

Distribution of ABO and Rhesus Blood Groups Among Blood Donors at a Tertiary Care Centre in Jaipur, Rajasthan: A Retrospective Study

Running Title: 'ABO and Rh Blood Group Distribution'

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Abstract: ***Background:** Knowledge of the distribution of ABO and Rhesus (Rh) blood groups among blood donors is essential for effective blood bank inventory management, ensuring timely availability of compatible blood, and supporting transfusion services. Regional variations in blood group frequencies necessitate periodic evaluation of donor profiles. **Objective:** To determine the distribution of ABO and Rhesus (Rh) blood groups among blood donors at a tertiary care centre in Jaipur, Rajasthan. **Methods:** This retrospective observational study was conducted in the Department of Transfusion Medicine, SMS Medical College, Jaipur, Rajasthan, using blood donor records collected over a six-month period from January to June 2025. Data on ABO and Rh blood groups were retrieved from the blood bank database and analysed using descriptive statistics. Blood group frequencies were expressed as numbers and percentages. **Results:** A total of 1,993 blood donors were included in the study. The most common ABO blood group was B (36.3%), followed by O (31.0%), A (21.3%), and AB (11.4%). Among individual blood groups, B positive was the most prevalent (33.2%), followed by O positive (28.0%) and A positive (19.9%). Rh-positive blood groups accounted for 91.6% of donors, whereas Rh-negative blood groups constituted 8.4%. AB negative (0.9%) was the least common blood group observed. **Conclusion:** B positive was the predominant blood group, while AB negative was the rarest among blood donors at this tertiary care centre.*

Keywords: ABO blood group; Rhesus factor; Blood donors; Blood bank; Transfusion medicine

1. Introduction

The ABO and Rhesus (Rh) blood group systems are the most clinically important blood group systems in transfusion medicine. Accurate determination of ABO and Rh blood groups is essential for ensuring compatibility during blood transfusion, preventing haemolytic transfusion reactions, and reducing the risk of haemolytic disease of the foetus and newborn.^{1,2}

The distribution of ABO and Rh blood groups varies considerably among different populations owing to genetic, ethnic, and geographical differences. Knowledge of the regional distribution of blood groups is invaluable for blood banks in maintaining adequate inventories, identifying rare blood group donors, planning donor recruitment strategies, and ensuring timely availability of compatible blood for routine and emergency transfusion services.²⁻⁴

India has a heterogeneous population with marked regional variation in blood group frequencies. Although several studies have described the distribution of ABO and Rh blood groups in different parts of the country, donor demographics and blood group patterns continue to evolve over time, necessitating periodic evaluation of local blood donor databases. Updated region-specific data are essential for

strengthening transfusion services and facilitating evidence-based blood bank management.³⁻⁵

However, contemporary data describing the distribution of ABO and Rh blood groups among blood donors from tertiary care centres in Jaipur, Rajasthan, remain limited. Therefore, the present study was undertaken to determine the distribution of ABO and Rhesus (Rh) blood groups among blood donors at a tertiary care centre in Jaipur, Rajasthan, to provide updated regional data that may support effective blood inventory management and donor recruitment strategies.

2. Materials and Methods

This retrospective observational study was conducted in the Department of Transfusion Medicine, SMS Medical College, Jaipur, Rajasthan, India. Blood donor records from January to June 2025 were reviewed to determine the distribution of ABO and Rhesus (Rh) blood groups.

All eligible blood donors who donated blood during the study period were included. Donors with incomplete records or missing blood group information were excluded. Data regarding ABO and Rh blood groups were retrieved from the blood bank records. ABO and Rh blood grouping had been routinely performed in the department using standard

immunohematology techniques with commercially available antisera, following the departmental standard operating procedures and quality control measures.

Statistical analysis

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA). The data were checked for completeness and consistency before analysis. Categorical variables, including ABO and Rhesus (Rh) blood groups, were summarized as frequencies and percentages. The distribution of blood groups was presented using tables and graphical representations. Comparisons between categorical variables were performed using the Chi-square test. A two-tailed p value of <0.05 was considered statistically significant.

The study was approved by the Institutional Ethics Committee of SMS Medical College, Jaipur. Donor confidentiality was maintained by anonymizing all records before analysis.

3. Results

During the six-month study period (January to June 2025), a total of 1,993 blood donors were included in the analysis. The highest number of donations was recorded in June (468, 23.5%), followed by April (372, 18.7%), while the lowest number was observed in January (268, 13.4%) (Figure 1).

