

PREVALENCE OF BLOOD PATHOGENS AMONG TRANSFUSED PATIENTS IN EKPOMA, NIGERIA

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ABSTRACT

With the advent of 21st century technology that has resulted in the development of sophisticated equipments, blood supply is thought to be safer than ever. This study therefore, investigates the incidence and prevalence of transfusion transmitted infections in patients. The study was carried out on 55 hospitalized cohorts who for some medical or surgical reasons needed blood transfusion. Using standard laboratory procedures, the post-transfused blood samples were screened for parasite, bacterial species and viral antibodies. Results showed that 58.18% (32 samples) were positive for transfusion-transmissible infections. Co-infections of several bacterial species, viral antibodies and parasites were also observed in the transfused blood. Specifically, 15 samples were positive for viral antibodies [Hepatitis C (10.90%) and hepatitis B (16.36%)], 25 samples for parasites [*Plasmodium falciparum* (40.00%), and *Plasmodium malariae* (5.45%)] and 19 samples for bacterial spp [*Staphylococcus aureus* (10.90%), *Escherichia coli* (7.27%), *Klebsiella spp* (7.27%) and *Staphylococcus epidermidis* (9.09%)]. Our results suggest therefore, that transfusion-transmissible infections from donors to recipients might exist and this calls for attention. Hence, screening donor blood for HIV and hepatitis viruses alone is not sufficient to justify that donor blood is safe. As such, there is a need to further screen transfusion blood for possible transfusion-transmissible infections.

Key words: Blood transfusion, pathogenic bacteria, Transfusion-Transmitted Infection, parasites.

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INTRODUCTION

A transfusion transmitted infection (TTI) is a virus, parasite, or other potential pathogen that can be transmitted in donated blood through transfusion to a recipient. The most common examples are HIV, hepatitis B, hepatitis C and several other viral infections that can cause hemorrhagic fevers (Weiss et al., 2005). Nevertheless, diseases exist that are not usually transmitted through blood contact, but by insect or other vectors and are termed 'vector-borne'; even though the causative agents can be found in blood. Examples of such vector-borne diseases include West Nile fever and malaria.

Although blood-borne diseases can be transmitted by other means like high risk sexual behavior and intravenous drug use, those via blood transfusion queries patients' trust on health care providers. Until date, blood transfusion departments remain the major portal to screen, monitor and control infection transmission through blood transfusion (Zeesham et al., 2007).

In developing countries like Nigeria, blood safety is an issue of concern and despite the emergence of the

21st century technology which has resulted in the development of more sophisticated facilities and procedures, the prevalence of blood-transfusion infections still persist. This is evident in the report on bacterial contamination of blood products by Kitchen and Davis (2005).

In Europe and the United States however, continuous improvement on more sensitive serologic methods and nucleic acid amplification test (NAT), have resulted in phenomenal decrease in the residual risk of viral transmission recorded in 2000 to less than 1:250,000 for hepatitis C virus (HCV) and 1: 1.3M for HIV (Velati et al., 2007; Allain, 2002). In fact, over the past three decades, the risk of transfusion transmitted infections has been dramatically reduced through the introduction of routine donor laboratory screening of blood-borne pathogens (Luban, 2005; Allain, 2002). It has even been estimated that the mortality risk of severe post-transfusion sepsis ranges from 1:230,000 to 1:625,000 donor exposures (Blajchman, 2002; Ness et al., 2001; Perez et al., 2001).

This cannot be said of Africa and particularly Nigeria, where factors preventing safe blood supply are common place. The issue is further complicated considering the fact that existing blood banks are few and 60% of health facilities lack blood banks in Nigeria. These inadequacies compel physicians and other health care givers to rely on transfusing patients in dire need of blood with freshly donated blood that are subjected to routine screening. By contrast, transfusion transmitted infections still pose a great threat to blood Safety in Nigeria.

