912        | 33           | 0                       | 0                       |
| August  | 611        | 33           | 5                       | 2.5                     |
| September | 720   | 35           | 1                       | 0.5                     |
| Total   | 4975       | 200          | 16                      | 8                       |

**Specimen collection and preparation**

About 5ml of blood sample was aseptically collected from each bag into sterile anticoagulant free blood sample tubes. The blood was centrifuged for about 10 minutes at 200 rpm to separate the plasma from the packed cells. The plasma was then screened for antibodies specific for T. pallidum.

**Principle of test**

The Syphilis Ultra Rapid Test Strip (Whole Blood/Serum/Plasma) is a qualitative membrane strip based immunoassay for the detection of T. Pallidum antibodies (IgG and IgM) in whole blood, serum or plasma. In this test procedure, recombinant Syphilis antigen is immobilized in the test line region of the strip. After a specimen is added to the specimen pad it reacts with the Syphilis antigen coated particles that have been applied to the specimen pad. This mixture migrates chromatographically along the length of the test strip and interacts with the immobilized Syphilis antigen. The double antigen test format can detect both IgG and IgM in specimens. If the specimen contains T. pallidum antibodies, a red line will appear in the test line region, indicating a positive result. If the specimen does not contain T. pallidum antibodies, a red line will not appear in this region, indicating a negative result. To serve as a procedural control, a pink line will always appear in the control line region indicating that proper volume of specimen has been added and membrane wicking has occurred.

**Assay for T. pallidum specific antibodies**

Each plasma sample was screened for T. pallidum specific antibodies at room temperature using Syphilis Ultra Rapid Test Strip (ACUMEN® Diagnostics Inc., Livermore, California, USA, Lot No: SYP 8010022]. The test strips were correspondingly labeled prior to the test. The plasma was separated from packed cells before application to the test strip. The syphilis test strip was removed from the pouch, each strip per blood sample (plasma), 2 drops (approximately 50µL) was vertically transferred onto the specimen pad of the test strip with the help of a dropper (each dropper per blood sample), 1 drop of buffer (approximately 40µL) was then added and timer was
started immediately, the maximum line on the strip was not exceeded during application. Afterwards, the strip was placed on a non-absorbent surface, and the test strips were observed for red colour appearance indicating the presence of *T. pallidum* specific antibody in the serum. The result was read immediately after 10 minutes. The result was reported as positive, negative, or invalid against the appropriate patient’s identification number. Care was taken to ensure the test kits used in this study were not expired.

**Interpretation of syphilis test result**

Positive test result was recorded as red colour which appeared both on the control (C) and test (T) bands indicating the presence of anti *T. pallidum* antibodies in the serum samples. Invalid test result was recorded as no visible colour in the test strip or a red colour at (T) without colour at (C) bands.

**Statistical analysis**

The data generated in this study were presented with descriptive statistics. In addition, statistical association between the risk factors and seropositivity was evaluated with Chi Square statistical test at 5% (p<0.05) level of significance.

**Results**

A total of 4975 units of donor blood were procured in the blood bank. Of these, 4622 units were certified as fit for transfusion following the hospital protocols. The sources of the donated blood samples were commercial blood donors (96.9% (n = 4822)) and targeted donation (3.1% (n = 153)). Two hundred donated and banked blood samples from commercial donors and targeted donors were screened for *Treponeema pallidum*, and 16 (8%) in all were found to be positive (95% confidence intervals 9.21-22.79). 15 (7.5%) was positive among commercial donors, while 1 (0.5%) was positive among targeted donations. Syphilis seropositivity was found to be significantly higher in commercial donors (p<0.05). The likely risk of iatrogenic transfusion related *T. pallidum* infection was estimated to be 384 cases/ year at the present rate of utilization of donor blood at the University of Benin Teaching Hospital.

**Discussion**

This study was aimed at determining the seroprevalence of Syphilis among pre-transfused blood in the University of Benin Teaching Hospital, Benin-City, Nigeria. The literature also notes that Syphilis can occur in blood donors [6-8].

