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Original Research Article

EVALUATION OF ADVERSE TRANSFUSION REACTIONS AND EVENTS IN RECIPIENTS OF BLOOD AND BLOOD PRODUCTS AT A TERTIARY CARE HOSPITAL IN NORTHERN ASSAM: A HOSPITAL BASED STUDY

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ABSTRACT

Background: Transfusion of blood and blood products is a routine lifesaving medical intervention. However, this essential lifesaving therapy is often found to be associated with significant clinical risks due to various adverse transfusion reactions. The present study is done with the primary objective to determine the frequency and nature of adverse transfusion reactions occurring in hospitalised patients who required blood and blood product transfusion.

Materials and Methods: The study was conducted in the Department of Pathology, Jorhat Medical College, Assam during June 2021-May 2022. All patients excluding the neonates who received transfusion of blood and blood products in the hospital during the study period, were selected to analyse the frequency of adverse transfusion reactions and events. Out of these patients, 36 patients who showed adverse transfusion reaction were selected for detail work up and to determine the nature of transfusion reactions. Statistical analysis was done and p values were found out.

Results: Out of 36 adverse transfusion reactions, 19 were seen in female patients (52.78%). Majority of cases were observed in the age group 21-30 years (33.33%). Incidence of transfusion reaction was highest with the transfusion of whole blood (0.27%), followed by Platelet Concentrate (0.15%) and PRBC (0.13%). The most common type was found to be Febrile Non-hemolytic transfusion reaction (FNHTR) comprising of 21cases (58.33%) cases.

Conclusion: The incidence of adverse transfusion reaction in our study is 0.21%. The observations emphasize on leukodepletion in case of whole blood use and preferential use of packed red blood cells as feasible to minimize incidence of febrile non-haemolytic transfusion reactions. Comprehensive education regarding nature and type of transfusion reaction like Transfusion associated lung injury can definitely aid on prompt diagnosis and timely intervention in those cases.

Keywords: Adverse Transfusion Reaction, Blood Transfusion, Febrile Non-Haemolytic Transfusion Reaction.

INTRODUCTION

Blood transfusion is an integral part of treatment and management of various clinical situations like severe anemia, major accidents, major surgeries. Prior to the discovery of blood group antigens, one third of human transfusions showed adverse outcomes resulting into non-severe and severe conditions and often resulting in death. In 1901, Karl Landsteiner on his breakthrough work on blood properties, discovered blood group antigens, which subsequently transformed the blood transfusion therapy into a

relatively safe procedure and minimizing the hazards to a great extent.[1] An adverse reaction is defined as an unwanted effect or undesirable response temporally associated with the procedure of transfusion of blood and blood components in to a patient's body.[2] A detailed analysis of adverse transfusion reactions is the most important objective of a hemovigilance system so that any recurrence of undesirable effects of the lifesaving transfusion therapy can be minimised and prevented in future.[3] In a developing country like India, the hemovigilance system is still at its nascent stage and very little due importance is paid for improvement of the same. The laid down procedure of recording and reporting of adverse events is highly inadequate and voluntary in nature. Hence, the present study is intended to be done with the primary objective to determine the frequency and nature of adverse transfusion reactions occurring in hospitalised patients who required blood and blood product transfusion at Jorhat Medical College and Hospital, Assam and compare it with related studies from India and abroad.

MATERIALS AND METHODS

The study was a hospital-based cross-sectional observational study which was conducted in the Department of Pathology for a period of one year from June 2021 to May 2022. All patients excluding the neonates who received transfusion of blood and blood products and Jorhat Medical College and Hospital, during the study period, were selected to analyse the frequency of adverse transfusion reactions and events. During the study period, a total of 17369 units of Blood and blood products were transfused. A total of 36 patients that showed adverse transfusion reactions following transfusion of blood and blood products were included in the study.

