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Clinical Heamatology

Quality Assurance of Blood Bank Performance in Khartoum Hospitals

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Abstract		Original Research Article

Background: Blood is a vital and limited resource with a lifesaving therapeutic benefit. Knowledge of standard transfusion practices to be followed is important in delivering quality transfusion services. The present study aims at assessing the knowledge of transfusion practices among undergraduate medical students, train them, and to assess the impact of this type of training sessions in improving the outcome. *Objectives:* To evaluate blood transfusion services (BTS) at the main blood banks (BBs) of some Sudan cities as sample to present the situation. *The Methods*: There were 13 main BBs evaluated according to the World Health Organization BTS standards. Qualitative and quantitative data were collected using semi-structured questionnaires covering 11 components: Personnel training and certification, Equipment, Physical facility, Safety, Pretesting, testing, post testing, appropriate use of blood, Waste management, Documentation and Record and External Quality Assessment(PT, Retesting and Site Supervision). *Results:* An overall mean percent score for BTS was calculated where <50% is considered unsatisfactory. The 13 BBs in Personnel training and certification there were five satisfying the need 38.5% (5/13), in equipment there was one blood bank accepted 7.7% (1/13), for Physical facility there were 11 blood banks satisfying the need 84.6% (11/13), for Safety there were only 3 blood banks satisfying the need 23% (3/13). For pretesting there were 12 blood banks satisfying the need 92.3% (12/13). For testing there were 4 blood banks satisfying the need 30.8% (4/13). For post testing all blood banks were satisfying the need 100% (13/13). For appropriate use of blood there was only one blood bank satisfying the need. For Waste management all blood banks satisfying the need 100% (13/13). For documentation and Recordthere were two blood banks accepted15.4% (2/13). For External Quality Assessment all blood banks do not satisfying the need 0% (0/13).*Conclusion:* Therefore, there is a need to develop and train staff on QAS and to increase awareness among blood bank personnel on importance of quality assurance. A wider scale evaluation of BTS in Sudan is recommended.
Keywords: blood transfusion services (BTS), blood banks (BBs), transfusion practices.

INTRODUCTION

Quality assurance deals with the maintenance of a system to ensure that the performance in that system is of the required quality. In a blood transfusion centre, it means that a management system should exist to look into provision of a safe unit of blood and, if any errors are identified, they should be corrected [1].

Blood transfusion is an essential component of modern health care that saves millions of lives each year. According to the World Health Organization (WHO) estimate, more than 5 million people die from violence and injury and 536 000 women die during pregnancy or childbirth each year, with most deaths that could be saved through blood transfusion [2]. Every country needs to meet its requirements for blood and blood products and ensure that blood supplies are free from

Infectious diseases and the development of pre-transfusion compatibility test, such as blood typing, irregular antibody screening. Furthermore, blood safety is an integral part of the WHO HIV/AIDS plan to accelerate the prevention of HIV infection and achieve its health-related goals [3-5] Blood transfusion services should therefore establish efficient systems to ensure that all donated blood is correctly screened for specific

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TTIs and that only non-reactive blood and blood components are released for clinical and manufacturing use. The adoption of screening strategies appropriate to the needs, infrastructure and resources of each country can contribute significantly in improving blood safety. In countries where effective blood screening programmes have been implemented, the risk of transmission of TTIs has been reduced dramatically over the last 20 years [6, 7].

blood transfusion has been practiced as a lifesaving intervention, but only when it is of good quality since it has a risk of transfusion transmitted infections (TTIs) such as viral, bacterial, and parasitic.(8) While highly sensitive and specific screening methods which detect both viral antibodies and antigens have greatly reduced viral agents, the risk of bacterial and malarial infections remains high.(9), 10) Bacterial contamination of stored blood for transfusion has been associated with inadequate disinfection in blood collection, processing, and storage [11].

Therefore, evaluating BTS is the corner stone to ensure its proper delivery and that related problems are monitored efficiently and effectively. The main objective of this study is to evaluate BTS in the 13 main blood banks in Sudan regarding activities, quality system and, blood collection, screening, and components preparation.

