East African Medical Journal Vol. 95 No. 1 January 2018
BACTERIAL CONTAMINATION IN PLATELET CONCENTRATES PREPARED AT KENYA NATIONAL BLOOD TRANSFUSION SERVICE (NRBTC)
Margaret Kemunto Onchaga, Kenya National Blood Transfusion Service, P.O. box 29804, Nairobi, Email: onchagam@yahoo.com, Dr. Amos Mbugua, Lecturer, Department of Medical Laboratory Sciences- Jomo Kenyatta University of Agriculture and Technology, P.O. Box 62000-00200, Nairobi, Email: ambugua@jkuat.ac.ke, Dr. Peter Maturi Mwamba, Hematologist, Kenyatta National Hospital, P.O. Box 303-00202, Nairobi, Email: pmmwamba@yahoo.com, Prof. Walter O. Mwanda, College of Health Sciences- University of Nairobi, Department of Human Pathology, Unit of Haematology and Blood Transfusion, P.O. Box 19676-00202, Nairobi, Email: walter.mwanda@uonbi.ac.ke

Corresponding Author: Margaret Kemunto Onchaga, Kenya National Blood Transfusion Service, Email: onchagam@yahoo.com

BACTERIAL CONTAMINATION IN PLATELET CONCENTRATES PREPARED AT KENYA NATIONAL BLOOD TRANSFUSION SERVICE (NRBTC)

M. K. Onchaga, A. M. Mbugua, P. M. Maturi, Prof. W. Mwanda

ABSTRACT

Background: **Contamination of platelets may result from bacterial inoculation into the blood bags. This is due to insufficient disinfection of the venipuncture site.**
Objective: **To determine the prevalence of bacterial contamination in platelet concentrates prepared at Nairobi Regional Blood Transfusion Centre (NRBTC).**
Study Design: **Descriptive cross-sectional study was used.**
Setting: **The study was conducted at Nairobi Regional Blood Transfusion Centre**
Subject**: Nighty one (91) platelet concentrates were selected for the study**
Results: **The prevalence of bacterial contamination was 12.1% (11/91) with 95 CI [5.4%-18.8%]. Out of the 11 concentrates that were contaminated, Staphylococcus epidermis was isolated from 5 units, staphylococcus aureus from 4 units and pseudomonas paucimobilis from 2 units.**
Conclusion: **The isolates obtained in the donated blood are skin associated organisms and are considered as contaminants related to venepuncture process during the blood donation process. Based on these findings, there is need to review the quality assurance protocol and focus mainly on the venepuncture process.**

INTRODUCTION

Blood transfusion practice serves an important role in saving lives and improving the quality of life in a large range of clinical conditions [1]. However, it is also a potential source of infection to the blood recipient [2]. Among the infections that can be transmitted through blood transfusion, bacterial sepsis remain a major health-care concern being the most frequently reported cause of transfusion related acute septic reactions. This can lead to fatality from septicaemia [3], [4].

Contamination of platelets may result from bacterial inoculation into the blood bags via skin plug at the time of phlebotomy, unrecognized bacteraemia in the donor, contamination from the environment or during platelet concentrate preparation [5].

Blood contamination will most commonly occur during blood collection because of insufficient disinfection of the venepuncture site [1]. Bacterial contamination of platelet components occurs because of the storage temperature for platelets (22° C) which may facilitate bacterial growth [6].

Multiple aerobic- culture surveillance studies have demonstrated that 1 in 1000 to 2000 platelet units are bacterially contaminated [1]. Bacterial infections are reported to occur in at least 1:75 000 platelet transfusions for cases where clinical reactions are apparent [7]. According to [6] transfusion-transmitted sepsis has been recognized and culture-confirmed in at least 1 of 100,000 recipients leading to immediate fatal outcome in 1 in 500,000 recipients.

The most predominant bacteria contaminants in septic episodes among of platelet component recipient secondary to transfusion are skin and gastrointestinal flora. These include Gram positive bacteria such as Bacillus species and staphylococcus aureus and gram negative bacteria such as Klebsiella pneumoniae, Escherichia coli, Yersinia enterocolitica, Pseudomonas fluorescens, and Pseudomonas aeruginosa [8]. Serious morbidity and mortality occurs most frequently with transfusion related gram-negative bacterial infection [5].

The AABB standards recommend a septic technique to be used during blood collection and an enclosed system during component preparation to ensure platelet concentrates prepared are free from bacterial contamination.

