

Prevalence of ABO and RH Blood Group and Sub-Group A1 and A2 in Blood Donors of Odisha - Experience of One Tertiary Centre

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Abstract

The paucity of report from Odisha regarding prevalence of ABO and Rh blood group promoted us to undertake the present retrospective study. Total number of subjects studied are 45,564. Prevalence rate of A, B and O are 9679 (21.24%), 13881 (30.46%) and 16662 (36.56%) respectively. The subgroup analysis showed of A1 and A2 has also been carried out in the present study. One case of A2 has been described which had antibody to A1 where there was difficulty in arranging the blood transfusion insisting there by the importance of subgroup analysis in the blood bank.

Keywords: Blood group; Population; Blood donors

Introduction

India is a vast country and the population is genetically heterogenous. Therefore, the blood group distribution especially ABO and Rh varies from one to the other state [1-4]. There is no published report on ABO and Rh blood group from Odisha. Odisha consists of 23% of ST and 17% of SC population and rest is of general caste.

Therefore, the present communication is an attempt of one tertiary care centre i.e. Apollo Hospitals, Bhubaneswar, Odisha to report the distribution of ABO and Rh with special reference to A1 and A2 subgroup of the Odisha population. People from different parts of Odisha are attending this hospital. Hence, it represents almost all the districts of Odisha.

Furthermore we have tried to emphasize in this present paper the need of A1 and A2 Distribution in our state, the importance of which many transfusion medicines personal do not realize, Attempt has been made therefore to highlight the importance of A1 and A2 sub Group. We innumerate here one case involving this problem:

Case Report

A 28 years female was admitted in the year 2015 to Apollo Hospitals Bhubaneswar with severe anemia (Hb-4.2 g/dL) for Blood Transfusion. The clinician requested for 2 units of PRC. While doing grouping and cross matching in the patients sample following are the observations (Figure 1).

Negative reaction with anti A1 lectin indicates it is not group A1. However, +++ reaction with Anti H suggests A sub group, but not A1 or A intermediate. Positive reaction with A1 cell indicates the presence of atypical antibody.

To confirm this test results serum grouping with A2 and O cell with Auto control was done. The test for atypical antibody was also carried out which showed the absence of atypical antibody. This confirms that the patient belongs to sub- group A2 with A1 antibody.

To confirm these results cross match was done with A2, A1 and O packed red cells, Both A2 and O packed red cells are compatible, whereas A1 packed red cell was incompatible by both Tube and Cat technique. Depending on these results, we transfused one unit of A2 packed red blood cell to the patient without any untoward reaction.

Methodology

For the present study we adopted the Following methods.

A total of 3 ml. of blood sample was collected pre donation in EDTA vial and one plain vial for clotted sample with the Unique Identification Number. ABO and Rh blood grouping was performed for each sample in Tube and Column Agglutination Technique. (Ortho clinical Diagnostics UK).

The reagent used was Anti A, Anti B, Anti AB, Anti D1 and Anti D2 manufactured by Tulip Diagnostics (P) Ltd. The A Cell, B Cell, and O Cell suspension was prepared in-house. All reagents were subjected to Quality control test including Titer and Avidity for each new lot used.

ABO grouping A and AB Sub group A1, A2, A1B and A2B depending upon the reaction with A1 Lectin (*Dolichus Biflorus*) was also carried out [5-7].

The sample size of our study is 45,564; out of which 20,750 blood donors and 24,814 are recipients. Age of the subjects varies from 18 years to 65 years.

Forward Typing			Reverse Typing		
Anti A	Anti B	Anti D	A1 Cell	B Cell	O Cell
+++	Neg	+++	+	+++	Neg
Cell group- A+ve			serum group- O		
Anti A1 lectin	Anti H				
Negative	+++				

Figure 1: Observations of the patient's sample.

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Observation

Prevalence of ABO and its subgroup

In our five years study from 2011 to 2015 we have found highest number of donors and patients from Central Division of Odisha in comparison to the Northern and Southern parts of odisha (Figure 2a and 2b).