MATERIAL AND METHODS

Study design, site, and duration

A laboratory-based cross-sectional study was conducted at central blood banks and some of hospitals blood banks from may 2019 to april2020).The Central blood bank is located in khartoum, middle of sudan. It receives donors, and has a bed capacity of seventeen for donation. The hospital has a transfusion laboratory locally known as "Emergency laboratory" dedicated for blood transfusion procedures. It receives blood that is already screened for TTIs from the central bank. Blood is collected from healthy family and voluntary non-remunerated blood donors. Blood and component issuance from the regional referral hospital blood bank was based on the first in, first out (FIFO) principle. This principle is applied in the blood bank while processing and issuing blood units. By this, the first units of blood to be received were issued first to the matched recipients. In this way, the first received had a short shelf-life, and will not allow with a to expire. Upon request from CBB, the hospital transfusion laboratory stores this blood suitably, and issues it out on the request of the hospital wards. Currently, this laboratory carries out and average of 735 to 835 blood bags transfusions daily.

Sample size estimation, sampling, and recruitment criteria

The sample size was estimated 300. The study used systematic sampling, whereby every 5th unit of blood to be issued out was considered. The study enrolled whole and packed red blood cell units that had been tested for TTIs of HBV, HIV, HCV and syphilis using the WHO model for blood donor screening. The study excluded blood units that were returned for any reason, platelet concentrates that were obtained on special request and issued to the wards immediately, and other emergencies.

Sample collection procedure

Blood is then mixed and allowed to seep into the tubing. Part of the tubing is well swabbed with 70% ethanol, and 6 mL of blood is collected using a 10-mL sterile syringe. Two seals are made in the tubing, one before and another after the puncture so that air could not flow into the blood bag. The blood unit sampled is re-labeled with its original donor unit number, ABO Rh D status, and the expiry date was reduced to within 24 hrs.

Conduct of the blood bank audit

An audit of the hospital transfusion laboratory was carried out using the Stepwise Laboratory quality Improvement Process The audit was carried out by those who are experienced in using the checklist. This checklist consists of 11 sections of quality system essentials (QSE), comprising 150 questions covering 150 points. They include Personnel training and certification, equipment, physical facilities, bio safety, pretesting, testing, post testing, approciate use of blood, waste management, documents and records and external quality assessment.

A careful selection of the checklist questions for the different personnel was in accordance with the hierarchy. The answers to the checklist question were obtained from the laboratory technician, quality manager, and from thehead of clinical laboratories. They documented the results of the 11 QSE based on either, "yes", "partial", or "no". The credibility of the laboratory audit was ensured by critical observations, reviews, asking open-ended questions, talking to clients, and specimen follow-up through laboratory procedures.

All defects which were detected in this study are represented in tables. Donor selection process was selected for correction because we have to start with a healthy donor to guarantee that the subsequent steps will be based on sound base.

DATA CODING, ENTRY, AND ANALYSIS

Each question in the questionnaire was scored as 1 for yes and 0 for no. The mean score for each domain was calculated by dividing the number of

correct answers by the total number of questions measuring that domain.

RESULTS
The centers and blood banks perform different activities including 11 components mentioned before and the result as bellow:

Personnel training and certification

City	Required	Obtained	%
Atbara	22	5	23%
kosti	22	11	50%
North Kordofan	22	9	41%
Godarif	22	11	50%
Wad Medani	22	11	50%
Bahri	22	16	73%
Ibrahim Malik	22	8	36%
Omdurman	22	10	46%
khartoum	22	9	41%
Elfasher	22	10	46%
Portsudan	22	10	46%
Dongla	22	10	46%
NBTS	22	18	82%

Equipment

City	Required	Obtained	%
Atbara	32	12	37.5
Kosti	32	14	43.8
North Kordofan	32	14	43.8
Godarif	32	9	28.1
Wad Medani	32	13	40.6
Bahri	32	16	50.0
Ibrahim Malik	32	11	34.4
Omdurman	32	13	40.6
Khartoum	32	9	28.1
Elfasher	32	14	43.8
Portsudan	32	10	31.3
Dongla	32	13	40.6
NBTS	32	12	37.5

Physical facility

City	Required	Optined	%
Atbara	17	13	76.5
Kosti	17	14	82.4
North Kordofan	17	15	88.2
Godarif	17	15	88.2
Wad Medani	17	13	76.5
Bahri	17	9	52.9
Ibrahim Malik	17	13	76.5
Omdurman	17	8	47
Khartoum	17	12	70.6
Elfasher	17	12	70.6
Portsudan	17	11	64.7
Dongla	17	10	58.8
NBTS	17	7	41.2

