

## Frequency of A<sub>2</sub>B Among the AB Blood Group Donors

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### ABSTRACT

**Objective:** The aim of the study is to detect the frequency of A<sub>2</sub>B blood groups among the AB donors.

**Method:** This cross-sectional observational study which was carried out at Transfusion Medicine department, Bangabandhu Sheikh Mujib Medical University, Dhaka from January 2018 to July 2018 over 142 subjects. After selection of healthy donors blood group was detected by standardized tube technique. Anti- A<sub>1</sub> lectin study was done for all blood donors with blood group AB. Based on the serological reactivity, blood group was classified into A<sub>2</sub>B and Rh-D negative or positive.

**Results:** In the study, it was found that among 142 AB blood group donors, majority blood donors were male 130 (91.5%) and rest were female 12 (8.5%). Among 10 A<sub>2</sub>B blood group donors 25% were female and 5.38% were male. More than half donors 78 (54.9%) belonged to age 21-30 years. The mean age was 27.68 SD±6.76 years with ranged from 18 to 50 years. It was observed that 132 (93.0%) belonged to A<sub>1</sub>B subgroup and 10 (7.0%) belonged to A<sub>2</sub>B subgroup. The study also revealed that 126 (95.5%) A<sub>1</sub>B individuals were Rh-positive, 6 (4.5%) A<sub>1</sub>B individuals were Rh-negative. All A<sub>2</sub>B individuals were found Rh-positive.

**Conclusion:** From our study we found that, the frequency of A<sub>2</sub>B among the female donors is more than four times higher than the male donors. As the A<sub>2</sub>B is the rare subgroup but the frequency of this subgroup in this study recommend the extra attention for the physician and staff working in the Transfusion Medicine department.

**Keyword:** Transfusion, Organ Transplantation, Group, Subgroup A<sub>2</sub>B, Subgroup AB.

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### INTRODUCTION

The ABO blood group system is one of the major blood group system. There are four main blood groups in ABO system, they are- A, B, O and AB. The A, B, O blood group were discovered by an Austrian physiologist Karl Landsteiner in 1900. In 1902 De Casterlo & Struli discovered the fourth blood type AB. Rh blood group, referred as Rhesus blood group, is the second important group in Transfusion Medicine.<sup>1</sup> This system is highly polymorphic due to the presence or absence of Rh (D) antigen on red cells. The discovery of ABO Blood Group by zS served the beginning of blood-banking and Transfusion Medicine.<sup>2</sup> A, B, H, antigens of ABO blood group system. There are two potential precursor substances for A, B, H, antigen which may be glycoprotein, glycolipid or glycosphingolipid. They are comprised of identical sugars but the linkage of the terminal sugars differ in two types. ABH antigens on the red cells are derived from Type-II chains

whereas the ABH in plasma are derived from both Type-I & Type-II chains.

Inheritance of an A1 gene elicits production of high concentration of 3-N-acetyl-galactosaminyl transferase converting all H precursor structure to A1 antigens. A1 creates 810,000 to 1,170,00 antigen sites on the adult RBC, whereas 240,000 to 290,000 antigen sites are present on the adult A2 RBC.<sup>3</sup>

Subgroups in this system are due to polymorphism in the genes coding for the A gene which leads to diminished amounts of A antigens on the red blood cells.<sup>4</sup>

ABO antigens are one of the oligosaccharides antigens (Watkins WM 1995, p. 313-90).<sup>5</sup> These antigens are widely expressed on the membranes of red cell and tissue cell as well as, in the saliva and body fluid (Zmijewski CM 1978).<sup>6</sup> Approximately 80% of blood type A or B are classified as A<sub>1</sub> or A<sub>1</sub>B, the remaining 20% are

either A<sub>2</sub> or A<sub>2</sub>B (Mourant et al, 1977; Roychoudhurin AK, Nei M 1988).<sup>7</sup>

In 22%-35% cases there is presence of Anti-A<sub>1</sub> in the serum of A<sub>2</sub>B individual which can cause ABO discrepancies between forward and reverse grouping and incompatible in cross-matches with A<sub>1</sub>B cells. A<sub>2</sub>B subgroups are wrongly typed as B, which may cause haemolytic transfusion reaction. The distinction between A<sub>1</sub>B and A<sub>2</sub>B subgroups can be determined by observing reactivity with the lectin from Dolichos biflorus seeds. The Dolichos biflorus lectin (Anti-A<sub>1</sub>lectin) agglutinates A<sub>1</sub>B cells but does not agglutinate A<sub>2</sub>B cells.

