Journal of Cardiovascular Disease Research

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 09, 2024

Original research article

A study of distribution pattern of blood groups among blood donors at a tertiary care hospital in North Karnataka

[1]Dr. Aishwarya S Patil, [2]Dr. Anshi Singh, [3]Dr. Shruti Sawant, [4]Dr. Srushti Mulimani

[1]Assistant Professor, Department of Pathology, ESIC Medical College and Hospital, Kalaburagi, Karnataka, India

[2]Assistant Professor Department of Pathology, Maharshi Devraha Baba Autonomous State Medical College, Deoria, Uttar Pradesh, India

[3]Assistant Professor, Department of Pathology, Al Ameen Medical College, Vijayapura, Karnataka, India

[4]Senior Resident, Department of pathology, Shri BM Patil Medical College and Research Centre, Vijayapura, Karnataka, India

Corresponding Author:
Dr. Srushti Mulimani

Submitted on: 01/08/2024 **Published on:** 31/08/2024

Abstract

This study aims to analyze the distribution pattern of blood groups among blood donors at a tertiary care hospital in North Karnataka. The analysis includes gender, age distribution, ABO blood groups, and Rh phenotypes. Understanding these patterns can help in better blood bank management and meet the needs of patients more effectively.

Keywords: ABO, blood group, Rh factor, distribution, blood donors.

Introduction

Blood donation is a critical aspect of healthcare systems, and understanding the distribution of blood groups among donors can provide valuable insights for blood bank management. This study investigates the demographic distribution and blood group frequencies among donors at a tertiary care hospital in North Karnataka. We compare these results with studies from other regions of India to assess regional variations.

Objectives

1. To determine the distribution of blood donors by gender.
2. To analyze the age distribution of blood donors.
3. To assess the distribution of ABO blood groups among donors.
4. To evaluate the distribution of Rh phenotypes among donors.
5. To compare the study results with similar studies from different regions of India.

Materials and Methods

- **Type of Study:** Retrospective study.
- **Setting:** Tertiary care hospital in North Karnataka.
- **Duration:** 5 years (25th of July 2019 to 31st of July 2024).
- **Participants:** Blood donors who donated between (25/7/2019 to 31/7/2024).
- **Data Collection:** Data was collected from blood donor records maintained at the hospital.
- **Data Analysis:** Descriptive statistics were used to summarize the data. Frequencies and percentages were calculated for categorical variables.

Results

The total number of blood donors registered at our blood bank from July 2019 to July 2024 was 8196 which included 8029 (98.0%) males and 167(2.0%) females (Table 1).and maximum donors belonged to age group of 21 to 30 years followed by 31-40 years. Analysis of data collected on the ABO and Rh blood group type of all blood donors revealed Group O (33.3%) as the most common ABO blood group type, followed by group B (31.2%), group A (24.2%) and group AB (11.3%) respectively.

Bombay blood group remains exceptionally rare in our study, with only 0.02% prevalence (Table 3).

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 09, 2024

The distribution of Rh blood group type revealed 96.3% as Rh-positive and 3.7% as Rh-negative (Table 4). In other parts of India, blood group frequencies show A: 18-26%, B: 28-39%, AB: 5-13%, O: 37-40% (Table 5). Internationally, A: 21-42%, B: 8-29%, AB: 2.8-11%, O: 33-54%. Rh+ in India ranges from 94-99%, while Rh- is 0.57-8.7%. (Table 5). While globally Rh+ ranges from (83% to 96.7%) and Rh- (3.3% to 17%).

Table 1: Distribution of blood donors by gender

Gender	No of donors	%
Male	8029	98.0
Female	167	2.0
Total	8196	100

Table 2: Distribution of blood donors by age group

Age of donors (in years)	Number of donors	Percentage (%)
19-20	392	4.8
21-30	4722	57.6
31-40	2518	30.7
41-50	463	5.6
51-60	98	1.2
61-65	03	0.04
Total	8196	100

Table 3: Distribution of blood donors by ABO blood groups

Blood Group	Number of donors	Percentage (%)
A	1980	24.2
B	2559	31.2
AB	925	11.3
O	2730	33.3
Bombay blood group	02	0.02
Total	8196	100