When the total number of subjects were divided to Donors and recipients (patients) there is not much change in the distribution of ABO and Rh blood group system Table 1a. The subgroup of ABO i.e

A1 and A2 have been shown in Table 1b. It can be noticed that A2+ve subjects vary from 0.11 to 1.94, where as A1+ve vary from 20.31 to 0.11.

Weak D prevalence in blood donors and patients

The prevalence of Rh blood group system is shown in Table 2. It is observed 03 subjects (0.014%) are weak D positive. We also studied the Rh negative recipients in different subgroups of ABO system. In total 15 recipient were found to have weak D (Table 3). According to different ABO blood group the distribution of Weak D is shown in Table 4. It is observed that the percentage of Weak D is more in Recipients than the blood Donors.

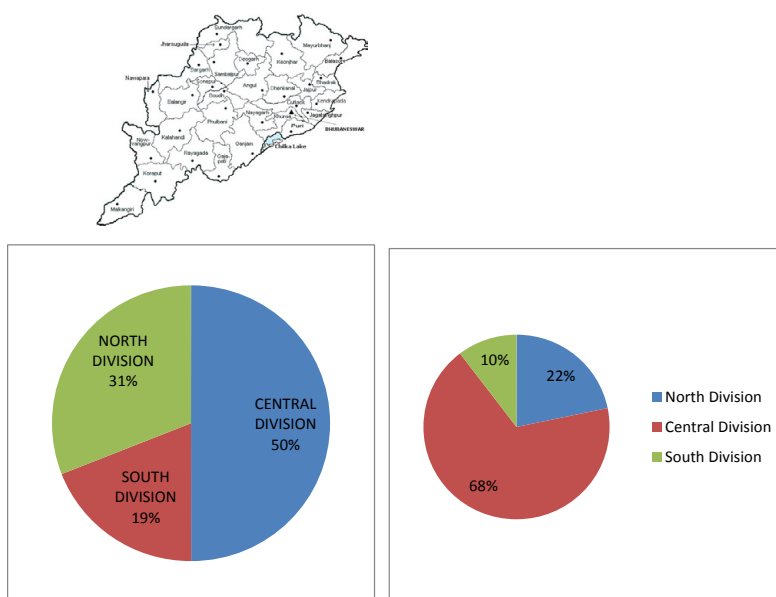


Figure 2: (a and b) Division wise distribution of donors and patients.

Total Number of Patients (n=24814) and Donors (n=20750) from the year 2011 to 2015		
Blood Group	Number of patients with (%)	Number of Donors with (%)
A+ve	5141 (20.71)	4538 (21.86)
B+ve	7471 (30.10)	6410 (30.89)
O+ve	9430 (38.002)	7232 (34.85)
AB+ve	1577 (6.35)	1617 (7.79)
A-ve	288 (1.16)	210 (1.01)
B-ve	343 (1.38)	326 (1.57)
O-ve	474 (1.91)	335 (1.61)
AB-ve	88 (0.35)	80 (0.38)
Oh+ve	02 (0.008)	2 (0.009)

Table 1a: ABO and Rh blood group system.

Total No of Patients (n=24814) and Donors (n=20750)		
Sub-Group	Number of patients with (%)	Number of Donors with (%)
A1+ve	4658 (18.77)	4216 (20.31)
A2+ve	483 (1.94)	322 (1.55)
A1B+ve	1388 (5.59)	1418 (6.83)
A2B+ve	189 (0.76)	199 (0.95)
A1-ve	141 (0.56)	237 (1.14)
A2-ve	11 (0.04)	51 (0.24)
A1B-ve	33 (0.13)	64 (0.30)
A2B-ve	7 (0.02)	24 (0.11)

Table 1b: The subgroup of ABO i.e. A1 and A2.

Total No of Donors (n=20750)		
Number of Donors	Blood Group	Percentage (%)
19916	Rh+ve	95.98%
831	Rh-ve	4.00%
3	Weak D+ve	0.014%

Table 2: The prevalence of Rh blood group system.

Total Number of Rh Negative Recipients from the year 2011 to 2015 (n=1208)		
Number of recipients	Blood Group	Percentage (%)
288	A-ve	23.841%
343	B-ve	28.394%
474	O-ve	39.238%
88	AB-ve	7.284%
15	Weak D+ve	1.241%

Table 3: Rh negative recipients in different subgroups of ABO system.

