

Research Article

Prevalence of Transfusion Transmissible Infection among Healthy Blood Donors at Dongola Specialized Hospital, Sudan, 2010–2015

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Abstract

Background: Blood transfusion saves lives but carries the risk of transmission of infections. Screening donors for transfusion transmissible infection (TTI) is mandatory.

Objectives: To study the prevalence of TTI among blood donors at Dongola Specialized hospital, Northern State, Sudan.

Materials and Methods: Retrospective study performed on blood donors at the blood bank of Dongola Specialized Hospital during the period 2010–2015. Demographic data and results of screening tests for all donors in the study period were included. Data were analyzed using SPSS and results were presented in percentages.

Results: The total number of donors were 6,489, of which 6,433 (99.1%) were included in the study. All donors were males and family donors. Mean age (SD) was 27.9 (6.516) years. hepatitis B virus was detected in 85 (1.3%), syphilis in 68 (1.1%), hepatitis C virus in 45 (0.7%), and human immunodeficiency virus in 3 (0.05%) donors. Coinfections of hepatitis B with syphilis and hepatitis B with hepatitis C were found in 0.05% and 0.03% of the donors, respectively.

Conclusion: The prevalence of TTI is low compared to national and international figures. These findings may reflect low prevalence rates of the studied infections in the community.

Keywords: blood donors, Northern State, Sudan, transfusion transmissible infection

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1. Introduction

The history of blood transfusion originated with William Harvey who discovered blood circulation in 1628. The earliest known blood transfusion in dogs occurred in 1665, and 1966 witnessed the first transfusion of blood from lambs to humans that was stopped due to serious interactions. The first human blood transfusion was performed by Dr. Philip Syng Physick in 1795. The first blood bank was established in Leningrad in 1932 [1].

Blood donation saves lives; one pint of donated blood saves an average of three lives. Someone needs blood every 2–3 sec, and about 117.4 million blood donations are collected worldwide [2]. There are three types of blood donors: voluntary unpaid donors, family donors, and paid donors. Voluntary unpaid donors account for 50–90% of all donors globally. Whole blood donation is the most common type of donation followed by donation of specific type of blood components such as plasma which is known as apheresis. Autologous blood donation refers to donation for the donor's own use later for elective surgery. Average age of donors ranges from 18 to 65 years and males are more likely to donate blood as only about 30% of donors are females [3].

Donation of blood is not without risks. Transfusion transmissible infection (TTI) remains the major challenge to transfusion services in the world, particularly in developing countries like Sudan, where these infections tend to be more prevalent and the need for blood transfusion services is high. Many infectious agents like viruses, bacteria, and parasites can be transmitted through blood transfusion. Major TTIs include hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and syphilis.

WHO recommends that all blood donations should be screened for evidence of infections prior to the release of blood and blood components for use. Screening of all blood donations should be mandatory for TTIs; HBV, HCV, HIV, and syphilis [4].

Literature review revealed no studies concerning the prevalence of TTI among blood donors in the Northern State. The aim of this study was to determine the prevalence of TTIs; HBV, HCV, HIV, and syphilis among healthy blood donors at Dongola Specialized Hospital, Northern State, Sudan during the period 2010–2015.

2. Materials and Methods

This study is a retrospective hospital-based study. Records of all donors who were seen at the blood bank of Dongola Specialized Hospital, the main hospital of the Northern State of Sudan were included. The study was carried out between the 1st of January 2010 to 31st of December 2015. Permission was obtained from the director general of the hospital and the director of the blood bank to use data from the records of the blood bank.

After taking informed consent, the donors were seen by the laboratory staff of the blood bank and a sample of blood was taken for assessment of hemoglobin level and screening for HBV, HCV, HIV, and syphilis using rapid diagnostic tests. Donors who had normal hemoglobin and negative screening for infections were seen by the emergency

room doctors for medical fitness for donation. Donors who had positive screening tests for either one or more of HBV, HCV, HIV, or syphilis were referred for counseling and further confirmatory tests.

Data including donors' age, gender, and results of screening tests were extracted from the records of the blood bank using data sheet and analyzed using SPSS Statistics software version 24 (Armonk, NY: IBM Corp, USA). Results were shown as percentages.

3. Results

The total number of donors during the study period was 6,489, 56 were excluded due to missing or incomplete results of screening tests and 6,433 (99.1%) were included in the study. The age of donors ranged from 17 to 46 years with a mean age of 27.9 years and standard deviation of 6.516, and the median age was 27 years. All donors were males and were family donors. Of the 6,433 donors, 201 (3.1%) were seropositive for one or more TTIs.

Table 1 shows the prevalence of TTIs among healthy blood donors in Dongola Specialized Hospital. HBV infection was the most common type in the study with a prevalence of 1.3%, while HIV infection had the lowest prevalence of 0.05%. Three donors had HBV and syphilis coinfections, and two donors demonstrated HBV and HCV coinfections.