Table 4: Distribution of blood donors by Rh phenotype

Rh Phenotype	Number of donors	Percentage (%)
Rh+	7890	96.3
Rh-	306	3.7
Total	8196	100

Table 5: Comparison of frequency distribution of ABO & Rh blood groups among different regions of India

	A (%)	B (%)	O (%)	AB (%)	Bombay Blood group (%)	Rh+ (%)	Rh – (%)
South India							
Kalaburagi, Karnataka (Present study)	24.2	31.2	33.3	11.3	0.02	96.3	3.7
Mangalore, Karnataka	25.47	28.39	38.05	7.62	0.02	94	06
Mumbai, Maharastra	18.85	32.69	38.75	5.27	-	94.53	4.47
Bangalore	23.85	29.95	39.81	6.37	-	94.2	5.7
Davanagere	26.15	29.85	36.76	7.24	-	94.48	5.52
Shimogga, Malnad	24.27	29.3	39.1	7.1	-	94.9	5.0
North India							
Lucknow	21.38	39.92	29.27	9.43	-	95.71	4.29
Delhi	23.98	35.4	30.96	9.65	-	95.63	4.37
Amritsar	18	38.6	34.3	9.6	-	91.2	8.7
Central India							
Chattisgarh	24.95	30.44	31.09	13.52	-	99.43	0.57
Western India							
Gujrat	24.35	34.43	32.26	8.94	-	95.12	4.87
Ahmedabad	21.94	39.4	30.79	7.86	0	95.05	4.95
Eastern India							
Durgapur	23.9	33.6	34.8	7.7	0	94.7	5.3

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 09, 2024

Table 6: Comparison of frequency distribution of ABO & Rh blood groups among different regions outside India

	A (%)	B (%)	O (%)	AB (%)	Bombay (%)	Rh+ (%)	Rh- (%)
Nepal	34	29	33	4	-	96.7	3.3
Britain	42	08	47	3	-	83	17
USA	41	09	46	04	-	85	15
Australia	38	10	49	03	-	NA	NA
Nigeria	21.6	21.4	54.2	2.8	-	95.2	4.8
Saudi Arabia	24	17	52	04	-	93	07

1. Comparison of Blood Group and Rh Phenotype Data

Blood Group Distribution Analysis

Table 3 (Current Study)

- **A:** 24.2%
- **B:** 31.2%
- **AB:** 11.3%
- **O:** 33.3%
- **Bombay Blood Group:** 0.02%

Table 5 (Regional Data from India):

- **A:** Ranges from 18% to 26.15%
- **B:** Ranges from 28.39% to 39.92%
- **AB:** Ranges from 5.27% to 13.52%
- **O:** Ranges from 36.76% to 39.81%
- **Bombay Blood Group:** Data not available

Table 6 (International Data)

- **A:** Ranges from 21.6% to 42%
- **B:** Ranges from 8% to 29%
- **AB:** Ranges from 2.8% to 11%
- **O:** Ranges from 33% to 54.2%
- **Bombay Blood Group:** Data not available

Rh Phenotype Analysis

Table 4 (Current Study)

- **Rh+:** 96.3%.
- **Rh-:** 3.7%.

Table 5 (Regional Data from India)

- **Rh+:** Ranges from 94% to 99.43%
- **Rh-:** Ranges from 0.57% to 8.7%

Table 6 (International Data)

- **Rh+:** Ranges from 83% to 96.7%
- **Rh-:** Ranges from 3.3% to 17%

Discussion

In 1900, Karl Landsteiner discovered the ABO blood group system, identifying A, B, and O types, for which he won the Nobel Prize in 1930. He found that blood clumping occurs due to antigens and antibodies. Understanding ABO and Rh blood group distributions is crucial for blood banks to prevent complications from incompatible transfusions, including hemolysis and renal failure.

This study highlights blood group distribution among donors at a North Karnataka hospital, showing a significant male predominance (98.0%), consistent with national trends. This imbalance may be influenced by socio-cultural factors and eligibility criteria affecting female participation. Increased awareness and targeted campaigns are needed to address this disparity. The study also notes a predominance of younger donors (57.6% aged 21-30), reflecting greater health awareness among this group. However, the low representation of older donors suggests a need for strategies to engage this age group more effectively. Overall, the findings align with other Indian studies on gender and age distribution in blood donation.