Considering the above literatures therefore, this study investigates the incidence and prevalence of transfusion transmitted infections in transfused blood from donors

MATERIALS AND METHODS

Study area: The study was carried out in Ekpoma, Edo State, situated in the tropical belt of South-South Nigeria. Ekpoma lies between latitude 60 40o N 60 45o N and longitude 60 05o E 60 10 o E (Obabori et al., 2006). It is also the administrative headquarters of Esan West Local Government Area of Edo State, Nigeria. Since it's inception as the Local Government headquarters and host to the State owned Ambrose Alli University, the town has grown into an urban center with a significant rise in population.

Study population: The study participants were 55 hospitalized cohorts who for some medical or surgical reasons needed blood transfusion and blood samples were collected at the health centres from both patients (recipients) and donors, pre and post transfusion.

Ethical consideration: The study was conducted in compliance with the Declaration on the Right of the Patient (WMA, 2000). Also, informed consent was obtained from all subjects enrolled for the study.

Hematological Screening: Inclusion criteria for the cohorts entailed a negative pre-transfusion screen (nil blood pathogen), using standard but commercially sourced kits.

Microbiology and Serology: All pre-transfusion blood screened for the cohorts returned negative to culture and serologic results using standard microbiological methods as well as serologic screening kits.

Isolation and Identification: All post-transfused blood samples were inoculated onto Nutrient agar, MacConkey agar and Blood agar plates by streaking.

Inoculated plates were incubated aerobically at 37^oC for 24hrs and discrete colonies therein, were picked from the growth and Gram stained while further sub-culturing was done to obtain pure cultures for biochemical tests.

Serological test were conducted on the samples for HIV I & II, Hepatitis A, B, C as well as Syphilis. Staining of thin film on dried slides was also conducted for all the post-transfusion samples (Arness et al., 2003; Momoh et al., 2012)

Data analysis: Descriptive analysis was performed on the laboratory test results using SPSS version 17 and presented in tables.

RESULTS

Table 1 represents micro-organisms and microbial antibodies detected from post transfusion blood samples. The results showed 32 (58.18%) samples to be positive for transfusion-transmissible infections. Also, co-infections of bacterial species, viral antibodies and parasites were also observed in the post transfusion blood samples.

After staining, 25 of the post transfusion blood samples were positive for *Plasmodium falciparum* (22; 40.00%), and *Plasmodium malariae* (3; 5.45%) parasites. For bacterial infection, four bacterial species were isolated 72 hrs post-transfusion from 19 hitherto sterile blood samples and are distributed as follows; *Staphylococcus aureus* (6; 10.90%), *Escherichia coli* (4; 7.27%), *Klebsiella* spp (4; 7.27%) and *Staphylococcus epidermidis* (5; 9.09%). For viral infection, 15 samples were positive for viral antibodies after serologic screening some 36-45 days post-transfusion and they include Hepatitis C (6; 10.90%), and hepatitis B (9; 16.36%).

DISCUSSION

Blood transfusion no doubt, has saved millions of live worldwide. However, it is reported that recipients stand the risk of becoming infected with blood-borne diseases through transfusion of infected blood and blood products (UNAIDS, 2007). The observation that there were blood borne infections (58.18%) in the studied post transfusion blood samples, is in line with the study by Weiss et al. (2005) who reported such infections in 53% (373 of 709) patients. This has led to patients' blood being tested for abnormal liver function, neutropenia, and possible history of IV drug use in order to rule out transfusion infection.

Table 1. Prevalence of micro-organisms and microbial antibodies detected from post transfusion blood

Isolated transfusion transmitted pathogens	Specificity	Number	Percentage
Bacterial species (present in 19 samples 72 hrs post-transfusion)	<i>Staphylococcus aureus</i>	6	10.90
	<i>Escherichia coli</i>	4	7.27
	<i>Klebsiella</i> spp	4	7.27
	<i>Staphylococcus epidermidis</i>	5	9.09
Parasite (25 samples after staining)	<i>Plasmodium falciparum</i>	22	40.0
	<i>Plasmodium malariae</i>	3	5.45
Viral antibody (15 samples 36-45 days after)	Hepatitis C	6	10.90
	Hepatitis B	9	16.36

The detection of bacterial spp in the post transfusion blood samples is in line with the reports by Fasola and Otegbayo (2002) that 12.5% of patients who received blood transfusion were at risk of post-transfusion hepatitis. According to Picker (2012), Walther-Wenke et al. (2006), and Kitchen and Davis (2005), bacterial contamination, especially of platelet concentration, stored at room temperature that allows for bacterial proliferation, has been recognized as the most common cause of transfusion-transmitted infections.