Safety

City	Required	Obtained	%
Atbara	16	6	37.5
Kosti	16	7	43.8
North Kordofan	16	7	43.8
Godarif	16	3	18.8
Wad Medani	16	7	43.8
Bahri	16	9	56.3
Ibrahim Malik	16	9	56.3
Omdurman	16	7	43.8
Khartoum	16	8	50
Elfasher	16	6	37.5
Portsudan	16	7	43.8
Dongla	16	6	37.5
NBTS	16	6	37.5

PRETESTING

City	Required	Obtained	%
Atbara	15	11	73.3
Kosti	15	10	66.7
North Kordofan	15	10	66.7
Godarif	15	6	40
Wad Medani	15	10	66.7
Bahri	15	13	86.7
Ibrahim Malik	15	13	86.7
Omdurman	15	8	53.3
Khartoum	15	10	66.7
Elfasher	15	12	80
Portsudan	15	13	86.7
Dongla	15	10	66.7
NBTS	15	14	93.3

TESTING

City	Required	Obtained	%
Atbara	16	6	37.5
Kosti	16	6	37.5
North Kordofan	16	6	37.5
Godarif	16	7	43.8
Wad Medani	16	7	43.8
Bahri	16	10	62.5
Ibrahim Malik	16	11	68.8
Omdurman	16	8	50
Khartoum	16	7	43.8
Elfasher	16	6	37.5
Portsudan	16	6	37.5
Dongla	16	5	31.3
NBTS	16	11	68.8

POST TESTING

City	Required	Obtained	%
Atbara	*7*	*5*	*71.4*
Kosti	*7*	*4*	*57.1*
North Kordofan	*7*	*6*	*85.7*
Godarif	*7*	*4*	*57.1*
Wad Medani	*7*	*5*	*71.4*
Bahri	*7*	*6*	*85.7*
Ibrahim Malik	*7*	*5*	*71.4*
Omdurman	*7*	*5*	*71.4*

City	Required	Obtained	%
Khartoum	*7*	*5*	*71.4*
Elfasher	*7*	*5*	*71.4*
Portsudan	*7*	*5*	*71.4*
Dongla	*7*	*5*	*71.4*
NBTS	*7*	*6*	*85.7*

Appropriate use of blood

City	Required	Obtained	%
Atbara	*3*	*1*	*33.3*
Kosti	*3*	*1*	*33.3*
North Kordofan	*3*	*1*	*33.3*
Godarif	*3*	*1*	*33.3*
Wad Medani	*3*	*1*	*33.3*
Bahri	*3*	*1*	*33.3*
Ibrahim Malik	*3*	*1*	*33.3*
Omdurman	*3*	*1*	*33.3*
Khartoum	*3*	*1*	*33.3*
Elfasher	*3*	*1*	*33.3*
Portsudan	*3*	*1*	*33.3*
Dongla	*3*	*1*	*33.3*
NBTS	*3*	*2*	*66.7*

Waste management

City	Required	Obtained	%
Atbara	4	4	100
Kosti	4	4	100
North Kordofan	4	4	100
Godarif	4	4	100
Wad Medani	4	4	100
Bahri	4	4	100
Ibrahim Malik	4	4	100
Omdurman	4	4	100
Khartoum	4	4	100
Elfasher	4	4	100
Portsudan	4	4	100
Dongla	4	4	100
NBTS	4	4	100

Documentation and Record

City	Required	Obtained	%
Atbara	10	4	40
Kosti	10	3	30
North Kordofan	10	3	30
Godarif	10	2	20
Wad Medani	10	3	30
Bahri	10	5	50
Ibrahim Malik	10	4	40
Omdurman	10	3	30
Khartoum	10	2	20
Elfasher	10	2	20
Portsudan	10	1	10
Dongla	10	1	10
NBTS	10	7	70

External Quality Assessment (PT, Retesting and Site Supervision)

City	Required	Obtained	%
Atbara	8	0	0
Kosti	8	2	25
North Kordofan	8	2	25
Godarif	8	0	0
Wad Medani	8	2	25
Bahri	8	2	25
Ibrahim Malik	8	2	25
Omdurman	8	3	37.5
Khartoum	8	3	37.5
Elfasher	8	3	37.5
Portsudan	8	0	0
Dongla	8	0	0
NBTS	8	3	37.5

DISCUSSION

Transfusion of blood and blood products is a common and useful therapy, unfortunately always linked with the risk of an adverse event or reaction, which can be life threatening. Safety in transfusion medicine is the result of the implementation of quality strategies at all levels of the chain from donor to patient. Audits must be organized prospectively to review the appropriateness of blood and blood components prescribed in accordance with patient needs, and in the process, to make clinicians more familiar about transfusion triggers and indications.

