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Pattern of ABO and Rh Blood Groups and Gender-Wise Distribution among School Going Children of Jammu Region

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A B S T R A C T

Background: The distribution of blood groups within population is crucial for blood transfusion safety and understanding potential health risks associated with various blood types. This study addresses the research gap concerning the distribution of ABO and Rh blood groups among school-going children in the Jammu region of India, aiming to explore potential gender-based differences in these distributions. ***Methods***: A cross-sectional study was conducted at Acharya Shri Chander College of Medical Sciences and Hospital, Jammu, involving 200 randomly selected school-going children aged 6 to 15 years. Blood samples were collected and analysed to determine ABO and Rh blood groups using standard serological techniques. The data was statistically analysed using SPSS software, with chi-square tests employed to assess gender differences. ***Results***: The study revealed that 38.0% of participants belonged to blood group O, followed by B (31.5%), A (22.0%), and AB (8.5%). Gender-wise analysis indicated no significant differences in ABO blood group distribution (P=0.9839), while 93.0% of participants were Rh-positive, with a slight female predominance in Rh-positive status. ***Conclusion and Implications***: This study enhances the understanding of blood group distribution patterns, essential for optimizing blood transfusion services and evaluating disease susceptibility in the region. These findings have significant implications for local healthcare planning and blood bank management, ensuring the availability of compatible blood products and reducing transfusion-related risks.

Keywords: Blood group distribution, ABO system, Rh factor, transfusion medicine.

INTRODUCTION

The study of blood group distribution in a population is essential for determining the frequency of various blood groups and assessing the potential risks associated with blood transfusions [1].

Different types of blood groups are hereditary and determined based on the presence or absence of antigens on the surface of red blood cells. Individuals are categorized into four major blood groups according to the presence of antigens. The ABO system is characterized by the presence or absence of A and B antigens on the surface of red blood cells, resulting in four major blood groups: A, B, AB, and O. On the other hand, the Rh system is defined by the presence or absence of the D antigen, with individuals classified as either Rh-positive or Rh-negative [2]. The distribution of ABO and Rh blood groups can vary significantly among different populations and races.

The ABO and Rh blood group systems are the most clinically significant blood group systems, with their antigens playing a crucial role in transfusion medicine and organ transplantation [3].

Understanding the distribution of ABO and Rh blood groups within a population is essential for ensuring the availability of compatible blood for transfusions, predicting the risk of hemolytic disease in newborns, and studying the potential associations between blood groups and various diseases [4].

Blood group studies serve as valuable parameters in various genetic analysis, providing reliable geographic information. Moreover, they hold significance in the blood transfusion process, with implications for associated diseases.

Ultimately, this knowledge can contribute to reducing morbidity and mortality rates [5]. The frequency of ABO and Rh blood groups among different populations can also provide valuable insights into the genetic structure and evolutionary history of those populations [6].

The pattern of blood group distribution can vary significantly among different populations and geographical regions, and understanding these patterns is essential for effective healthcare planning, resource allocation, and management. This information can aid healthcare providers in developing effective blood banking strategies, ensuring the availability of appropriate blood products to meet the diverse needs of the local population, and minimizing the risks of adverse reactions during transfusions.

This study aims to investigate the distribution of ABO and Rh blood groups among school-going children in the Jammu region of India, as well as any potential gender-based differences in the observed patterns.

Methodology

This cross-sectional study was conducted at Acharya Shri Chander College of Medical Sciences and Hospital, Jammu, with a sample size of 200 school-going children aged 6 to 15 years. All the subjects were screened for ABO and Rh blood groups.

The participants were selected through a random sampling method, and their blood samples were collected and analysed to determine their ABO and Rh blood groups. The data collected included the participants' age, gender, and blood group information.

The collected data was analysed using appropriate statistical methods, and the distribution of ABO and Rh blood groups was examined, with a focus on any gender-based differences.