So in this study I aimed to determine the frequency of A<sub>2</sub>B blood group in the study population to prevent haemolytic transfusion reaction. By knowing the prevalence of A<sub>2</sub>B subgroup among the AB donors will help the patient who are A<sub>2</sub>B with anti-A<sub>1</sub> in case of emergency transfusion.

## OBJECTIVES

### General Objective

- To find out the frequency of A<sub>2</sub>B blood groups among the AB donors.

### Specific Objective

- To detect A<sub>1</sub>B and A<sub>2</sub>B blood group.
- To find out the sex distribution of A<sub>1</sub>B and A<sub>2</sub>B subgroup among study population.
- To find out the distribution of A<sub>2</sub>B blood group among the study population on the basis of Rh-D antigen.

## METHODOLOGY

### Type of Study

Prospective observational study

### Place of Study

Department of Transfusion Medicine, BSMMU, Dhaka.

### Study Period

March 2017- March 2018.

### Study Population

Total 142 AB blood group donors were included in this study.

### Sampling Technique

A purposive sampling technique was used to identify the participants. This study used a non-random sampling technique.

### Method

It was a Cross-sectional observational study of 142 AB blood group donors which was carried out at the Department of Transfusion Medicine, BSMMU, Dhaka. Short history taking, sample collection, proper procedure of blood grouping was performed. Procedure details and findings were recorded on specifically designed proforma. All the procedure was carried out by following departmental SOP.

Details of this study were explained to each donor who gave due consent before the procedure. After donor selection, according to inclusion and exclusion criteria, the procedures were done. Donors were made comfortable before starting the study.

### Statistical Analysis

The statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS Inc., Chicago, Illinois, USA). Qualitative variables were expressed as frequencies, percentages. Quantitative variables were expressed as mean ± standard deviation.

### Sample Size (n):

$$n = \frac{Z^2(p \times q)}{d^2}$$

Z= Z score

p = Population proportion

e = Margin of error

Calculation: Z= 1.96 (Confidence level is 95%)

p = 0.103 (as frequency of A<sub>2</sub>B is 10.30% among AB blood group)

[Ref. Giriyan et al. 2017]

e = 0.05

$$n = \frac{1.96^2(0.103 \times 0.897)}{(0.05)^2}$$

= 141.9

= 142

## SELECTION CRITERIA

### Inclusion Criteria

- Weight > 50 kg
- Age- 18 to 60 years.
- At least 4 months from last whole blood donation.
- Hemoglobin > 12.5 gm/dl.
- Negative test for HIV, Hepatitis B, Hepatitis C, malaria, Syphilis.

### Exclusion Criteria

- Taking an antibiotic and other medication for an infection defer for 14 days after completion of treatment.
- Pregnant donor.
- Vaccinations within 8 weeks.
- Had any problems with heart or lungs.
- Suffering from any systemic disease or malignancy.

Table I: Distribution of the studied donors by age (n=142)

Age(yrs)	Number of AB donors	Percentage
≤20	20	14.1
21-30	78	54.9
31-40	37	26.1
41-50	7	4.9
Total	142	100
Mean ± SD	27.68 ± 6.76	
Min – Max	18 – 50	

Table II: Distribution of the studied donors by sex (n=142)

Sex	Number of donors	Percentage
Male	130	91.5
Female	12	8.5
Total	142	100

Table III: Sex Distribution of A<sub>2</sub>B subgroup

Sex	Number of donors	A <sub>2</sub> B	Percentage (%)
Male	130	7	5.38%
Female	12	3	25%

