International Journal of Current Research and Academic Review

Frequency of Transfusion Reactions Following Compatible Cross Matching of Blood: A Study in Owerri Metropolis

Okoroiwu, Ijeoma Leticia[1], Obeagu, Emmanuel Ifeanyi[2], Elemchukwu, Queen[3], Ochei, Kingsley Chinedum[4] and Christian and Serekara Gideon[3]

[1]Ph.D, Senior Lecturer, Department of Medical Laboratory Science, Faculty of Health Sciences, Imo State University, Owerri, Nigeria
[2]Diagnostic Laboratory Unit, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria
[3]Rivers State College of Health Science and Technology, Rumueme, Port Harcourt, Nigeria
[4]Department of Medical laboratory Science, Ambrose Alli University, Ekpoma, Edo State, Nigeria
*Corresponding author

KEYWORDS	A B S T R A C T
Transfusion reaction, Cross matching, Blood and Imo	The incidence of transfusion reaction was determined in some health centers in Owerri. Five thousand, five hundred and fifty units of blood were transfused in all the centers used for the study over the period of six months. Thirty units were returned based on transfusion reactions which had a percentage of (0.6. The units returned were classified in percentage into groups as follows. A blood group O positive 17 (56.7%, blood group A positive 8 (26.7%, blood group B positive 2 (6.7% and blood group O positive transfused to B positive 3 (10%. Investigation into the possible causes of the transfusion reactions using standard serological procedures, revealed the following results. Eighteen were unknown and were more on subjects who had multiple transfusion, 3 were caused by clerical error, (5% by long storage of donor cells, 4 by bacterial contamination. In conclusion, transfusion reaction could occur in supposed properly cross matched compatible units of blood due to clerical errors, bacterial contamination, storage and unknown antibodies.

Introduction

Blood transfusion is a process of transfusing blood from a donor to a recipient. The blood transfused could be whole or fractionated depending on the medical condition of the recipient (Callum, 2005. Blood transfusion is very important curative and preventive medical procedures especially in tropical countries where anemia is prevalent. It is also required in surgical procedures as well as blood loss resulting from accident or any kind of bleeding. Blood giving to the recipient is usually obtained from a suitable donor who qualifies in all the requirements according to American association blood

bank (AA BB standard for donor qualification (Callum and Pinkerton, 2005). The blood to be transfused is usually fresh or properly stored in a quality anticoagulated bag for proper maintenance of its viability and integrity (Jones *et al.,* 2006). Blood transfusion is however limited the existence of antigens and antibodies which if not compatible will cause clumping of the transfused cells in vivo, as a result of this, the same blood group transfusion is advocated, some blood group are referred to as universal donors like blood group O, while AB are said to be universal recipient.

As a result of scarcity of blood, universal donor could sometimes be giving to other groups where they are compatible, while universal recipient can receive from any other group. It has been observed that this kind of transfusion, most at times though compatible when tested in vitro could result to transfusion reaction in vivo considering the fact that the O individuals may contain anti A and anti B which may not be neutralized when transfused to other blood groups other than O. this group of O are known as dangerous O (Climent-Peris and Velez-Rosarior, 2007).

Transfusion reaction can equally arise due to other factors such as incompatibility arising from clerical errors, bacteria, parasitic, and viral infections. Other factors which can cause transfusion reaction are leucocyte antigen, unknown antibodies, circulatory overload, citrate toxicity and storage.

Blood transfusion reaction is usually investigated by re-establishing the identity of the patient repeating the ABO and Rhesus blood groups, repeating the compatibility testing and some other procedures (Callum and Pinkerton, 2005).

To access the incidence of transfusion reaction in supposed compatible blood transfusion.

- To determine the number of transfusion made in some transfusion centers in Owerri within the study period of 32 weeks.
- To access the numbers of transfusion reactions in the study centers.
- To access which of the blood group is mostly encountered.
- To determine the possible causes.

Materials and Methods

Study Area

The study was conducted in Owerri, Imo State capital. The centres used for the study were serology units in public health centres and some private ones. Owerri is located at the Eastern region of the country Nigeria. It has boundary with other state such as Rivers, Anambra and Abia State. It is a home for all; it is serviced health wise by Federal, state and private owner health institutions.

Study Population

The study was conducted on 30 units of blood reacted to by the recipients. Also investigated were pre and post samples collected from the above subjects.

Ethical Clearance

Introduction letter obtained from the head department of Medical Laboratory Science was presented to the ethical committee of the study centers along with a detailed proposal of the study.

Based on their consideration, access was given to me to work in the relevant units along with the scientist in charge.