At the Kenya National Blood Transfusion Service (KNBTS), the platelet concentrates are prepared from random whole blood donors and platelet concentrates are separated from platelet rich plasma derived from these donors. The platelet concentrates are stored in the platelet agitator for a maximum of 5 days. Most of the concentrates are dispatched within the first two days after preparation. This study sought to determine the prevalence of bacterial contamination in platelet concentrates prepared and stored in Nairobi Regional Blood Transfusion Centre blood bank and identify the bacterial contaminants.

MATERIALS AND METHODS

Study design: Descriptive cross-sectional study.

Sampling method: Systematic sampling of every 2nd sample of platelet concentrate prepared was picked. On average, 15 platelet concentrates are prepared per day at NRBTC and this is done three days in a week. Nighty one (91) platelet concentrates were selected for the study.

Laboratory testing: Isolation and identification was done following the standard operating protocol in the National Public Health Laboratories (NPHL) Microbiology department. The broths were incubated at 37°C up to 7 days before they were discarded. After overnight incubation, sterile loopfuls of broth were sub-cultured on to blood agar and MacConkey agar plates and incubated aerobically for 18-24 hours at 37°C. The identities of bacteria growing on the culture plates were determined by colonial morphology, Gram and spore stains; as well as standard biochemical tests

Data analysis: Data analysed using STATA version 13. Descriptive statistics were used to summarize the data and pie chart plotted to show the distribution.

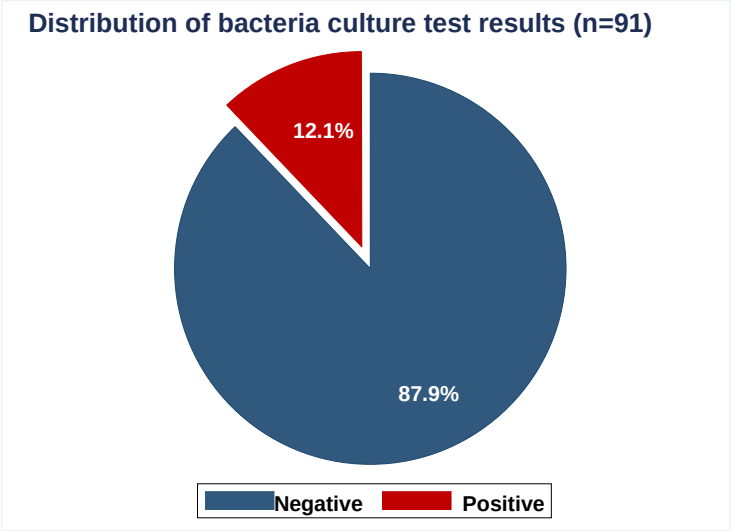
Ethical approval: ERC approval was sought and obtained from the KNH/UoN ERC

RESULTS

All the 91 samples collected from the concentrates were assessed for bacterial contamination at day 1, day 3 and day 5. At day 1 and 3, all the samples were negative for bacterial culture test. At day 5, 11/91

(12.1%) samples tested positive for bacteria culture.

Figure 1:
Distribution of platelet samples bacterial culture test results



The bacterial contaminants isolated were identified as staphylococcus epidermidis, staphylococcus aureus pseudomonas paucimobilis. Staphylococcus epidermidis was the most frequent contaminant as shown in Table 1 below;

Table 1:
Distribution of bacterial isolates from contaminated platelet concentrates

Bacterial isolate	Frequency	Proportion (%)
Staphylococcus albus	5	45.5
Staphylococcus aureus	4	36.4
Pseudomonas paucimobils	2	18.1

DISCUSSION

The aim of this study was to assess the prevalence of bacterial pathogens in prepared platelets at NRBTC-Kenya, we noted that there was low bacterial contamination in this centre, which was about 11(12.1%) and most of them were non-pathogenic bacteria. This finding is considered low compared to reports from other studies.

This study revealed the presence of Staphylococcus epidermidis, micrococci, and gram positive rods which was similarly to the work conducted in Ethiopia (15/120; 12.5%) but lower compared to the 16.5% (16/97) reported in a study done[2]. This prevalence was higher compared to the findings reported by studies done[9], India[10] and Mexico[11] which reported a prevalence of 10.3% (4/39), 9% (9/100) and 0.5% (2/410) respectively. Hence proper blood donor skin disinfection has long been recognized as the definite way to reduce blood contamination [1].