Blood Group Determination:

Blood samples were collected from the participants and tested for ABO and Rh blood groups using standard serological techniques. Blood groups were determined by slide agglutination method, by using commercially available Anti Sera A and Sera B. On a labelled slide, a drop of each finger prick blood was placed onto which a drop of anti-A, anti-B, and anti-D was added and mixed. Results of agglutination are recorded immediately. Agglutination with anti-A showed group A, with anti-B showed group B, withboth anti-A & anti-B showed group AB and with neither of these showed O group. The blood samples were also classified as Rh positive or Rh negative according to the presence or absence of the anti-D. Screening for Rh type was conducted by using anti-Dsera.

Statistical Analysis

The data collected were statistically analysed with the help of SPSS software 22.0 version. For statistical analysis, the students are grouped based on gender. A chi-square ($\chi 2$) test was performed to determine the significance between blood group and gender of the students and the graphical representation of the results was prepared with SPSS software.

RESULTS

In our study, 200 school-going children were screened for ABO and Rh grouping. Of these, 104 (52.0 %) were males and 96 (48.0%) were females with an average age of 14.9 years.

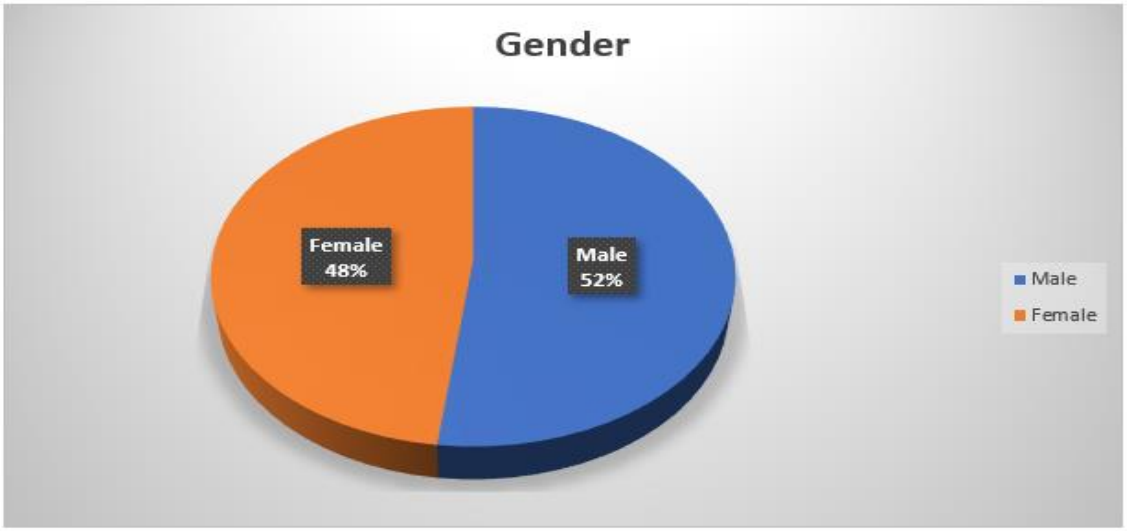

Fig 1: Gender Distribution

Table 1: Distribution of ABO blood groups

Blood Groups	No. of Students	Percentage (%)
A	44	22.0%
B	63	31.5%
O	76	38.0%
AB	17	8.5%
Total	200	100.0%

Table 1 depicts the distribution of the ABO blood group system among the study participants. It was observed in our study that the majority 76 (38.0%) of students belong to Group O, followed by Group B in 63(31.5%), Group A in 44 (22.0%) and the least common blood group was AB in 17 (8.5%) participants. The high-frequency of blood group identified was the 'O' blood group and the least blood group was AB.

