Original Article

FREQUENCY OF ABO BLOOD GROUP DISCREPANCIES AMONG PATIENTS AND DONORS: THEIR IDENTIFICATION AND RESOLUTION

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ABSTRACT

Objective: The aim of this study is to determine the frequency of common ABO discrepancies among patients and blood donors at Chughtai Institute of Pathology (CIP) and the measures taken to resolve them. Thus, enabling timely prevention of undesirable events during transfusion of blood components.

Material and Methods: It was a Retrospective observational study analyzing disparity in routinely encountered ABO blood group tests at blood bank of Chughtai Institute of Pathology between Year July 2019 to June 2020. These were detected serologically in blood donors and patients, where discordant results of forward and reverse method of blood group or both were recorded and interpreted by agglutination viewer and microscopic analysis.

Results: A total 20,401 blood groups were performed in blood bank of Chughtai Institute of Pathology, Lahore from the year July 2019 to June 2020. Both male and female patients were included for ABO blood group testing. The male to female ratio was 0.96:1 and age ranges from 6 months to 80 years. ABO blood group discrepancies were detected in 33 patients out of 20,401(0.161%). Most common type of discrepancy encountered was weaker reactions in forward group particularly A type blood group due to variable antigenic distribution on red cells

Conclusion: It is essential to identify and resolve various blood group discrepancies to avoid acute hemolytic transfusion reactions.

Key Words: ABO discrepancies, Forward group, Reverse group**.**

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INTRODUCTION

ABO blood group is the common of all blood group systems in transfusion medicine. ABO blood group antigens are found on red cells, platelets and other body proteins. ABO blood group system is of four major types, (A, B, AB and O), characterized by the presence of two major antigens A and B and B with presence or absence of A or B antibodies formed against missing antigens [1].

Common ABO blood group discrepancies come to notice when the results of forward and reverse grouping are discordant and unexpected reactions occur in both red cell and serum grouping. The main reason for these discrepancies is due to intrinsic defects in red cell antigens and serum antibodies, along with technical errors [2]. Normally red cell and serum grouping give strong (3+) to (4+) reaction. Discrepancies, however, appear as a weaker reaction (1+ to 2+) in forward or reverse group. Common causes are weak subgroups, and auto-antibody or alloantibody. Therefore, these variant results should be noted and sorted out by a thorough and detailed history (age, history of blood transfusion, drug history or pregnancy), serological workup and essential steps taken to resolve such discrepancies before commencement of blood transfusion. Resolution of these unexpected results are done by performing the reactions at various temperatures or by washing red cells with normal saline to clear abnormal proteins [3].

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ABO discrepancies are of four major types:

Type I: These arise due to weak or unexpected reactions in reverse grouping due to weak antibody expression especially in newborns, elderly and patients on immunosuppressive therapy.

Type II: These occur as a result of unexpected reactions in forward grouping due to weak antigen expression (weak antigens, subgroups of A and B)

Type III: These discrepancies are caused by plasma abnormalities and results in pseudo agglutination or rouleaux formation.

Type IV: These arise as a false positive or false negative reaction in both forward and reverse grouping due to miscellaneous disorders (pan agglutination) [4].

Transfusion of ABO incompatible blood can be associated with intravascular hemolysis, kidney failure and ultimately death. ABO blood grouping and compatibility testing is of utmost significance and forms the basis of pre-transfusion testing [5].

Resolution of these discrepancies involve various procedures according to the type of variability in blood grouping results, such as increasing the serum: cell ratio or room temp/ 4-degree Celsius incubation in weak reverse grouping results and 37-degree Celsius incubation in case of weak reaction in reverse or forward group indicating an alloantibody / autoantibody. Further steps include Elution / Adsorption technique [6].

MATERIALS AND METHODS:

The study was conducted at blood bank of Chughtai Institute of Pathology (CIP). It was a retrospective, Observational study. A total of 20,401 samples were taken ranging from the age of 6 months up to 80 years. The minimum sample size was calculated as 1476 by taking 95% as the confidence coefficient and 0.04 as the prevalence of blood group discrepancies [7]. There were 10,390 female patients and 10,011 male patients. All blood samples were obtained from peripheral venous collection by phlebotomy/ arm venipuncture technique, in potassium EDTA (K2 EDTA) collection tube and serum samples in clotted vial with yellow top. Blood group analysis was performed by tube method. In tube methodology, forward (red cell) technique in which 3% to 5% suspension of red cells were mixed with commercially prepared Anti A, Anti B and Anti D(Rh) was performed. Reverse type method was performed by adding 2 drops of Patient's serum with reagent A, B and O red cells in glass tubes. All these tubes were kept in centrifuge at 3000 rpm for 15 seconds and observed for agglutination. Discrepancies in any of the following results were resolved with incubation at 37 degrees Celsius (pre warm technique), increasing the serum to cell ratio, saline suspension of red cells, 4^{o}C incubation, running Auto control, O cell control and antibody detection and identification procedure. The positive and negative results were confirmed by agglutination viewer and microscopy, so that the weaker reactions are not missed [8].

Frequency distribution of blood group type and type of discrepancies were given. Chi-square test of association was applied to observe significant association of blood group type and type of discrepancy. A 5% or less level of significant was consider as significant. SPSS version 26 was used for statistical analysis.