From this study, Syphilis among blood donors is of alarming rate (8%). Syphilis among blood donors in this study was higher than the 3.6% found by Chikwem *et al* [6] in Maiduguri, North-eastern Nigeria; the 7.5% found by Adjei *et al* [9] in Ghanaians donors; and lower than the 12.7% found by Matee *et al* [10] among Tanzanian donors; and the 15.0% found by Elfaki *et al* [11] among Sudanese donors. The 8% sero-prevalence rate of antibodies to syphilis found in this study calls for a major review of the practice of screening donor blood in Nigeria. Based on the results of this study, the present policy in which prospective doners are screened clinically and for only HIV and HBV infections therefore require urgent revision. Hence, there should be a consensus among transfusion scientists in Nigerian medical institutions on the need for routine donor screening.

The wide differences in the syphilis infection rate among the blood donors in the different regions within Nigeria, and even those outside Nigeria may be due to the differences in geographical locations, age range of blood donors, sample sizes, the period of time the studies were carried out, and the different socio-cultural practices such as sexual behavior, marriage practices etc which take place in these regions. Access to healthcare and the laboratory test reagents used may also be contributory factors.

The implication of syphilis in voluntary blood donors is the risk of transmission of this infection to recipients of blood and blood products. This can contribute to the ever-widening pool of infection in the wider population. Syphilis has also acquired a new potential for morbidity and mortality through association with increased risk for HIV infection [5] thus making safe blood more difficult to get.

**Conclusion**

There is a risk of iatrogenic transfusion-transmitted *Treponema pallidum* in the study hospital. Regardless of blood banking temperature, we recommend all hospitals in Nigeria and the world over to screen for *T. pallidum* and other transfusion transmissible infections prior to allogeneic transfusion, which may help in avoiding transfusion related Syphilis and its probable long-term effects. Blood that is positive for Syphilis should be discarded, and the affected donor treated appropriately.

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**References**

1. World Health Organization. Screening Donated Blood for Transfusion Transmissible Infections—Recommendations. WHO. Geneva; 2009: 30.
2. World Health Organization. Global data base on blood safety—report 2001-02. Geneva: World Health Organization 2004; 5-17. (WHO/EHT/04.09).
3. Contreras M: ABC of transfusion (3rd edn.). London BMJ Books 1998.
4. World Blood Donor Day (2006): World Health Organization. (Accessed April 21, 2010, at http://www.who.int/mediacentre/news/releases/2006/pr33/en/index.html).
5. Olokoba A, Olokoba L, Salawu F, Danburam A, Desalu O, Midala J. Res J Med Sci 2008; 2(5): 217-219.

6. Chikwem J, Mohammed I, Okara G, Ukwandu N, Ola T. Prevalence of transmissible blood infections among blood donors at the University of Maiduguri Teaching Hospital, Maiduguri, Nigeria. East Afr Med J 1997; 74(4): 213-216.

7. Ejele O, Erhabor O, Nwauche C. The risk of transfusion-transmissible viral infections in the Niger-Delta area of Nigeria. Sahel Med J 2005; 8(1): 16-19.

8. Fiekumo I, Musa A, Jeremiah Z. Sero-epidemiology of transfusion-transmissible infectious diseases among blood donors in Osogbo, South-west, Nigeria. Blood Transfusion 2009; 1: 1-10.

9. Adjei A, Kudzi W, Armah H, Adiku T. Prevalence of antibodies to syphilis among blood donors in Accra, Ghana. Jpn J Infect Dis 2003; 56: 165-167.

10. Matee M, Lyamuya E, Mbena E, Magessa P, Suffi J, Marwa G, et al. Prevalence of transfusion-associated viral infections and syphilis among blood donors in Muhimbili Medical Centre, Dares Salaam, Tanzania. East Afr J Med 1999; 76: 167-171.

11. Elfaki A, Eldour A, Elsheikh N. Sero-prevalence of immunodeficiency virus, hepatitis B and C and syphilis among blood donors at ElObeid Teaching Hospital, West Sudan. Sudan J of Med Sc 2008; 3(4): 333-338.