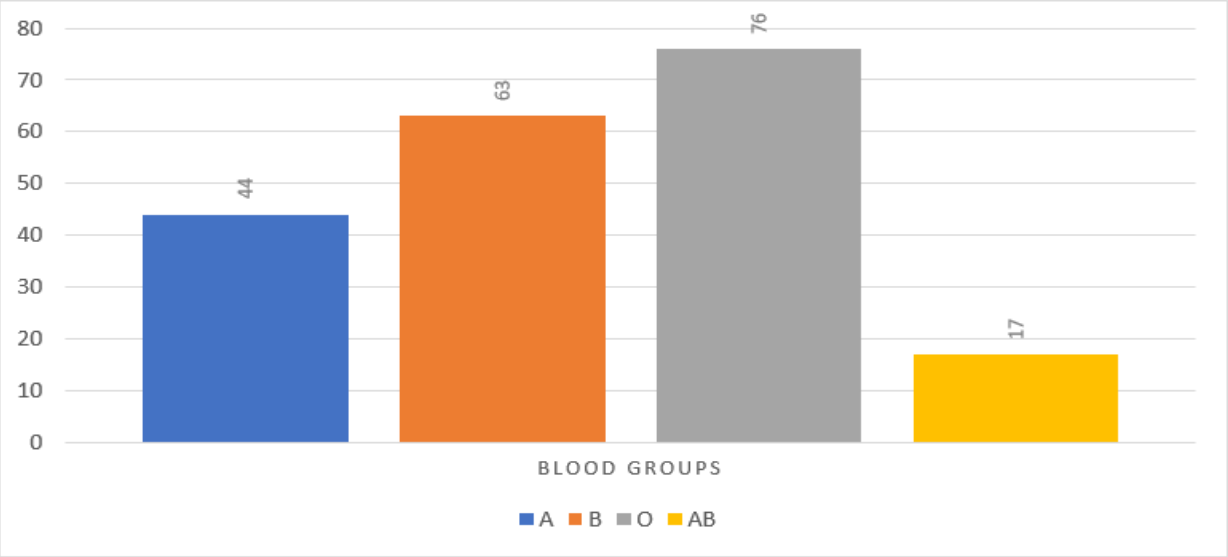

Fig 2: Distribution of ABO blood groups among the study participants

Table 2: Gender-wise distribution of ABO Blood Groups

Blood Groups	Gender	
	Male N (%)	**Female N (%)**
A	23 (11.5%)	21 (10.5%)
B	35(17.5%)	28(14.0%)
O	40(20.0%)	36(18.0%)
AB	9(4.5%)	8(4.0%)
Total	107(53.5%)	93(46.5%)

Table 2 depicts the gender-wise distribution of ABO blood groups among the study participants. It was observed in our study that there was no significant difference in ABO blood group distribution between male and female participants. The chi-square analysis ($\chi 2$= 0.1588) showed that there wasan insignificant (P=0.9839) difference between the gender and blood groups of the students.

