



Distribution Of ABO And Rh Blood Group In Students Of ITM Vocational University, Vadodara: A Comprehensive Analysis

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Abstract: Blood group distribution varies across different geographical regions and populations, and understanding these patterns is crucial for efficient blood transfusion services and population genetics studies. This research paper presents a comprehensive analysis of the distribution of ABO and Rh blood groups among the students of ITM Vocational University, Vadodara, Gujarat, India.

The study utilized a cross-sectional design and collected data from a diverse sample of students studying in ITM Vocational University, Vadodara. A total of 778 students, comprising both males and females from various streams, were included in the study. Blood group typing was performed using standard serological methods.

The results revealed that the distribution of ABO blood groups in students of ITM Vocational University, Vadodara followed the typical patterns observed globally. The most prevalent blood group was B (35.7%), followed by O (32.3%), A (22.6%), and AB (9.2%). The Rh D positive (Rh+) blood group was found in 96.6% of the student strength, while the Rh D negative (Rh-) blood group accounted for 3.4%.

This study provides valuable insights into the distribution of ABO and Rh blood groups in the students of ITM Vocational University, Vadodara. These findings have significant implications for blood transfusion services, organ transplantation, and population genetics research in the region. The knowledge of blood group frequencies will aid in developing effective strategies for maintaining an adequate and safe blood supply, reducing transfusion-related complications, and understanding the genetic diversity of the population

I. INTRODUCTION

Blood groups are among the most well-known and widely studied genetic traits in human populations.[1] The ABO and Rh blood group systems, in particular, have significant implications in various aspects of medical practice, including transfusion medicine, organ transplantation, and prenatal care. Understanding the distribution of ABO and Rh blood groups in a specific population can provide valuable insights into the genetic diversity and health characteristics of that community.[2,3]

The ABO blood group system classifies human blood into four major groups: A, B, AB, and O, based on the presence or absence of specific antigens on red blood cells. Additionally, the Rh blood group system determines the presence or absence of the Rh antigen, primarily focusing on the RhD antigen.[4] By examining the frequencies of these blood groups in the ITM Vocational University students, we can gain

insights into the genetic composition of the student population and its implications for healthcare management within the University.

Studying the distribution of ABO and Rh blood groups has broader implications beyond individual health considerations. Understanding the prevalence of different blood groups in specific regions can aid in optimizing blood transfusion services, ensuring safe and compatible blood supplies for patients in need. Furthermore, this knowledge may contribute to the development of targeted healthcare strategies, such as prenatal screening and personalized medicine approaches that take into account genetic variations associated with specific blood groups.[5]

Knowledge of the prevalence and distribution of blood group, which aids in the prevention and management of various hemoglobinopathies, is essential in the hospital blood bank and in the creation of transfusion policies.[6] Many populations and ethnic groups around the world have had their frequencies of these hereditary traits published.[7-10] There are not much published data in India.[10-13]

The research methodology involves collecting blood samples from a representative sample of ITM Vocational University students and analyzing them using standard laboratory techniques. The collected data will be statistically analyzed to determine the frequencies of different blood groups.

The results of this comprehensive analysis will not only contribute to the existing body of knowledge regarding ABO and Rh blood group distributions but also provide insights into the genetic makeup of the ITM Vocational University student population. These findings may have implications for healthcare planning, transfusion services, and genetic counseling within the university and the broader Vadodara community.

In conclusion, this research paper aims to provide a detailed analysis of the distribution of ABO and Rh blood groups among students at ITM Vocational University in Vadodara. The findings of this research may also have broader implications for transfusion medicine, prenatal care, and personalized healthcare strategies based on blood group variations.

II. MATERIALS AND METHODS

A cross sectional study of 1 year was carried out in students of ITM Vocational University, Vadodara, Gujarat, India. Blood Group determination of 778 students was done from May 2022 to May 2023 at ITM Vocational University, Vadodara, Gujarat, India.

The blood groups in ABO and Rh were determined using an antigen antibody agglutination test with commercially available standard antiseras, namely Anti A, Anti B, Anti AB, and Anti D.

The blood group was determined using the slide and test tube agglutination method. Both the forward (cell grouping) and reverse (serum grouping) methods were used. Only if both the forward and reverse groups were identical was the final blood group certified.

2.1 Sample Collection:

Blood samples were taken on a by finger prick in most cases, but occasionally by venepuncture, and promptly transferred to a tube containing Ethylene Diamine Tetra Acetic acid (EDTA). ABO and Rh blood grouping were determined using an agglutination test with anti-A, anti-B, and anti-D human sera.