Overall, blood group B was the most prevalent ABO blood group, accounting for 724 (36.3%) donors, followed by blood groups O [618 (31.0%)], A [424 (21.3%)], and AB [227 (11.4%)] (Table 1). Among the individual blood groups, B positive was the most common, representing 662 (33.2%) donors, followed by O positive [558 (28.0%)] and A positive [396 (19.9%)]. AB negative was the least common blood group, observed in only 17 (0.9%) donors.

Rh-positive blood groups constituted the majority of the donor population, with 1,826 (91.6%) donors, whereas Rh-negative blood groups accounted for 167 (8.4%). Among Rh-negative donors, B negative was the most frequent blood group [62 (3.1%)], followed by O negative [60 (3.0%)], A negative [28 (1.4%)], and AB negative [17 (0.9%)] (Table 2). Pearson's Chi-square test: $\chi^2 = 13.154$, $df = 15$, $p = 0.590$ shows no statistically significant results.

4. Discussion

Our findings are comparable with those of Agarwal et al., who reported blood group B as the predominant phenotype among blood donors from North India, followed by O, A, and AB, with Rh-positive donors accounting for the majority of the donor population. Similarly, Thakur et al. observed that blood group B was the most frequent and Rh positivity exceeded 90% among blood donors in Delhi, supporting the regional distribution pattern observed in the present study.⁶

The high prevalence of Rh-positive donors in the present study is consistent with reports by Agarwal et al. and Thakur et al., who also documented Rh positivity in more than 90% of blood donors.^{6,7} Such information is valuable for blood banks in maintaining adequate inventories, identifying rare

blood group donors, and planning donor recruitment strategies.

However, variations in ABO blood group distribution have been reported across different regions of India. Patil et al. reported a predominance of blood group O among blood donors from Gujarat, whereas Jain et al. observed blood group B to be the most common in Southern Rajasthan.^{8,9} These differences may be attributed to regional genetic diversity, ethnicity, and population characteristics.

The present study was limited by its retrospective, single-centre design, which may limit the generalizability of the findings. Nevertheless, it provides recent data on the distribution of ABO and Rh blood groups among blood donors in Jaipur, Rajasthan, which may assist in regional blood inventory management and transfusion service planning.

5. Conclusion

Blood group B was the predominant ABO blood group, while AB negative was the least common among blood donors at our tertiary care centre. Rh-positive blood groups constituted the majority of the donor population.

Conflict of interest: No

Funded/sponsorship: Self

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Figure

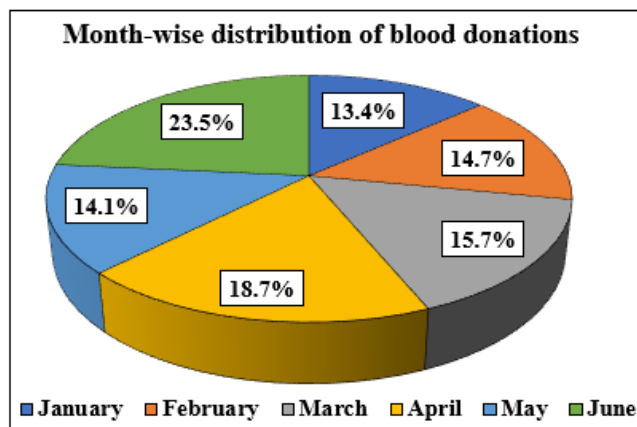


Figure 1: Month-wise distribution of blood donations

Tables

Table 1: Distribution of ABO and Rhesus (Rh) blood groups among blood donors

Blood Group	Frequency (n = 1993)	Percentage (%)
A+	396	19.9
A-	28	1.4
B+	662	33.2
B-	62	3.1
O+	558	28
O-	60	3
AB+	210	10.5
AB-	17	0.9

Table 2: Month-wise distribution of ABO blood groups

Month	A n (%)	B n (%)	O n (%)	AB n (%)	Total	Pearson's Chi-square test: $\chi^2 = 13.154$, df = 15, p = 0.590
January	67 (25.0)	98 (36.6)	78 (29.1)	25 (9.3)	268	
February	55 (18.8)	105 (36.0)	94 (32.2)	38 (13.0)	292	
March	65 (20.8)	100 (32.1)	107 (34.3)	40 (12.8)	312	
April	74 (19.9)	134 (36.0)	121 (32.5)	43 (11.6)	372	
May	60 (21.4)	99 (35.2)	90 (32.0)	32 (11.4)	281	
June	103 (22.0)	188 (40.2)	128 (27.4)	49 (10.5)	468	
Total	424 (21.3)	724 (36.3)	618 (31.0)	227 (11.4)	1993	