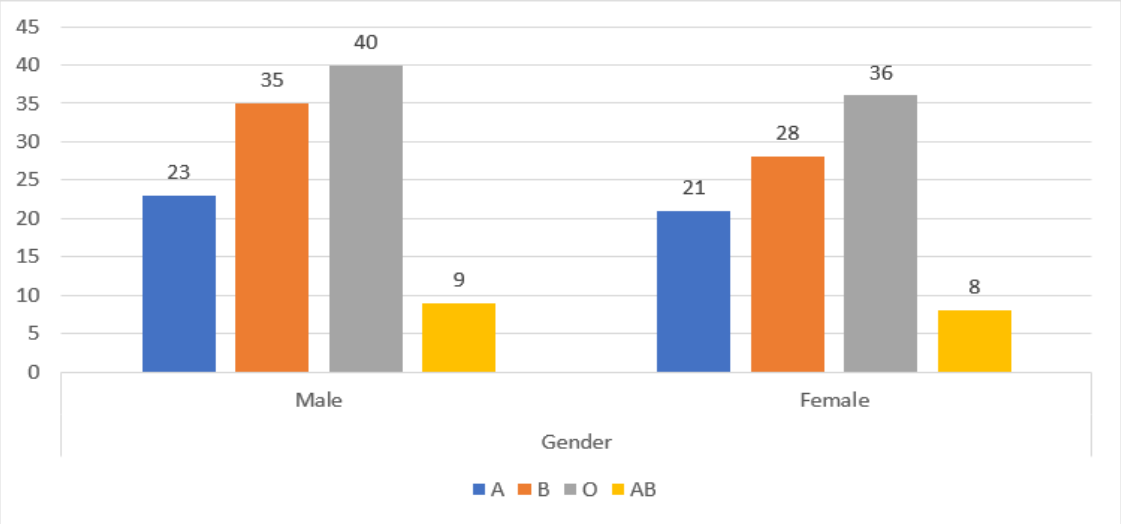

Fig 3: Gender-wise distribution of ABO Blood Groups among study participants

Table 3: Distribution of Rh factor among the study participants

Rh Factor Type	Gender	Frequency	Percentage
Positive	**Male**	92	46.0%
	Female	94	47.0%
Negative	**Male**	8	4.0%
	Female	6	3.0%
Total		200	100.0%

Table 3 depicts the Rh factor among the study participants. In our study out of 200 participants, 186 (93.0%) participants were Rh positive and 14 (7.0%) were Rh negative. It was further observed that 47.0% of females and 46.0% of males were Rh-positive whereas 4.0% of males and 3.0% of females were Rh-negative. The frequency of the Rh-positive factor was slightly higher in females than males while the Rh-negative was slightly higher in males. The chi-square analysis ($\chi 2$= 0.3072) showed that there is an insignificant (P=0.5793) difference between the gender and blood groups of the students.

DISCUSSION

The findings of this study provide insights into the distribution of ABO and Rh blood groups among school-going children in the Jammu region of India.

In our study there were 104 (52.0%) male participants and 96 (48.0%) were females with an average age of 14.9 years. This is in line with the study by (Hossain *et al*., 1970), where they found that the ABO blood group distribution varies across different populations and geographical regions. In another similar study by Groot *et al*., 2020 the mean age of the study participants was 15.6 years and there were 57% males and 43% females [3].

The distribution of ABO blood groups in the present study showed that the most common blood group was 'O' (38%), followed by 'B' (31.5%), 'A' (22%), and 'AB'(8.5%). This finding is consistent with several other studies conducted in different regions of the world, which have also reported a similar pattern of ABO blood group distribution (Hossain *et al*., 1970 and Groot *et al*., 2020) [3, 7].

Regarding gender-wise distribution, our study found no significant differences in the ABO blood group profiles between male and female participants. This observation is in agreement with the findings of previous studies by Nepal *et al*., 2019 and Groot *et al*., 2020 indicating that gender is not a major determinant of ABO blood group distribution [1, 3].

Further, the majority of the study participants (93%) were found to be Rh-positive, which is consistent with the general trend observed in other populations. The slightly higher frequency of Rh-positive among females compared to males is also in line with the results reported in the literature. The observed patterns are in line with the findings from previous studies conducted in different parts of the world (Mahmood, 2018 and Xhetani *et al*., 2014) [9, 10].

The distribution of blood groups can vary among different populations and regions, and understanding these patterns is crucial for efficient blood transfusion services and disease risk assessments [3, 8].

Limitations and Further Recommendations

This study was conducted with a relatively small sample size of 200 school-going children in the Jammu region. Future studies with larger and more diverse samples would be valuable to further explore the distribution of ABO and Rh blood groups in the region and investigate potential associations with health and disease outcomes. Additionally, incorporating genetic analysis to determine the underlying genotypes could provide deeper insights into the population-level patterns of blood group inheritance and distribution.

CONCLUSION

This study aimed to investigate the distribution of ABO and Rh blood groups among school-going children in the Jammu region of India. The study found that the most common blood group was O, followed by B, A, and AB. No significant gender-based differences were observed in the ABO blood group distribution, but the Rh-positive factor was slightly more prevalent in females, while the Rh-negative factor was slightly more common in males. The findings of this study contribute to the understanding of the regional patterns of blood group distribution, which can inform blood transfusion services and research on disease susceptibility.

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