In this study about 11 (12.1%) of platelet concentrate samples were found to have bacterial contamination of staphylococcus epidermidis, Staphylococcus aureus which is Gram positive cocci, and aerobic Gram-negative sphingomonas paucimobilis identified as Pseudomonas which is oxidase negative. All were blood stream associated with contamination intravenous. The

isolates obtained in the prepared platelet concentrates are skin associated organisms and are considered as contaminants related to procedure during donor bleeding or taking sample for culture.

At NRBTC showed that a total of 91 units of platelet concentrate in GroupI, III, V had 5(5.5%) growth of staphylococcus aureus, Group II, IV had 4(4.4%) growth of staphylococcus epidermidis, Group VI has 2(2.2%) Pseudomonas paucimobilis total to 11 (12.1%) showed evidence of bacterial contamination, with occurrences of coagulase-negative Staphylococcus species and four instance of coagulase-negative Staphylococcus species plus Pseudomonas paucimobilis (the latter was considered a contaminant of the inoculation process during culture set-up). This study revealed the presence of Staphylococcus epidermidis, staphylococcus aureus and pseudomonas paucimobilis bacteria in contaminated platelet components at day 5 of storage. These bacteria isolates have been reported between day 1 and 5 from similar studies done in Ethiopia, Ghana and Zimbabwe. In addition to these bacteria, some of these studies have also reported presence of enteric bacteria such as E. coli and Pseudomonas aeruginosal[1], [2]. The isolates obtained in this study are skin associated organisms and are considered as contaminants related to phlebotomy or taking a sample for culture. It is therefore important to do proper blood donor skin disinfection as a first step in reducing blood contamination.

STUDY LIMITATION

Inability to make a follow up for the recipients whether will develop any kind of septicaemia as result of transfusion of contaminated platelet concentrates.

CONCLUSION

We concluded that the isolates obtained in the donated blood and prepared platelet concentrate are skin associated organisms and are considered as contaminants related to procedure used during donor bleeding. We recommended that there is a need for staffs who are involved in the blood collection and storage procedure to continue to adhere on their safety precautions, protocols/quality assurance especially during blood collection and any other procedures involving blood so as to reduce the risk of contaminating blood units during blood collection. From the study findings results shows that platelet concentrates should be issued within 3 days.

REFERENCE

1. Ismael A, Dagnew Z, Degu G (2014) Bacterial Contamination of Stored Blood Ready for Transfusion at a Referral Hospital in Ethiopia. J Clin Res Bioeth 5: 176.
2. Boye A, et al. (2016) "Bacterial Contamination of at-Point-of Transfusion Blood in a Tertiary Hospital in Ghana". EC Bacteriology and Virology 2.4:121-128.
3. Rahman A.B, Oladipo A.A, Babatunde W.O, Aramide B.A (2011) Bacterial contamination of blood and blood components in a tertiary hospital setting in Nigeria. Int J Infect Control 7:1 996-9783
4. Benjamin R.J (2016) Transfusion-related sepsis: a silent epidemic. Blood 127:380-381
5. Callum J.L, Pinkerton P.H, Lima A, Lin Y, Karkouti K, Lieberman L, et al. (2016) Chapter 5, A Guide to Transfusion Medicine, 4rd edition. Canada: Ontario Regional Blood Coordinating Network.
6. CDC (2013) Bacterial Contamination of Platelets
7. Fung MK, Downes KA, Shulman IA: Transfusion of platelets containing ABO-incompatible Plasma. Arch Pathol lab Med 2007; 131: 909-915.
8. Mudassar M, transfusion-transmitted diseases Fellow, Department of Internal

Medicine, Division of Geriatrics, Duke University Health System 2008 : 10.1046/j.1537- 2995.2000.40030335.24

9. Makuni N, Simango C, Mavenyengwa R.T (2015) Prevalence of bacterial contamination in blood and blood products at National Blood Service Zimbabwe. J Infect Dev Ctries 9(4):421-424
10. Das S, Kale M, Beena P.M, Kumar H. (2015) Bacterial contamination of platelet at University Hospital: A prospective surveillance study". Int.J.Curr.Microbiol.App.Sci 4(4):805-812
11. Ibanes-Cervantes G et al., (2017) Prevalence of bacterial contamination in platelet concentrates at the National Center of Blood Transfusion (Mexico). Transfus Clin Biol. 24 (2): 56-61
12. Yazer M, Triulzi D (2005) Use of a pH meter for bacterial screening of whole blood platelets. Transfusion. 45:1133–7.