



(RESEARCH ARTICLE)



Distribution of ABO and Rh blood groups among undergraduate students of allied and healthcare at Malla Reddy university, Telangana, India

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Abstract

Introduction: Karl Landsteiner was an Austrian scientist discovered ABO blood group system in 1900 and Rh system in 1940. Blood groups are the antigens which are present on Red blood cells (RBCs), White blood cells (WBCs), platelets and body fluids such as saliva etc. The ABO system and Rh blood group system are most important significant systems in blood transfusion.

Methodology: The study was done at School of Allied and Healthcare Sciences, Malla Reddy University, Hyderabad from June to August 2024. Capillary blood was collected from each participant and tested for blood grouping by slide method.

Results: A total of 988 students were participated. Among these 304 were male and 684 were female. O Blood group was most prevalent (41.2%), followed by B (34.5%), A (18.6%) and AB (5.56%).

Conclusion: In this study, among allied healthcare students, O blood type is the most prevalent, while blood type AB is the least common in both male and female.

Keywords: ABO Blood group system; Rh blood groups; Karl Landsteiner; Malla Reddy University

1. Introduction

The discovery of ABO blood group system by Austrian scientist Karl Landsteiner in 1900 and Rh (D) antigen in 1940 are significant achievements in the history of blood transfusion¹. Blood groups are antigens present on the red blood cell (RBC) membrane. They are inherited genetically from parents to their children and remain unchanged throughout an individual's lifetime². Till date, 47 blood group systems are recognized, containing 366 red cell antigens according to the International Society of Blood Transfusion (ISBT) as of October 2024³.

Testing these antigens is an important criterion in the field of blood transfusion as well as organ transplantation⁴. The ABO blood group system derives its significance from the fact that A and B antigens are highly immunogenic, and plasma contains naturally occurring anti-A and anti-B antibodies of individuals lacking the corresponding antigen. These antibodies possess the capacity to induce hemolysis in vivo. From the perspective of transfusion medicine, the Rhesus (Rh) blood group system is the second most significant blood group system after ABO system⁵.

Classification of ABO blood groups based on the presence or absence of A and B antigens on red blood cell membrane and their corresponding antibodies anti-A and anti-B is accordingly present or absent in the plasma⁶. A, B, AB, and O are the four different types of blood groups in the ABO blood group system. The Rh antigen on the RBC membrane

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determines whether the Rh blood group is negative or positive. Rh antigens C, D, E, c, d, and e are present only on the RBC membrane, but Rh positive plasma does not contain any naturally occurring antibodies. Out of the six antigens, D antigen is the most immunogenic⁷.

Understanding the ABO blood groups distribution can be beneficial for both the effective management of stock in blood banks and providing blood transfusion services at a safety level⁸. ABO and Rh blood group detection play a crucial role in selecting blood for blood transfusion and organ transplantation. Moreover, blood group analysis serves as a valuable tool for personal identification in forensic science and helps determine familial relationships in legal disputes, as blood types are genetically transmitted from parents to their children^{9, 10}. It's important to know one's blood type to avoid transfusion reactions and mismatches between donors and recipients¹¹. Though many young adults during their infancy might have done blood grouping, many are less aware or remember about the same due to the time factor. This study emphasized knowing blood groups among young adults and making them aware of its importance. Subsequently, distribution was also studied among students in the School of Allied and Healthcare Sciences, Malla Reddy University.

2. Materials and Methods

2.1. Study Area

This study involved first, second, and third year Under Graduate students (N=988) of School of Allied and Healthcare Sciences, Malla Reddy University, Hyderabad. The study was carried out between June and August, 2024.

2.2. Sample Collection

Capillary blood was collected from fingertip of the participants after cleaning with 70% isopropyl alcohol (Alco swab). An Informed consent was obtained from all the students before collecting the blood sample.

3. Methodology

Determined ABO and Rh Blood grouping is based on the principle of agglutination (antigen antibody reaction) by using known monoclonal antisera. 3 drops of capillary blood of each participant was taken on a clean Glass slide labelled with A, B and D. a drop of each of the monoclonal antisera (anti-A, anti-B and anti-D) was added and mixed with separate applicator sticks over an circular area approximately 20 mm. Gently tilted the slide and agglutination was observed after 2 minutes. Blood group was recorded in data collection sheet of each student.

4. Results

A total of 988 students aged between 18-24 years participated. Among these 69.23% were female and 30.76% were male.

Table 1 Gender distribution of subjects

Gender	Number of students	Percentage
Male	304	30.76
Female	684	69.23

The distribution of O+ve, B+ve, A+ve, AB+ve among Rh D positive subjects were 39.17%, 32.5%, 17.4% and 4.6% while distribution of O-, B-, A- and AB- among Rh D negative subjects were 2.12%, 1.92%, 1.21% and 0.91% respectively.