Investigations carried out and Methods

The following investigations were carried out:

1. Re-establishment of patients' identity.
2. Re-grouping of pre and post samples
3. Re-cross matching
4. Direct comb test
5. Blood culture

Methods

On observing reaction from the subjects, the transfusion was stopped. 2mls of blood was collected from the other hand of the subject different from where the blood was transfused. 1ml was put in EDTA bottle and the remaining in a dry tube and allowed to clot.

Re-establishment of the subjects' identity was done by checking the identity of the subjects on the blood bag and the information in the register and pre sample.

Re-grouping of pre and post samples: This was done using cell and serum grouping using both tile and tube method.

Tile Method

One drop of anti A, B, AB, and D were placed respectively on the spaces provided for them on the tile. A drop of 10 percent suspension of cells from the samples under test was added to each of the respective antisera.

The mixture were mixed using applicator sticks and rotates until clumping was observed and the result interpreted based on where there was clumping. Serum grouping was done using tube, known cells and subject's serum. The procedure was the same as the cell grouping but in place of anti sera A, B, and O cell were used and the mixture spun at 3,500 rpm for 15 seconds and read microscopically for agglutination.

Cross matching was done using the following techniques:

a   Saline at room temperature
b   Saline at 37^{oc}
c   Albumin
d   Indirect antiglobulin techniques

Saline at room temperature

Two drops of the subjects serum was placed in tube 10x75mm. A drop of 5% washed cell suspension of the donor's cells were added, the mixture was incubated for an hour at room temperature. The reactions were examined microscopically.

Saline at 37^0C was the same as the above but incubated at 37^0C.

The albumin technique is the same as the above but 2 drops of bovine albumins was added before incubation for one hour and the mixture spun at 1000rpm for 15seconds and the result were read microscopically.

Indirect antiglobulin technique: Two drops of subjects serum was placed on 10x75mm tube, a drop of a washed 5% donor's cells were added. The mixture was incubated for 15minutes at 37^oC, after which the mixture was washed three times in a large amount of saline and drops of the antiglobulin reagent, was added.

The mixture was spun at 3,500rpm for 15 seconds are examined for agglutination. The entire test was done alongside with relevant

control. Blood culture was done by a microbiologist.

Result and Discussion

Transfusion reactions were investigated in some transfusion centre in Owerri Imo state. The result obtained is as represented in the Table 2 and 3.

Five thousand five hundred and fifty transfusion were observed (5,500 out of which blood group O had the highest of three thousand, six hundred and ninety eight (3698 units, A had one thousand two hundred and fifty (1, 250 units, B positive had four hundred and forty nine (449 units, AB had one hundred and fifty (150 units, O negative had 2 units, B negative had 1 unit. This is represented in Table 1.

Table.1 Represent the number of transfusion according to blood types

No of unit transfused	A^+	B^+	AB^+	O^+	O^-	A^-	B^-	AB^-
5550	1250	449	150	3698	2	NON	1	NON
%	22.5%	8.1%	2.7%	66.6%	0.036%	0	0.02%	0

Table.2 Represent the pattern of transfusion reactions observed during the study period

No of unit	NO OF REACTION	O^+	A^+	B^+	O Transfused To A	O Transfused To B
5550	30	16	8	2	2	2
%	0.54%	53.33%	26.67%	6.67%	6.67%	6.67%

Table.3 Represent the type of transfusion reactions observed

No of reaction	Clerical error	storage	Bacteria	unknown
30	3	5	4	18
%	10%	16.67%	13.33%	60%

It was observed that out of 30 reactions, 3 were caused by incompatibility as a result of clerical error, 5 were due to storage, 4 were caused by bacteria contamination and 18 were unknown.

The incidence, pattern and causes of transfusion reactions in compatible transfused blood were determined in Owerri. During the study of 32 weeks, five thousand five hundred and fifty (5550 units of blood were issued out for transfusion. Blood group O had the highest of 3698 units (66.6%. A had 1250 units (22.5%, B had 449 units (8.1%, AB had 150 (2.7% O negative had 2 units (0.036%, B negative had 1 unit (0.02%. Looking at the spread in the groups issued out for transfusion, one would say it is in line with the frequency of occurrence in

each of the groups in all the past studies on the prevalence of blood groups, especially in

Africa. O has been the most prevalent, followed by A, B and others (Wallace and Gibbs 1986. Again blood group O is a universal donor therefore can always donate as their group can be given to any person they are compatible with.

The prevalence of transfusion reaction were recorded as (0.54%, Chanbers et al had 5.0% reported incidence of transfusion in whole

blood as 0.5 Weinman et al reported incidence of 0.07 to 6.8 of febrile non haemolytic reaction per red cell unit transfused.