TABLE 1: Prevalence of transfusion transmissible infections among healthy blood donors in Dongola Specialized Hospital, 2010–2015

Type of Infection	Positive No. (%)	Negative No. (%)	Total No. (%)
Hepatitis B virus infection	85 (1.3)	6348 (98.7)	6433 (100)
Hepatitis C virus infection	45 (0.7)	6388 (99.3)	6433 (100)
HIV infection	3 (0.05)	6430 (99.95)	6433 (100)
Syphilis	68 (1.1)	6365 (98.9)	6433 (100)
HBV and HCV coinfection	2 (0.03)	6431 (99.97)	6433 (100)
HBV and Syphilis coinfection	3 (0.05)	6430 (99.95)	6433 (100)

HBV, Hepatitis B virus; HCV, Hepatitis C virus; HIV, Human immunodeficiency virus

Figure 1 demonstrates the distribution of TTIs among the 201 seropositive donors. HBV is the most common infection followed by syphilis and HCV, whereas HIV is the least common among seropositive donors.

Table 2 demonstrates the distribution of TTIs among healthy blood donors in Dongola Specialized Hospital by years of study. The highest rates of HBV was recorded in 2012 and 2014, while the lowest rate was reported in 2010. For HCV, the highest rate occurred in 2014 while the lowest rate in 2010. With regard to syphilis, the highest rate occurred in

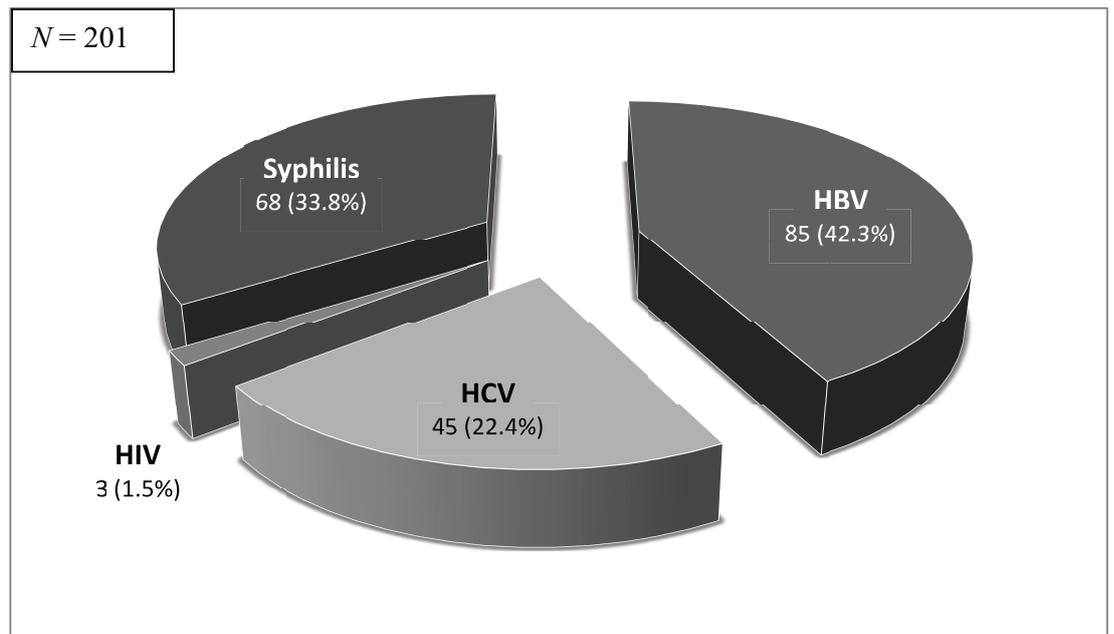


Figure 1: Distribution of Hepatitis B virus (HBV), Hepatitis C virus (HCV), Human Immunodeficiency virus (HIV), and syphilis among seropositive blood donors at Dongola Specialized Hospital, Sudan, 2010–2015.

2014 and the lowest rate in 2015. Fluctuations in the prevalence of the TTIs in different years may be due to many factors including variations in the brands of testing devices used from different manufacturers as well changes in laboratory staff with different levels of skills to perform the tests.