The ABO blood group distribution in our study aligns with both regional and global trends. The A blood group at 24.2% fits within the Indian (18% to 26.15%) and global (21.6% to 42%) ranges. The B blood group prevalence of 31.2% is at the higher end of the Indian range (28.39% to 39.92%) and lower than the global range (8% to 29%). The AB group at 11.3% matches the Indian (5.27% to 13.52%) and global

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 09, 2024

(2.8% to 11%) ranges. The O blood group at 33.3% is consistent with the global range (33% to 54.2%) and higher end of Indian data (36.76% to 39.81%).

Bombay Blood Group

The Bombay blood group remains exceptionally rare in our study, with only 0.02% prevalence. This rarity is consistent with data from both regional and international sources, which report no significant presence of the Bombay phenotype. This emphasizes its genetic rarity and highlights the need for specialized awareness and resources to manage cases involving this blood type.

Rh Phenotype: Our study shows a 96.3% prevalence of Rh-positive individuals, consistent with global (83% to 96.7%) and high Indian (94% to 99.43%) ranges. The 3.7% Rh-negative rate aligns with international data (3.3% to 17%) and the lower end of the Indian range (0.57% to 8.7%).

Conclusion

Our study provides a detailed analysis of blood group distribution among donors in North Karnataka, offering valuable insights for optimizing blood bank operations. It highlights a predominance of male and younger donors, with blood group O being the most common, followed by B, A, and AB, reflecting consistent trends seen both nationally and globally. Rh positive blood is also prevalent, aligning with international data.

The Bombay blood group remains extremely rare in our study, accounting for just 0.02% of donors, which is consistent with its negligible prevalence reported in both Indian and international studies. This rarity underscores the need for specialized protocols to manage this rare phenotype effectively.

To improve blood bank management, it is crucial to encourage diverse donor participation across various age and gender groups and ensure an adequate supply of all blood types, including rare ones. This data is essential for efficient blood supply management and addressing specific patient needs based on demographic trends. Continuous research and monitoring will enhance our ability to adapt to the evolving demands of the healthcare system. Overall, our findings reflect broader patterns in blood group distribution and emphasize the importance of preparedness for rare blood types.

References

1. Badge SA, Ovhal AG, Azad K, Meshram AT. Distribution of blood groups in blood donors in the blood bank of Jagdalpur, Bastar district, Chhattisgarh. Med J DY Patil Univ. 2017;10(1):32-35.
2. Chandekar AS, Gayathri PA, Heena MD, Nitin V, Gururaj VP. Distribution of ABO and Rh-D blood groups among blood donors: Western India data. Int J Sci Stud. 2017;5(3):54-56.
3. Das PK, Nair SC, Harris VK, Rose D, Mammen J, Bose YN, *et al*. Distribution of ABO and Rh-D blood groups among blood donors in a tertiary care centre in South India. Trop Doct. 2001;31(1):47-48.
4. Periyavan S, Sangeetha S, Marimuthu P, Manjunath B. Distribution of ABO and Rhesus-D blood groups in and around Bangalore. Asian J Transfus Sci. 2010;4(1):41. doi:10.4103/0973-6247.59391.
5. Mallikarjuna S. Prevalence of ABO and Rhesus blood group among blood donors. Indian J Public Health Res Dev. 2012;6(3):106-109.
6. Singh A, Srivastava RK, Deogharia KS, Singh KK. Distribution of ABO and Rh types in voluntary blood donors in Jharkhand area: A study conducted by RIMS, Ranchi. [Unpublished study].
7. Pillay V, Reddy P, de Kock L, Muthusamy S. Blood group distribution in South Africa: A retrospective study. Transfus Med. 2022;32(4):189-195. doi:10.1111/tme.12876.
8. Rao PS, Kumar VP, Reddy YV, Suresh S, Kumari NS. Frequency of ABO and Rh blood groups in the South Indian population. J Blood Med. 2021;12:57-63. doi:10.2147/JBM.S293126.
9. Khan AA, Sheikh A, Khan M, Khan MA. Blood group distribution among blood donors in a tertiary care hospital in Northern India. Asian J Transfus Sci. 2020;14(1):34-8. doi:10.4103/ajts.AJTS_91_19.