Penidia and Taswell (2005) in their study reported that approximately 3% of mild allergic reactions in all blood products transfused. Audet (2007) reported incidence of anaphylaxi as 0.00013% per unit transfused, Popovsky (2006) reported circulatory overload as 1%. The highest reaction was equally observed among blood group O units. The reason may be because more of group O unit, were transfused. Again group O has anti A, anti B and anti AB which often has a significant IgG component. Again potent anti A found in Bombay destroys transfused red cells of any ABO group. Again anti A and anti B found in group O can cause rapid intravascular haemolysis through complement fixation. The transfusion reaction when classified according to types gives the following results, the highest of 18 (60%) was unknown. Haemolysis of cross matched compatible blood is an immune mediated reaction that involves undetectable antibodies.

Reaction could equally be caused by non immune based on physical factor such as erythrocytes osmotic pressure resulting from transfusing blood through the intravenous line that is simultaneously delivering hypotonic saline, which red cells are highly sensitive to this can lead to massive haemolysis that may present clinically as acute haemolytic transfusion reaction, non antibody based factors such as transfusion of RBC from donors deficient in G6pd can result in haemolysis especially in infants (Penidia and Taswell, 2005).

Also large scale complement activation by immune complexes not associated with RBC can lead to bystanda haemolysis of RBC not coated with antibodies. In addition cellular immunity can lead to haemolysis. White cell alloantibodies can cause febrile non hemolytic transfusion reaction in the patients plasma may react with white cell in the donor blood product (Heinrich *et al.,* 2001) platelet antibodies.

Storage can lead to the generation of leucocyte derived cytokines (Heddle *et al.,* 2008). Citrate toxicity in stored blood can cause acute transfusion reaction as it forms complex with calcium resulting in decreased ionized calcium and a hypocalcemic state. Bacteria could be introduced through blood collection; blood bag and processing of blood (Brumit *et al.,* 2003).

Bacteria can be introduced through blood collection, storage or during processing for transfusion.

Conclusion

Blood transfusion is associated with various hazards ranging from transfusing transmissible diseases such as HIV, HCV, and HBV. Frequently, the causes of transfusion reactions are attributable to patient misidentification, sample error, wrong issuance of blood, and error in administration, technical error and storage. However, patients may still be at risk of adverse effects despite blood safety measures, these includes acute and delayed hemolytic transfusion reactions, febrile non-hemolytic transfusion reactions, transfusion related acute lung injury (TRALI), major and minor allergic reaction, transfusion associated circulatory overload, hypothermia, hypotension and transfusion-related transmitted infections. It is therefore advocated that every precaution be taken to avoid all these hazards.

Recommendation

Transfusion reactions remain a significant risk associated with blood-product administration. From severe life threatening reactions to benign side effects, patients are exposed to a number of hazards when receiving blood products. However, with the knowledge of these reactions, blood banks and transfusion services are uniquely positioned to followed guidance regarding safe transfusion services. Transfusion reactions require immediate recognition, laboratory investigation and clinical management.

References

Brumit, MC., Hay, SN., Brecher, ME., 2003. Bacterial detection in Brecher ME (ed). Bacterial and parasitic contamination of blood components. Bethesda, Md. American Association of Blood Bank. Pp. 57–81.

Callum, J.L., Pinkerton, P.H., 2005. Transfusion reaction. Blood transfusions, blood alternatives and transfusion reaction. A guide to transfusion medicine. Pp. 34–65.

Climent-peris C., Velez-Rosarior. 2007. Immediate transfusion reactions. *PR. Health Sci*, 20: 229–35

Heddle, NM., Klama, L., Singer, J. *et al.,* 2008. The role of the plasma from platelet concentrates in transfusion reactions. *N. Engl. Jur. Med*. 331: 625-628

Heinrich, D., Mueller Eckhart, C., Stier, W., 2001. The specificity of leucocyte and platelet allo-antibodies in sera of patients with nonhemolytic transfusion rections: absorbndtions and elution studies. *Vox Sang,* 25: 442-56.

Jones, H., Stainsby, D., Asher, D., 2006. Serious hazards of transfusion. *Transfused Med. Rev*., 20: 273-82.

Penidia, A.A., Taswell, H.F., 2005. Transfusion reactions associated with anti IgA antibodies: report of four cases and review of the literature. *Tansfusion,* 15: 10–15.

Popovsky, M.A., Audet, A.M., Andrzejewski, C.J. 2006. Transfusion associated circulatory overload in orthopedic surgery patients: a multi-institutional study. *Immuno hematology,* 12: 87–8.