Based on the Gender, ABO and Rh (D) distribution, the common blood group was O+ve in male (12.14%), followed by B+ve (10.12%), A+ve (5.26%), AB+ve (1.72%), B-ve (0.80%), O-ve(0.50%), AB-ve (0.40%) and least common A-ve (0.20%). In Female O+ve was common blood group (27.02%), followed by B+ve (22.4%), A+ve (12.14%), AB+ve (2.93%), O-ve (1.61%), B-ve (1.11%), A-ve (1.01%) and least common AB-ve (0.50%).

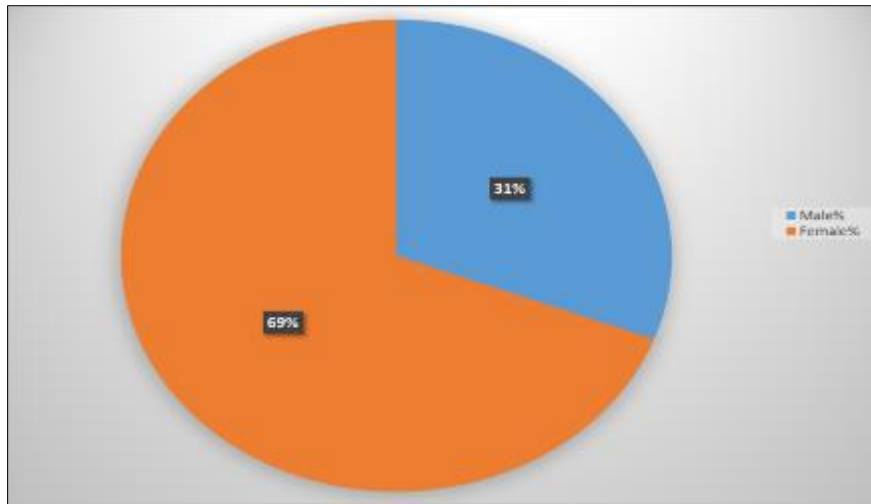


Figure 1 Pie diagram showing Gender distribution of subjects

Table 2 Distribution of ABO and Rh (D) in both male and female subjects

ABO & Rh (D) Blood groups	Male (Number)	Male (percentage)	Female (Number)	Female (percentage)	Total (Number & %)
A+ve	52	5.26	120	12.14	172 (17.4%)
B+ve	100	10.12	222	22.4	322 (32.5%)
AB+ve	17	1.72	29	2.93	46 (4.6%)
O+ve	120	12.14	267	27.02	387 (39.17%)
A-ve	2	0.20	10	1.01	12 (1.21%)
B-ve	8	0.80	11	1.11	19 (1.92%)
AB-ve	4	0.40	5	0.50	9 (0.91%)
O-ve	5	0.50	16	1.61	21 (2.12%)

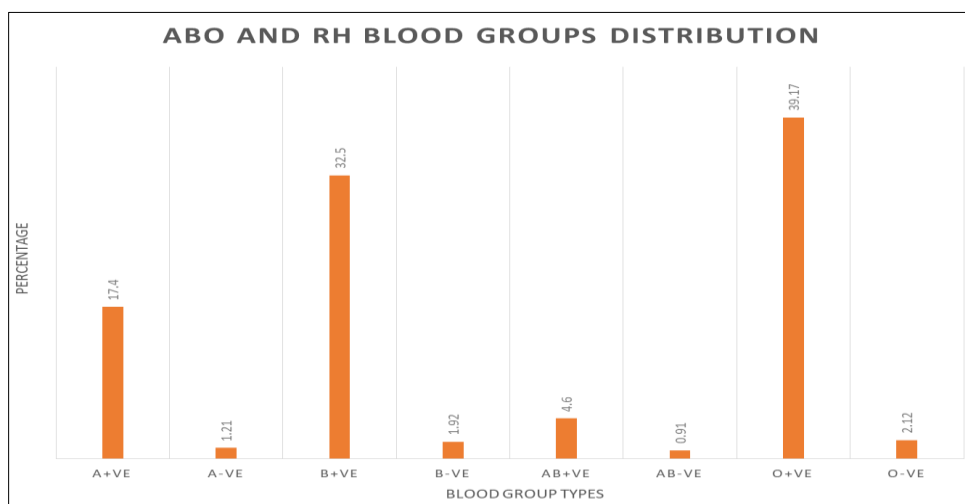


Figure 2 ABO and Rh Blood Groups distribution of subjects

Rh D antigen was present in 93.8% of students, while 6.17% were Rh D negative.