Similarly, the 45.45% parasites discovery in the post transfused blood sample signifies that malaria is prevalent in Nigeria. In fact, a high malaria parasite prevalence rate of 40% has also been reported in transfused donor blood with *Plasmodium falciparum* being the most prevalent (Ibhanesebhor et al., 1996). Indeed, malaria is endemic in Nigeria (Erhabor et al., 2007; Ibhanesebhor et al., 1998) and sometimes asymptomatic. While about 1500 cases of malaria are diagnosed in the United States each year, over 1,500 cases of malaria are diagnosed daily in Nigeria (Ibhanesebhor et al., 1996; Nwaneka et al., 2004; Falade et al., 2009); hence, its detection in the post transfused blood samples is unexpected.

The 27.27% detection of viral infections (hepatitis B and C) in post transfused blood sample indicated that hepatitis B and C viruses may be circulating in recipients' blood. Similar assertions have been made in Ibadan and residents of other cities in Nigeria (Afolabi et al., 2013). In accordance with the findings of this study, several studies in Nigeria have also detected hepatitis C antibodies among blood donor (Isa et al., 2009; Ayolabi et al., 2006; Chukwurah et al., 2005; Egah et al., 2004; Fashola, et al.2001). The 10.91% prevalence of hepatitis C antibodies in post transfusion blood in this study is high compared to the 1.8% reported in Kaduna- Nigeria (Isa et al., 2009), 4.96% in Ibadan-Nigeria (Fashola et al., 2001), 6.0% in Jos-Nigeria (Egah et al., 2004), 7.6%

in South-Eastern Nigeria (Chukwurah, et al., 2005) and 8.4% in Lagos, Nigeria (Ayolabi et al., 2006).

The presence of these pathogenic organisms, particularly *Staphylococcus aureus* and *Staphylococcus epidermidis* may be attributed to point of puncture of the needle, either in the donor or the recipient, as these organisms constitute the normal skins microbial flora. However, same cannot be said of hepatitis viruses or the plasmodium species.

Any blood borne pathogen has the potential to be transmitted by blood transfusion. Due to occasional report of blood borne diseases such as Babesiosis, Chagas disease, Leishmaniasis and malaria in the United States, it is pertinent to note that since 2007, the blood supply in the US has been screened for Chagas disease (aetiologic agent-*Trypanosoma cruzi*), making the risk of transfusion-transmitted Trypanosome cruzi rare (Ochie et al., 2012). Transfusion-transmitted infections (TTIs), though common, are largely unaccepted in Nigeria. Due to the difficulty in ascertaining the inherent pathogens of any given donor blood which might be lethal, it is important to consider as a rule, that all blood and body fluids are potentially infectious. Also, the possibilities of transfusion-transmitted infections might be implicated in the risk of false -positive or -negative results (Schrezenmeier et al., 2007).

Although the use of standard donor screening methods to a large extent, help to reduce the risk of an infectious organism being transmitted by blood transfusion, it is however, not routine in most health facilities in Nigeria prior to transfusion. This has to a large extent contributed to the past transfusion infection diagnosed in some of the patient. Considering the finding of this study, screening donor blood for HIV and other viruses and syphilis alone is not sufficient to justify donated blood as safe. Therefore, there is a need to further screen blood for other possible transfusion-transmissible

infections. According to Robert et al. (1997), blood safety goes beyond screening for pathogens as improved methods of collection, handling and storage of blood products has to a large extent, decreased bacterial contamination in recent years.

Conclusively, the need to screen all donor blood for pathogenic organisms cannot be over emphasized. As the saying goes, if you cannot make it better, then do not make it worse by your actions or inactions. More blood banks should be established across Nigeria as well as making provisions for the microbiological analysis of the donor blood. Efforts should be made to ensure that the normal skin flora do not contaminate the blood meant for transfusion.

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The authors contributed their expertise, finance and time to ensure the success of the research that developed into this research article.