TABLE 2: Distribution of transfusion transmissible infections by years among healthy blood donors in Dongola Specialized Hospital from 2010 to 2015

Year	Total No.	HBV No. (%)	HCV No. (%)	HIV No. (%)	Syphilis No. (%)	HBV/HCV Coinfection No. (%)	HBV/Syphilis Coinfection No. (%)
2010	1085	6 (0.6)	1 (0.09)	0	9 (0.8)	0	0
2011	1177	15 (1.3)	10 (0.8)	1 (0.08)	12 (1.0)	1 (0.8)	1 (0.08)
2012	1089	18 (1.7)	10 (0.9)	0	9 (0.8)	1 (0.9)	2 (0.18)
2013	1019	14 (1.4)	9 (0.9)	1 (0.1)	10 (1.0)	0	0
2014	1042	18 (1.7)	14 (1.3)	1 (0.1)	22 (2.1)	0	0
2015	1021	14 (1.4)	1 (0.1)	0	6 (0.6)	0	0
Total (%)	6433	85 (1.3)	45 (0.7)	3 (0.05)	68 (1.1)	2 (0.03)	3 (0.05)

HBV, Hepatitis B virus; HCV, Hepatitis C virus; HIV; Human immunodeficiency virus

4. Discussion

Blood donation has life-saving benefits but also carries risks. Prevention of TTI depends on proper selection of healthy donors followed by screening for the infections.

The prevalence rates of both hepatitis B and C viruses were low among blood donors of the Northern State compared to the overall prevalence in Sudan. Hepatitis B surface antigen (HBsAg) seroprevalence was 6.8% in Sudan whereas the prevalence of HCV was 2.2–4.8% [5]. The prevalence rate for HIV was also lower compared to the national rate of 0.3% for adult males [6]. No studies could be found regarding the prevalence of syphilis in adult males, however, a study in pregnant women revealed a prevalence rate of 3%, which was high compared to the prevalence in this study [7].

The prevalence rates of HBV, HIV, and Syphilis in this study were low compared to four previous studies from different parts of Sudan, whereas the prevalence rate of HCV was high compared to three of those studies but low compared to one. The study from Khartoum, central Sudan by Ahmed *et al.* showed prevalence rates of HBV, HCV, HIV, and syphilis as 6.0%, 0.2%, 0.4%, and 5.4%, respectively [8]. The prevalence rates from Kassala, eastern Sudan by Abdalla *et al.* were 4.3%, 3.1%, 3%, and 2.6% for HBV, HCV, HIV, and syphilis, respectively [9]. The third study from Port Sudan, eastern Sudan by Mohammed *et al.* showed the prevalence rates of 11.7%, 0.4%, 0.4%, and 6.6%, for HBV, HCV, HIV, and syphilis respectively [10]. The fourth study from ElObeid, western Sudan revealed the prevalence rates of 10%, 0%, 0.8%, and 15% for HBV, HCV, HIV, and syphilis, respectively [11].

The much lower prevalence rates of TTIs in the Northern State compared to the rest of the country might be explained by the fact that this is a stable indigenous population with a minority of immigrants from areas with high prevalence rates. It might also be due to the conservative life style and behavior of the population. The low prevalence rates have favorable implications on blood safety and donation rates. This might also reflect low prevalence rates of these infections in the community of the Northern State but further community-based studies are indicated.

The author compared the study findings with studies from neighboring and some African countries. Compared to a study from Egypt, the prevalence rates for HBV and syphilis were high (1.22% vs 1.3% and 0.13% vs 1.1%, respectively) but the rates for both HCV and HIV were low (4.3% vs 0.7% and 0.13% vs 0.05%, respectively) [12]. The Prevalence rates for HBV, HCV, and HIV were low, while that of syphilis was high in this study compared to a study from Hail, Saudi Arabia [13]. A study from Ethiopia showed higher prevalence rates for HBV and syphilis but lower rates for HCV and HIV compared to the findings of this study [14]. The prevalence rates of this study were higher for HBV and HCV but lower for HIV compared to a study from South Africa that did not include syphilis [15].

This study is the first to release data from this area of Sudan, which gives it strength and importance, but this study is not without limitations.

The limitations of this study includes: first, the study was carried out on secondary data from a blood bank, which resulted in the absence of some important data such as occupation and residence for most of the donors and of screening results for some donors. Second, the study was based on screening donors by rapid diagnostic tests and no confirmatory tests were included for those donors with positive screening tests to TTI. Most of the rapid diagnostic tests have sensitivity and specificity below the WHO recommendations and demonstrate great variations in results without quality assurance, yet they are widely used in low-income countries that lack the capacity to support the routine use of more sophisticated techniques like ELISA and nucleic acid testing devices [16, 17]. Third, it included data from only one hospital.

5. Conclusion

This study reveals that the prevalence of TTI is low in Sudan compared to national and international figures. These findings may reflect low prevalence rates of the studied infections in the community but large-scale community-based studies are needed to determine the prevalence of these infections among potential healthy blood donors in the Northern State.

Ethical Approval

Verbal consent was taken from the director general of the hospital and the director of the laboratory department. To guarantee confidentiality, the names of donors were not taken from the records.

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Conflicts of Interest

The author declares that there are no conflicts of interest.

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