Our study revealed that only 38.5% of staff had completed training, and certification of operational quality with success. Our figure of 38.5% is comparable to some extent with a study from Egyptthey obtained only 32.6 %witch was regarded as adequate. Studies from Yemen showed 75% of the staff in BBs had received training in biosafetyand half of the staff had received training in Standard Operating Procedures (SOPs), no QAS is in place at any of the BBs.

AS regard the relation btween the knowledge of personell abaut the blood bank work and the type of equipment Bhri agreed with WHO standard as it is in Karachi.

In our study, the physical facility in most blood banks (84.6 %) was acceptable WHO standard and there is no study to agree with it.

Also the study revealed that the safety among blood banks is 23% and this is lower percent according to WHO standard. This study agreed with another study done Ahmadabad giving Awareness of Work Precautions is 20.8%,it is found that all the participants wear gloves during laboratory work but 81.2% wear a single hand gloves.17.5 %of the participants claimed to know what to do if exposed to infection. 45.6% of the participants eat in the laboratory, 47.0% of them store foods and water in the blood banks refrigerators, 31.5% of them put on cosmetics in the laboratory, 12.6% smoke in the laboratory, 10.0% cut their finger nails with teeth in the laboratory. 91.5% are not immunized against hepatitis B virus (HBV). 99.0% of them do not take shower immediately after laboratory work.82.0% of the participants do not feel that the use of masks is necessary inside the laboratory.

On the other hand the study show 92.3 for pretesting 23.1 for testing and 100% for post testing this result agree with study done in India. Our study showed 100% waste management. However we didn't get any study for comparison of our results.

Our study revealed that the documentation was very weak 15.4%. A similar study in Kenya [Natukunda B, Schonewille H, Smit Sibinga CT. Assessment of the clinical transfusion practice at a regional referral hospitalin Uganda. Transfus Med. 2010 Jun; 20 (3): 134–9.].Found that there were no records for pre-transfusion hemoglobin, transfusion start-times and vital signs in 30.2%, 21.5% and 97.6% of all recipients respectively.

The study showed the external quality control done in all participant blood banks were less than 50% (0--37.5%) and there was no similar study.

Blood grouping and compatibility testing were performed in all blood banks according to regular procedures, but no blood banks made antibodies screening test (which is the standard procedure for final compatibility testing) due to shortage in reagents and equipment. Regarding preparation of blood components, our finding revealed that blood banks prepared blood components (RBCs, plasma, and platelets) without applying quality procedures. This may be due to the lack of standards/guidelines and trainings.

Our study showed that 10 blood banks perform blood components preparation, which indicates some improvement in Blood Transfusion Service. Most blood banks performed HIV, HBV, HCV and syphilis tests for blood donor's samples by ELISA methods. This reflects

growing better understanding of the importance of TTIs prevention and control.

Our findings showed that none of the blood banks uses NAT for the confirmation of reactive samples due to the lack of financial resources in Sudan, compared to findings from Saudi Arabia that uses NAT for confirmation. The overall blood banks service quality score showed that only blood banks achieved highly satisfactory (81.8%) score. Therefore, more efforts are needed to improve service quality in blood banks.

CONCLUSION

The findings highlight the increasing challenges facing BTS in Sudan especially the lack of therapeutic transfusion, poor QAS, and predominant dependence on the family donors. Therefore, there is a need to develop and train blood banks staff on QAS and to increase awareness among public on the importance of voluntary donation. A wider scale evaluation of BTS in whole blood banks is recommended. The number of staff showed marked variation between different blood banks. Although this may reflect workload and donors number, there is a need to standardize staff number per 1000 donors—which is currently not available—to ensure proper performing of activities with high quality.

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