Exclusion criteria:

- Patients with history of administration of injectable anti-allergic or corticosteroids just prior to initiation of blood transfusion.
- Known cases of atopy or asthma.
- Neonates

After initiation of any adverse transfusion reaction, work up and evaluation was done, e.g., identification of the patient, ruling out clerical errors, inspection of the reactive blood unit for visible clot or haemolysis. Both pre and post-transfusion samples of patient were collected, and ABO grouping and Rh typing were repeated on both. Also, blood from a segment of the tubes attached to the blood bag was used for rechecking any previous error in ABO grouping and Rh typing. Direct anti-globulin test (DAT) was done on patient's blood. Bacteriological testing was done to rule out bacterial contamination in the reactive bag unit.

Investigations were done according to clinical features in cases of non-haemolytic transfusion reactions, e.g. Chest x-ray in suspected cases of Transfusion Related Acute Lung Injury (TRALI).

Febrile Non-Haemolytic Transfusion Reaction (FNHTR) and allergic and anaphylactoid reactions were diagnosed by their clinical symptoms mainly fever, chills, rigors and rashes, the aetiology of which cannot be attributed to any other primary cause.

Table 1: Distribution based on blood and blood components issued

Type of Blood	Number of blood components	Percentage %
Whole Blood	10834	62.38
Packed Red blood cell	4779	27.51
Fresh Frozen Plasma	1067	6.14
Platelet concentrate	689	3.97
Total	17369	100

Table 2: Distribution of transfusion reactions according to age-group of patients

Age Groups (In Years)	Number of adverse reactions	Percentage %
<1	NIL	0
1-10	1	2.78
11-20	2	5.56
21-30	12	33.33
31-40	9	25
41-50	5	13.89
51-60	2	5.56
61-70	4	11.11
71-80	1	2.77
Total	36	100

Table 3: Distribution of total blood units according to blood groups:

Blood Groups	Number of units issued	Percentage %
A+ve	4287	24.69
B+ve	4589	26.42
AB+ve	1624	9.35
O+ve	6394	36.81
A-ve	108	0.62
B-ve	120	0.69
AB-ve	82	0.48
O-ve	165	0.95
Total	17369	100

Table 4: Distribution of adverse reactions based on type of reaction:

Type of reaction	No of cases	Percentage %
FHNTR	21	58.33
Allergic	11	30.55
Mixed type (FHNTR + Allergic)	2	5.56
Non-specific	2	5.56
AHTR	--	--
TRALI	--	--
TACO	--	--
Total	36	100

Table 5: Distribution of Adverse Reactions based on type of blood unit transfused

Type of blood unit transfused	No of adverse reaction	Percentage %
Whole blood	29	80.56%
Packed red blood cells (PRBC)	6	16.66%
Platelet concentrate	1	2.78%
FFP	0	0.0
Total	36	100

RESULTS

During the study period, a total of 17369 units of blood and blood components were issued. Whole blood (WB) was issued the maximum (62.38%) followed by Packed Red Blood cell (PRBC), (27.51%), Fresh Frozen Plasma (FFP), (6.14%) and Platelet Concentrate (PC), (3.97%). [Table 1]

During the study period, out of 17369 units of blood and blood components that were issued, a total of 36 numbers of adverse transfusion reactions were reported (incidence: 0.21%) with majority of cases occurring in females,19 cases (52.78%). This was found to be statistically not significant, p value >0.05 using Chi Square test. Out of 36 cases of adverse transfusion reactions, majority of cases were observed in the age group 21-30 years (33.33%), followed by age group of 31-40 years (25%) [Table 2]. Patients with blood group O+ve showed highest numbers of adverse transfusion reactions,14 cases (38.89%) followed by B+ve blood group, 11cases (30.56%). [Table 3]