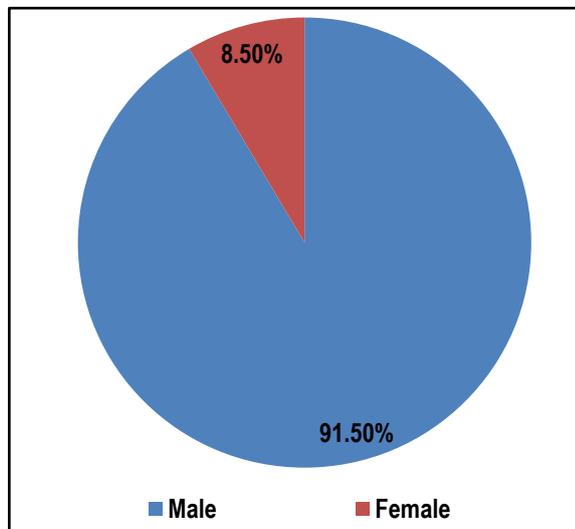
**Table IV: Distribution of the studied blood donors by subgroup of AB (n=142).**

Subgroup of AB blood group	Frequency	Percent
A <sub>1</sub> B	132	93.0
A <sub>2</sub> B	10	7.0
Total	142	100

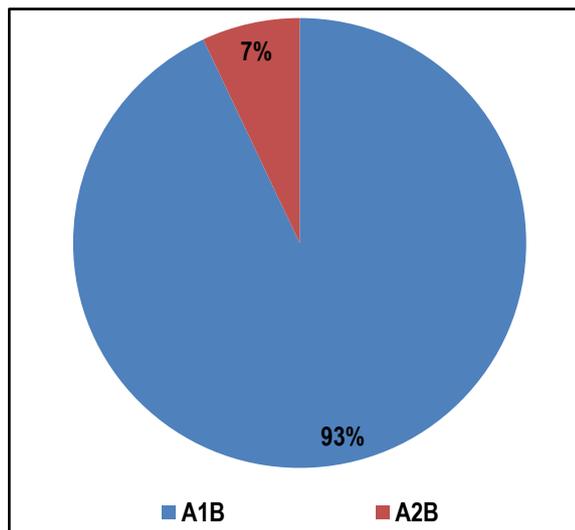
**Table V: Distribution of the studied blood donors by subgroup of AB in relation to Rhesus blood group**

Subgroup of AB blood group	Rh blood group			
	Rh (+ve)		Rh (-ve)	
	n	%	n	%
A <sub>1</sub> B (n=132)	126	95.5%	6	4.5%
A <sub>2</sub> B (n=10)	10	100.0%	0	0.0%
Total (n=142)	136	95.7%	6	4.5%

**Figure 1: Distribution of sex among AB blood group donors**



**Figure II: Distribution of A<sub>1</sub>B and A<sub>2</sub>B subgroup among AB blood group donors (%)**



**RESULTS**

Table I shows age of the study donors, it was observed that more than half 78(54.9%) donors belonged to age 21-30 years. The mean age was 27.68±6.76 years with ranged from 18 to 50 years. Table II shows sex of the study donors, it was observed that majority 130 (91.5%) donors were male and the rest 12 (8.5%) were female.

Table III shows sex distribution of A<sub>2</sub>B subgroup, it was observed that 25% A<sub>2</sub>B donors were female and 5.38% A<sub>2</sub>B donors were male.

Among the study donors, it was observed that majority 130(91.5%) donors were male and the rest 12(8.5%) were female. Table IV shows that among 142 AB blood group donors, 132 (93.0%) grouped as A<sub>1</sub>B and 10 (7.0%) grouped as A<sub>2</sub>B.

Table V shows that among 142 AB blood group donors. 126 (95.5%) A<sub>1</sub>B were Rh(+ve) and 6 (4.5%) A<sub>1</sub>B were Rh (-ve). All A<sub>2</sub>B individuals were found Rh(+ve).

