

Incidence of A₁ & A₂ Sub Grouping among Blood Group A & AB in Blood Donors Attended at Blood Bank MGH, Jodhpur

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Abstract: ABO groups and subgroups are medically important since these are responsible for transfusion reactions. Variation in A and AB subgroups are observed widely. The study was done in 1000 Blood group who had either A or AB blood group. In our study 711 blood donors had A blood group and 289 had AB blood group. 84.9% had A₁ subgroup and 15.1% had A₂ subgroup. Among AB blood group 81.6% had A₁B and 18.4% had A₂B subgroup.

Keywords: Blood groups, ABO group, Subgroup A₁ A₂

1. Introduction

Blood group is genetically predisposed. There are about 400 blood groups and the most common amongst them are ABO and Rh¹. The discovery of ABO blood groups by Karl Landsteiner was an important achievement in history of blood transfusion followed by discovery of Rh (D) antigen².

The bombardment of the red blood cells with A and/or B antigens occurs because of the action of the glycosyl transferase enzymes that add specific sugars to the precursor substance. A & AB Blood Group have been divided in to subgroup A₁, A₂, A₁B & A₂B depending upon the reaction with anti A₁ Lectin (Dolichous Bi Florous or Human anti – A). About 80 % blood group A & AB belong to sub group A₁ & A₁B i.e. they react with Anti A₁ Lectin while 20% belongs to A₂ & A₂B i.e. they fail to react with Anti-A₁ Lectin. At times the individual with sub group A₂ or A₂B have anti A₁ in their serum. But this antibody is usually weak and most of the time has no importance in selecting blood for transfusion. The difference between A₁ & A₂ is both quantitative & qualitative. A₁ red blood cell have about one million A antigen per cell. A₂ red cells have only 250,000 A antigen per cells or one fourth the amount that A₁ cells have³.

A frequency of ABO blood group varies, till date only few studies have done on incidence of A₁, A₂, A₁B & A₂B. Study was conducted to determine incidence of A₁, A₂, A₁B & A₂B in blood donors of Mahatma Gandhi Hospital Jodhpur.

Aim

The study was done to assess the prevalence of A₁, A₂, A₁B and A₂B subgroup in blood donors at Mahatma Gandhi Hospital Jodhpur, Western Rajasthan.

2. Material & Method

A total of one thousands blood donors with blood group A & AB were taken who attended Blood Bank MGH Jodhpur for

donating blood voluntarily as well as on the replacement basis.

A and AB Blood groups are tested for their subgroups. On slide and tube a drop of Anti A₁ was placed and a drop of blood sample having blood group A & AB mixed on slide and test tubes were centrifuged, just after centrifugation result were recorded for agglutination. If agglutination was present then that blood group was recorded as A₁ & A₁B respectively, and if no agglutination then A₂ & A₂B. Anti A₁ lectin is purified extract of the seeds of Dolichous biflorus containing phytohemagglutinin (Lectin) which agglutinate human red cell only.

3. Observation

1000 blood donors who had either A or AB were taken for this study. 711 blood donors had A blood group and 289 had AB blood group.

Out of 711 'A' blood group donor, 604 had A₁ subgroup while rest (107) had A₂ subgroup. (Table No. 1)

Out of 289 AB blood group, 236 had A₁B subgroup and 53 had A₂B subgroup (Table No. 1)

Hence in total 83% had A₁ subgroup while rest had A₂ subgroup. (Table No.1)

4. Discussion

The information of Blood Group is very essential as ABO blood groups system have a key role in evolutionary biology, anthropology, studying migration patterns, medical importance in diseases and organs transplantation, forensic pathology and medico legal issues such as mismatch pregnancy and disputed paternity⁴.

ABO subgroups are distinguished by decreased amount of antigen in RBCs and in secretor, present in the Saliva.

The distribution of A & AB subgroups varies greatly among different population. Approximately 80% of Blood Group A or AB are classified as A₁ or A₁B the remaining 20% are either A₂ or A₂B^{5,6}. In 1911, Von Dungern described two different A antigens based on reaction between A, RBC, anti-A and anti-A₁⁷. Classification into A₁ and A₂ phenotypes account for 99% of all group A individuals. The cells of approximately 80% of all group A (or AB) individuals are A₁ (or A₁B) and 20% remaining are A₂ (or A₂B) or weaker subgroups.

In our study 1000 blood samples were taken having blood group A and AB and has been tested for their subgroups i.e. A₁, A₂, A₁B, and A₂B. It was found that from total of 711 A group, 604 (84.9%) were A₁, 107 (15.1%) were A₂, and from 289 AB blood group, 236 (81.6%) were A₁B and 53 (18.4%) were A₂B. It is same as described by Von Dungern⁷ and by Prof. R.N. Makroo, Test Book of Transfusion Medicine³.

The study done in Southern India⁸ shows 95.9% of A₁ and 4.1% of A₂ while among A₁B AB, it is 81.6% A₁B and 18.4% A₂B. Other studies done in India also shows, More than 90% of A₁ but among AB it ranged from 68.5% to 91.4% of A₁B and 31.5% to 8.6% of A₂B. (Table No. 2)^{9,10}

In the studies done at International level in Pakistan⁵, Saudi Arab¹¹, Sudan¹² and Japan¹³ A₁ was 75.8% to 99.93% and A₂ was 0.17% to 24.2%. A₁B 79.8% to 98.9%, and A₂B was 1.12% to 20.2%.

All these studies had more number of A₁ and A₁B subgroup which is also seen in our study.

Table 1: Incidence of A and AB Subgroup in our Study

Blood Group	No. of Donors	Percentage
A ₁	604	84.9
A ₂	107	15.1
A ₁ B	236	81.6
A ₂ B	53	18.4

Table 2: Incidence of A and AB Subgroup in Different Part of India

Places in India	A ₁	A ₂	A ₁ B	A ₂ B
North-West India (Rajasthan, Jodhpur)	84.9	15.1	81.6	18.4
Southern India (Tirupati)	95.9	4.1	80.8	19.2
Eastern India (Cuttack)	94.2	5.8	68.5	31.5
Central Part of India (Gwalior)	92.0	8.0	91.4	8.6

Table 3: Incidence of A and AB Subgroup in Various Countries

Country	A ₁	A ₂	A ₁ B	A ₂ B
India (Our Study)	84.9	15.1	81.6	18.4
Saudi Arab	85.6	14.4	98.3	1.7
Pakistan	75.8	24.2	79.8	20.2
Suddan	93.42	6.58	91.67	8.33
Japan	99.83	0.17	98.86	1.14

5. Result

Variation in A & AB subgroups are observed widely. The common in all is that A₁ and A₁B are the commonest subgroup in A & AB subgroups.

In our study incidence of A₁ is 84.9%, A₂ 15.1%, A₁B 81.6% and A₂B 18.4%.

The range of differences in A₂ in different places varies from 4-15% but range of differences in A₂B in difference places are wide i.e. 8-31.5%.

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