It was observed that all the adverse reactions occurred within 24 hours of starting the transfusion i.e. all the reactions were found to be of acute type. The most common symptom reported by patients during the occurrence of adverse transfusion reaction was Fever, seen in 15 patients (41.67%) followed by Chill, seen in 9 patients (25%). The most common type of adverse reaction was found to be Febrile Non-Haemolytic transfusion reaction (FNHTR), 21cases (58.33%), followed by allergic reactions, 11 cases (30.55%). [Table 4]

Out of 36 reactions, majority of reactions occurred with whole blood, 29 (80.55 %) cases followed by Packed Red Cells, 6 cases (16.67%), [Table 5] while no transfusion reaction was seen with Fresh Frozen Plasma. All the 36 patients having adverse transfusion reactions were of Non severe type (Grade I) and they recovered on symptomatic treatment.

DISCUSSION

The findings of this study were compared with various other studies. During the study period i.e. from June 2021-May 2022, a total of 17369 units of blood and blood components were issued to various departments. It was observed that Whole Blood (WB) was issued to maximum patients, 10834 units (62.38%), followed by Packed Red Blood Cells (PRBC) 4779 units (27.51%), Fresh Frozen Plasma (FFP) 1067 units (6.14%), and Platelet Concentrates 689 units (3.97%). The high percentage in usage of whole blood may be due to lower amount of component preparation.

Venkatachalapathy TS, D.R. Somagari et al,[8] RTK Sinha et al,[9] also reported whole blood transfusion to be highest at 76.11%, 52.1%, 68.15% and respectively. However, the above data is inconsistent to the data reported by Joo-Young Cho et al,[10] Somnath Mukherjee et al,[11] Anandaraj Vaithy K et al,[12] where they had all reported a higher percentage of Packed Red Blood Cell (PRBC) transfusion of 85.5%,71%, 45.0%, respectively. This usage might be explained by increased production and uses of blood component over whole blood in these institutes.

During our study, it was observed that out of total 17369 units of blood and blood components issued, 36 cases (0.21%) resulted in adverse transfusion reactions (ATR).This finding was found to be similar to the studies carried out by P. Bhattacharya et al,[13] Alexis R. Harvey et al,[14] D.R. Somagari et al,[15] M. Sidhu et al,[16] Urmi Chakravarty Vartak et al,[17] S. Shajil et al,[18] S. Pahuja et al,[19] Rajni Bassi et al,[20] S. Mukherjee et al,[21] M Borhany et al.[22] Suryatapa Saha et al,[23] Anandraj Vaithy K et al.[14] In contrary to our study, studies conducted by Chowdhury FS et al,[25] Musa K. Waiswa et al,[26] Yao et al,[27] Joo-Young Cho et al,[28] Abdul -Wahab M Al-Saqladi et al,[29] reported higher frequency of adverse transfusion reaction. A total number of 36 cases of adverse transfusion reactions were reported out in our study , out of which majority of the reactions, 19 reactions (52.78%) occurred in female patients whereas 17 cases (47.22%) occurred in males patients .This may be due to multiple blood transfusions in perinatal women which is similar to other studies done by M Sidhu et al,[30] Gita Negi et

al,[31] D.K. Sharma et al,[32] Rajni Bassi et al,[35] T Ramanathan et al,[34] D.R. Somagari et al,[15] S. Shajil et al,[18] Anandraj V K et al.[24] In contrary to our study, studies conducted by Chowdhury FS et al,[25] Musa K. Waiswa et al,[35] Yao et al,[27] Joo-Young Cho et al,[28] Abdul -Wahab M Al-Saqladi et al,[29] reported higher frequency of adverse transfusion reaction.

In our study, majority of transfusion reaction cases were observed in the age group of 21-30 years, 12 cases out of 36 total cases of adverse transfusion reactions (33.33%). This data is similar to the data reported by D.R. Somagari et al,[15] Rajni Bassi et al. 20, where they had reported 25% and 41% of patients suffering from transfusion reaction were in the age group of 21-30 years respectively.