RESULTS

A total of 20,401 samples for blood group detection were received at blood bank of CIP from July 2019 to June 2020. Male (10,011) and Female (10,390) with age ranging from 6 months to 80 years. Common blood group types found during routine testing in our study population are elaborated in Table-I. Discrepancies were noted in 33 out of 20,401 patients that constitute about 0.161% of the total. Out of these the most common inconsistent result found was type II discrepancy with variable subgroups (24) comprising around 72.7% of total. Other types included type I (6) constituting about 18%, while (2) were of miscellaneous type IV a total of 6.6%. Technical errors accounted for about 3% of total cases, that is, 1 out of 33 cases [9] (Table-II).

Table-I: Common blood group types seen in ABO discrepancy cases.

Blood group	**Frequency**	**Percentage**
B Positive	**13**	**39%**
A Positive	**11**	**33%**
O Positive	**5**	**15%**
AB Positive	**2**	**6%**
O Negative	**2**	**6%**

Table-II: Total percentage of discrepancies.

Variables	**Number**	**Percentage**
Total Cases of Blood Groups	20,401	.
Abo Discrepant Positive cases	33	0.161%
ABO discrepant neg cases	20,368	99.83%

Table-III: Frequency of types of discrepancies.

Type of discrepancy	**Number**	**Percentage**
Type II	24	72.7%
Type I	6	18%
Type IV	2	6.6%
Technical Errors	1	3%

Table-IV: Crosstab of discrepancies with blood group and type of ABO discrepancies.

Factor	Categories	Type of Discrepancies				Chi-square (p-value)
		Type II	Type I	Type IV	Technical Errors	
Blood Group	B Positive	07	05	0	01	
	A Positive	11	0	0	0	
	O Positive	05	0	0	0	27.24 (0.01)*
	AB Positive	01	0	01	0	
	O Negative	0	01	01	0	
Total		**24**	**06**	**02**	**01**	

Chi-square test of association was applied to observe the association of blood group types and ABO discrepancy with type of discrepancies. Type of discrepancies were statistically significantly associated with blood group types.

DISCUSSION

ABO discrepancies account for majority of incongruous results in blood group testing. Appropriate patient/ donor identification and collection of a properly labeled blood sample, following standard protocol is crucial in performing routine blood tests [10].

This study was conducted at the blood center of Chughtai institute of pathology (CIP) Lahore. It retrospectively evaluated the incidence of common types of blood group discrepancies from the year June 2019 to July2020. A total of 20,401 blood groups were performed from July 2019 to June 2020. Patients of age 6 months to 80 years with 10,390 female patients and 10,011 male patients. Our institute reported 33 cases of discordant results, out of 20,401 blood groups performed, which accounted for a percentage of 0.161% [11]. Most common type of blood group variance results were due to weaker reactions in forward groups Type II (72.7%), of which subgroup of A accounted for majority of cases. Use of Anti A1-Lectin, A1, A2 and O cells along with adsorption, elution techniques were employed to recognize them. Unexpected reaction in forward group is due to weaker expression of blood group antigens. Next common was type I (18%) due to weaker reactions in reverse group, most likely occurring in older age groups, infants and patients with leukemia, lymphoma and immunodeficiency disorders. These weaker reactions are resolved by incubating cell: serum mixture at 4 Degree Celsius. Cold Autoantibodies and Alloantibodies constituted about 6.6% of the total. These were resolved by pre-warm technique. Technical and clerical errors comprised the lowest percentage i.e 3% of all [12].

Only a very few local studies have been published regarding the analysis of frequency of ABO discrepancies from blood bank Centers in Pakistan [13]. This study aims to investigate the distribution frequency of various types of dissimilar blood group results on antigen and antibody typing and contribute to the provision of data. Research conducted by Zia Uddin University Karachi reported the overall incidence of ABO discrepancies in a tertiary care hospital of Karachi was 1.1% which was higher in frequency to the results of the present study (0.161%) [14].

Bashawri et al. studied analysis of ABO discrepancies in the Middle East, Saudi Arabia. In that particular study frequency of ABO discrepancies ranged from 0.05 to 0.09% [15]. Chiaroni et al. analyzed frequency of ABO discrepancies in 35 French hospitals and he found inconsistent results of 0.03% [2]. The study on analysis of ABO discrepancies in 35 French hospitals showed the incidence of ABO discrepancies of 1 per 3400, most of which were due to phlebotomy errors, collection from wrong patient and clerical errors in descending order. Similar study done at a university hospital in Saudi Arabia showed 261 discrepancies in 549229 samples. The most common causes were errors of blood collection during phlebotomy and clerical errors [16].

If measures are not taken to resolve these discrepancies, it can lead to life threatening situation. Therefore, precautions and actions must be taken to prevent such undesirable events

CONCLUSION

Forward and reverse blood group method is of the commonly performed tests in routine Laboratory. It is essential to assign a correct blood group to the patient/donor in order to avoid hazardous transfusion reaction. Pre-analytical and technical errors must be kept in check by following standard operating procedures regarding correct patient/ donor identification, labeling, technique and transcription of results in order to prevent serious transfusion reactions in the future.

AUTHOR CONTRIBUTION

Ghazala Qamar: Conception and design of work
Ayisha Imran: Drafting and revisions of the paper
Nauman Aslam Malik: Analysis of the manuscript
Akhtar Suhail Chughtai: Overall supervision.

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