2.2 Laboratory Analysis:

ABO and Rh grouping were performed using the slide method, in which a drop of EDTA blood from each student sample was mixed with respective antiseras, anti A, anti B, and anti D reagents in separate places on a clean glass slide, and blood groups were determined based on agglutination. Controls were run paralleled. Agglutination was interpreted macroscopically and microscopically in ambiguous circumstances. All Rh negative results were confirmed for the weak D using the indirect antiglobulin test (IAT) approach.

III. RESULTS

Blood Group	Male	%	Female	%	Total	%
ABO Grouping						
A	125	22.89	51	21.98	176	22.62
B	193	35.36	85	36.64	278	35.73
AB	49	8.97	23	9.91	72	9.25
O	179	32.78	73	31.547	252	32.40
Total	546	100	232	100	778	100
Rh Typing						
Positive (+)	524	95.97	227	97.84	751	96.53
Negative (-)	22	4.03	5	2.16	27	3.47
Total	546	100	232	100	778	

Table 1 Prevalence of ABO and Rh Blood Group among students

Blood Group	A		B		AB		O	
	+VE	-VE	+VE	-VE	+VE	-VE	+VE	-VE
Male	122	3	184	9	44	5	174	5
Female	49	2	83	2	23	0	72	1
Total	171	5	267	11	67	5	246	6

Table 2 Distribution of various Blood Groups among students

Table 1 revealed the prevalence of the ABO and Rhesus (D) blood groups among students of ITM Vocational University, Vadodara. Blood group B was found to be the most frequent (35.73%) among the study population, while blood group AB was least prevalent (9.25%). The gene frequencies with respect to ABO can be shown as $B > O > A > AB$. The frequency of blood group O showed preponderance over blood group A. The distribution of ABO groups among the gender showed that A (22.89%) and O (32.78%) group were more frequent among the male. In contrast, B (36.64%) and AB (9.91%) group were higher prevalent among female. In Rh blood typing, 96.53% of the students were Rh Positive while the remaining 3.47% was Rh Negative [Table 1]. The percentages of male (4.03%) of Rh Negative type are more than the females. There were no significant differences in both ABO and Rh blood groups in male and female. With respect to both ABO and Rhesus blood grouping systems, the prevalence of blood group A^+ , A^- , B^+ , B^- , AB^+ , AB^- , O^+ and O^- were 21.99%, 0.64%, 34.32%, 1.41%, 8.61%, 0.64%, 31.62% and 0.77% respectively. The gene frequencies with respect to ABO and Rhesus systems can be shown as $B^+ > O^+ > A^+ > AB^+ > B^- > O^- > A^- > AB^-$ [Table 2].

IV. DISCUSSION

The most crucial blood groupings are ABO and Rh-D in Hemolytic disease of new born and routine blood transfusion practice. ABO and Rh (D) blood type distribution and allelic frequency in the Indian population are not well-studied on a large scale, although there are several regional studies that show distribution in their specific state or region.

ABO blood group distribution differs ethnically, regionally and between populations. According to research conducted in Lucknow^[14] and Punjab^[15] in northern India, blood category B is the most prevalent, followed by O, A, and AB. In our investigation, the same occurrence was discovered: B blood types were more common than O, followed by A and AB blood groups.

Studies conducted in Surat^[16] and other western regions of India, such as Eastern Ahmedabad^[17] and Western Ahmedabad^[18], revealed that blood group B is the most prevalent, followed by O, A, and AB, which is consistent with our findings.

B group was found to be the most prevalent, followed by O, A, and AB in a research conducted in Central India, such as Indore, which is consistent with the current study^[19]. In this study, blood group B was the most prevalent, closely followed by blood group O. This result is consistent with other research from India that has been published^[20,21]. With certain exceptions, such as central Asia and Africa, the B antigen is not widely distributed globally and has a low frequency.^[22-27]

According to our study, the frequency of Rh-positive in the Rhesus system was 96.53%, whereas Rh-negative were only 3.47%. Other investigations have shown a similar distribution trend.^[28]

V. CONCLUSION

It is concluded that the total 778 number of students was analyzed for blood group allocation. We discovered that B (35.73%) was the most prevalent blood type, followed by O (32.40%), A (22.62%), and AB (9.25%). Almost all of the samples tested positive for Rh. Every student's blood group must be listed on their ID card. This will be extremely useful in situations where an urgent transfusion of yet-to-be cross-matched blood is necessary. Knowledge of ABO and Rh blood types is important in health care planning and resource allocation in any community. Studying blood group distribution is crucial for blood banks and transfusion services that might benefit patients' health.

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