This may be due to the higher number of pregnancy cases in this age group that generally receive multiple blood transfusion. Repeated transfusions lead to allo-immunization against RBC antigens which causes increased risk of transfusion reaction. Anjali Handa et al,[35] in 2020 in the department of Immunohematology and Blood Transfusion, Punjab found in their studies that females have been observed to be more prone to develop allo-immunization than males probably due to the fact that females especially in the developing countries are anemic and pregnancy is important risk factors for allo-immunization.

During the study, it was noted that most number of patients who showed transfusion reaction were of the blood group O+ve, 14 cases out of 36 i.e. 38.89%, followed by B+ve blood group, 11 cases out of 36 i.e. 30.56%. which was similar to studies by D.R. Somagari et al,[15] and V K Gente et al,[36] where they reported higher percentage of transfusion reaction in the blood group O+ve as 52.7% and 38% respectively. O+ve blood group being the highest issued blood group for transfusion may be the cause of highest number of reactions as well.

However, Anandraj V K et al.[24], Sahoo D et al,[37] reported higher percentage of transfusion reactions in patients having AB+ve blood group (34%) and B+ve blood groups (21%) respectively.

In our study all of the adverse reactions occurred within the first 24 hrs of blood transfusion, which means all the reactions were of acute type. P. Bhattacharya et al,[13] P. Kumar et al.38, M Sidhu et al,[30] S. Pahuja et al,[19] Anandraj V K et al.24, had also reported similar frequency of acute transfusion reactions. On the contrary, B. Keller-Stanislawski et al,[39] found that only 58% of the reactions were of the acute type. During the study, the most common complaint made by patients were Fever, 15 cases (41.67%), followed by Chill, 9 cases (25%). Chakravarty V U et al,[17] reported fever with chills as most common type of reaction, T Ramanathan et al,[34] reported fever, tachycardia, chills and rigor as the most common signs, whereas Sahoo D et al,[37] reported fever in 33% and chills and rigor in 23%. P. Kumar et al,[38] reported highest number of cases related to rash (48.5%).

Out of total 36 adverse transfusion reactions, the most common type was found to be Febrile Non-Hemolytic Transfusion reaction (FNHTR), 21cases (58.33%) cases, followed by allergic reactions 11 (30.55%) cases which is similar to the study done by Priya S et al.[40]

During the study, the incidence of transfusion reactions were found to be maximum with whole blood transfusion, 29 cases (80.55%) followed by packed red blood cells, 6 cases (16.67%) and Platelet Concentrate 1 case (2.78%). In conformation to our results, studies carried out by P. Bhattacharya et al,[13] S. Pahuja et al,[19] D.R. Somagari et al,[15] M Sidhu et al,[30] also reported higher incidence of transfusion reactions due to transfusion of whole blood.

However, the above data is discordant to the data reported by S. Shajil et al,[18] R Bassi et al,[20] M Borhany et al,[22] Anandraj V K et al,[24] T Ramanathan et al,[34] who had reported PRBC as major blood type related with transfusion reactions. This may be because of more use and preference of blood components over whole blood in these institutes. Studies carried out by Anandraj V K et al,[24] R Bassi et al,[20] and S. Pahuja et al,[19] also observed similar incidences of transfusion reactions with respect to total blood and blood components issued. During the study it was found that out of total 36 cases of adverse transfusion reactions, 21 patients (58.33%) had a history of blood transfusion. Data reported in other studies such as, R Vasudev et al,[42] R Bassi et al,[20] V K Gente et al,[36] also reported 52.8%, 53% and 36.5% cases with previous history of transfusion.

CONCLUSION

The incidence of adverse transfusion reaction in our study is 0.21%. Transfusion of whole blood attributed to the maximum number of transfusion reactions. Preparation and use of blood components instead of whole blood should be increased to reduce the incidence of adverse transfusion reactions. Adverse transfusion reactions can be reduced in our institute by implementation of a well-coordinated hemovigilance system which begins right from donor selection, strict bedside monitoring and awareness regarding transfusion reactions.

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