**DISCUSSION**

In this study, a total 142 respondents were included of whom majority blood donors were male 130 (91.5%) and rest were female 12 (8.5%) (Figure-I). Among A<sub>2</sub>B blood donors 25% were female and 5.38% were male (Table III). So large scale study with extra attention to the female donors may be real data. The prevalence of male donor is more in our country than female donor. Most of the female were not oriented to donate blood. Another study was done on "Voluntary and directed blood donor problems and attitude" during the period of July 2013 to December 2013 in BSMMU, where majority 93% were male and 7% were female. From January 2007 to July 2007 the male female donor ratio in the Transfusion Medicine Department, BSMMU was 5.22:1.

A community-based study was carried out on blood groups representing a random population sample from urban and rural areas of Bannu region, North West Frontier Province (NWFP) of Pakistan over a period of 16 months and encompassed 2581 subjects in which 57.09% were male and 42.9% were female.<sup>8</sup>

One can donate blood between the age of 18-60 years. The study revealed that, more than half of the donors 78 (54.9%) belonged to age 21-30 years. 7 (4.9%) belonged to age 41-50 years. The mean age was 27.68 ± 6.76 years with ranged from 18-50 years (Table-I). During the period of July 2017 to December 2017 in the Transfusion Medicine Department, BSMMU, 46.90% blood donors belonged to age 18-24 years, 49.10% blood donors belonged to age 25-44 years and 4% blood donors belonged to age 45-60 years which were similar with my study. The frequency of AB blood group in our country is 8.39%. The study revealed that among 142 respondents 132 (93.0%) were grouped as A<sub>1</sub>B and 10 (7.0%) were grouped as A<sub>2</sub>B (Figure-II)

The present study was similar to a study carried out on blood donors in Karnataka Institute of Medical Science, over period of two years, 1708 (8.20%) belong to group AB donors, 176 (10.3%) were grouped as A<sub>2</sub>B (Giriyan et al. 2017).<sup>9</sup>

In another study shows the prevalence of blood group marker among six muslim populations of Aligarh district over 724 samples, blood O was the most prevalent (29.97%) followed by group A1 (26.52%), B(20.03%) , A 2 (19.34%) , A 2 (2.90%) , A2B (1.24%). Out of the 724 subjects tested 84.67% subjects were Rh +ve and 15.33% subjects were Rh -ve.<sup>10</sup>

A study was conducted on frequency of A<sub>2</sub>B blood group individuals in more than one center (BSMMU, BMC) during the period of 2005-2006 among 225 respondents which revealed that 13.7% were A<sub>2</sub>B individual.

In another study which was done in Faculty of Medicine and Health Sciences at Alimam Almahadi University, White Nile, Sudan among 100 students. Among these studied samples, 24 (24%) individuals belonged to group AB. Among the AB group, 22 (91.6%) individuals belonged to A<sub>1</sub>B and A<sub>2</sub>B was 2 (8.33%).<sup>11</sup>

Subgroups are important. So the AB individuals should be tested with anti-A<sub>1</sub> lectin for subgroup confirmation. Because A<sub>2</sub>B subgroup may be mistyped as blood group B in serum typing and if anti- A<sub>1</sub> is present then causes intravascular haemolytic transfusion reaction.

### CONCLUSION

Among the AB blood group donors the frequency of A<sub>1</sub>B is higher (93.0%) than A<sub>2</sub>B (7.0%). The frequency of A<sub>2</sub>B among the female donors is more than four times higher than the male donors. So, larger scale study with extra attention to the female donors may be real data. The frequency of the subgroup in this study recommend the extra attention for the physician and staff working in the Transfusion Medicine department. Moreover, to detect A<sub>1</sub>B and A<sub>2</sub>B subgroup is essential for minimizing the transfusion reaction and recipients' safety.

### LIMITATIONS

- Hospital based data were collected, not community-based data.
- Larger population will bring valid data.

### RECOMMENDATIONS

- The study can be done at the community level with the supports from the Government.
- Due to higher frequency, AB female donor would be paid more attention to detect the A<sub>2</sub>B subgroup.
- Proper care should be taken during blood grouping and cross-matching AB group.
- Regular AB blood group donors should be tested with anti-A<sub>1</sub> lectin for confirmation of subgroup A<sub>2</sub>B.

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