No. of Patient	Blood Group	Weak D	Percentage (%)
288	A-ve	8	2.777%
343	B-ve	3	0.874%
489	O-ve	3	0.613%
88	AB-ve	1	1.136%

Table 4: Different ABO blood group the distribution of Weak D.

Discussion

The present study is an attempt to find out the frequency of ABO and Rh blood group antigens and their sub group in Odisha population since no published report from Odisha was found. This is very well known that ABO and Rh phenotypes vary widely in different ethnic populations and countries [8]. Our observation about frequency of Rh negative donors is similar to Chandra and Gupta 2012 [9]. Indian population is a heterozygous one and some published reports about blood group distribution are available from different states which varies in their gene frequency [10].

The Rh system is second only to the ABO system in importance in Transfusion medicine because of Rh antigens, especially D, are highly immunogenic and can cause hemolytic disease of the newborn (HDN) and severe transfusion reactions. The Rh system has long been acknowledged as one of the most complex blood group systems because of its large number of antigens and the heterogeneity of its antibodies [6]. An estimated 0.2% to 1% of white persons (and a greater number of African Americans) have reduced expression of the D antigen [7].

Our study shows "O" Rh+ve to be the most prevalent one followed by 'B' Rh+ve (Table 1A). This is similar to the reported frequency in South India [2] and differs from the published reports in north Indian population [10].

The prevalence of Rh (D) reported in the present study is very similar to that reported by [1,11,12]. The present study deals with the importance of sub group of A determination in the transfusion medicine practice as illustrated by our case report. In fact this case prompted us to determine the sub group of A in the donor and patient population of our hospital. The subgroup of A (A1 and A2) was discovered after discovery of Dolichus Biflorus by BIRD in the year 1952 [8]; later on rarer subgroup A3 was also added to the series. Prevalence of A1 and A2 found to be in the proportion of 80% and 20% respectively in the western population [13]. The A2 antigen is a weaker one compared to A1; because of the weaker antigenic power of A2, hemolytic transfusion reaction is not severe or lethal under normo thermic situation. However severe reaction may occur due to presence

of anti A1 at lower temperature i.e approximately 25°C or below as has been reported in a case of CABG under hypothermic condition [14]. In the present study the prevalence of A1 and A1B and A2 and A2B in donors and patients are shown (Table 1B). In another previous study done in north Karnataka region by Sujatha et al. the prevalence of A1 and A1B in donors was 25.91% and 7.34% and A2 and A2B was 0.30% and 0.85% respectively [15].

In a study done in the Muslim population of Uttar Pradesh (UP) by Hussain et al. The prevalence of A1 and A1B was 26.52% and 19.34% and A2 and A2B was 2.90% and 1.24% respectively [4]. Their study was similar to a study done by Ara G et al. [16]. Another study from south India reported the prevalence of A2 and A2B to be 3.01% and 1.43% respectively [2]. Similar study under taken by chaitanya kumar et al. from Andra Pradesh, concluded that prevalence of A2 and A2B is 0.85% and 1.21% respectively [17].

Previous study from Karnataka showed that the prevalence of A2 and A2B along with Rh negative status is rare [13]. In general, Indian population the sub type A2B is found to be 0.9% to 1%. The Rh negative blood groups are found in 15% of the population [3]. Considering both, the prevalence of A2B negative is 0.1%. In our present study A2B negative was found to be 0.11%, A2 negative was found to be 0.24%, among all donors during the study period (Table 1B). A similar study from North Karnataka region [15], reported prevalence of A2B negative to be 0.014% whereas A2 negative was found to be 0.004%. These studies are similar to ours in terms of frequency of A1 and A2 indicating there by that A2 frequency is much lower compared to A1 [18]. However, if there is antibody development to A1 in A2 individuals, then for subsequent transfusion one has to be careful to find out the sub-group.

Conclusion

It seems from the present study that it is important to classify A1 and A2 and Weak D regularly in the blood bank to avoid transfusion reaction and allo-immunization.

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