Table 3 Rh Blood Groups Distribution of subjects

Rh D Antigen	Positive	Negative
Number	927	61
Percentage	93.8	6.17

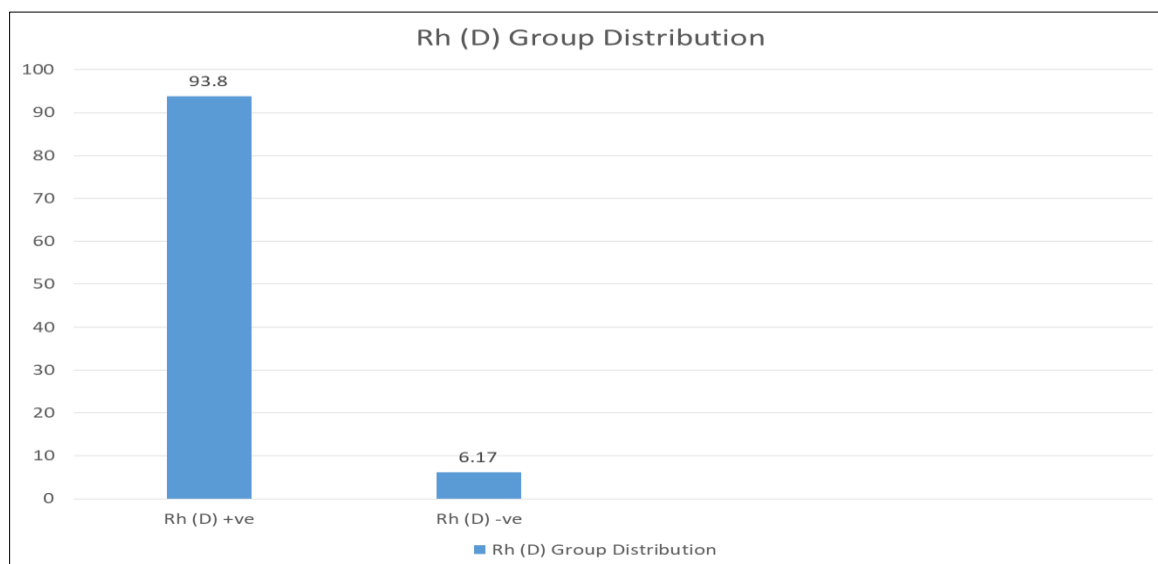


Figure 3 Bar diagram showing Rh Blood Groups distribution of subjects

O (41.2%) blood group was most frequent, followed by B (34.5%), A (18.6%) and AB (5.56%). (Figure: 4). the distribution of ABO and Rh D blood groups in both male and female subjects were O>B>A>AB.

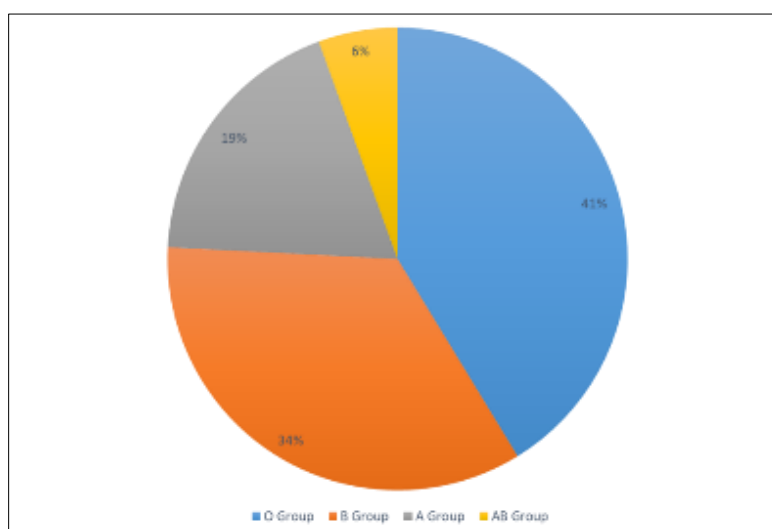


Figure 4 Pie diagram showing Prevalence of Blood groups distribution of subjects

5. Discussion

This study was conducted to determine ABO and Rh blood groups distribution among students at Malla Reddy University in Hyderabad, where there is a shortage of information about this subject.

Similar studies done at telangana by sukumaranmk et al & A R Vidyullatha et al revealed O group was most common followed by B, A, & AB^{12,13}. The same incidence is observed in this study, O blood group (41.2%) was the most common among students followed by B (34.5%), A (18.6%) and least common AB (5.56%).

Several studies done in India other than Telangana by authors anjulika et al at Nagpur and by shan et al at Jammu & Kashmir showed that B group was more frequent than O group followed by A group and AB group which is different from our study^{14,15}.

Similar results were observed in other countries like in Saudi Arabia the study done by Alshamlan et al, a study done in Nepal by Mahat et al and in Somalia by Mohamed hayir tahlil mohamud et al, O blood group is the commonest and AB group is the rarest which is same as in our study¹⁶⁻¹⁸.

6. Conclusion

The present study concludes blood group O is the most prevalent, while blood group AB is the least common in both male and female among allied healthcare students. Blood grouping is a significant parameter for medical, professional and social purposes. It is crucial to be aware of one's blood group, especially when faced with an emergency where blood donation is required.

Additional research is necessary across a range of educational institutions like schools, including various medical colleges, engineering, agricultural, law and management colleges, to examine the blood types.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

Yes, the present research work has received ethical approval from the appropriate institutional ethics committee.

Statement of informed consent

Yes, informed consent was obtained from all individual participants included in the study.

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