PATTERN OF ABO AND Rh BLOOD GROUPS AMONG VOLUNTARY BLOOD DONORS AT NEPAL RED CROSS SOCIETY CENTRAL BLOOD TRANSFUSION SERVICE CENTRE, KALIMATI, KATHMANDU

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ABSTRACT

Blood is a circulatory fluid, responsible for the transport of hormones, nutrients, and enzymes all over the body. It consists of a protein-rich fluid known as plasma, in which are suspended cellular elements: white blood cells (WBC), red blood cells (RBC), and platelets. ABO blood grouping and cross-matching are commonly tested for transfusion of blood and its components, organ transplantation, genetic studies, forensic determinations, as well as for medico-legal issues such as paternity disputes. A descriptive cross-sectional study was conducted in Nepal Red Cross Society Central Blood Transfusion Service Centre, Kalimati, Kathmandu from January 1st 2023 to June 2023 done in 187 donors. Among 187 donors, the age of the donors ranged from 18 years to 55 years, with an average age of 35±0.58 years. The above figure showed that the majority (65.0%) fell into the age group of 26-40 years, followed by those aged 41-55 years, and finally, those aged 18-25 years, respectively. Among all voluntary donors, the majority (71.0%) were male, while 29% were female donors. Data analysis was done by using SPSS and MS-Excel. The result showed maximum number of voluntary donors to be of blood group O, followed by B, A and AB.

KEYWORDS

ABO blood group, blood transfusion, Rhesus (Rh), organ-transplantation

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INTRODUCTION

Blood is a circulatory fluid, responsible for the transport of hormones, nutrients, and enzymes all over the body.[1] It consists of a protein-rich fluid known as plasma, in which are suspended cellular elements: white blood cells (WBC), red blood cells (RBC), and platelets.[2]

The RBC membrane contains many antigens made from glycoproteins and glycolipids.[3] Based on the presence of antigens on the RBC cell membrane, there are more than 100 blood group systems. Yet, the ABO and Rh blood group antigens are the most commonly used, in clinical settings in order to avoid transfusion reactions and maternal deaths.[4,5]

ABO blood grouping and cross-matching are commonly tested for transfusion of blood and its components, organ transplantation, genetic studies, forensic determinations, as well as for medico-legal issues such as paternity disputes.[6]

Karl Landsteiner discovered the ABO blood group, the first human blood group system, in 1901.[7] Later on, in 1941 Rh blood grouping was discovered by Landsteiner and Weiner.[8] Since then these ABO and Rh blood grouping systems have become the most important for blood transfusion purposes. Agglutinins are the antibodies against red blood cell antigens and based on the presence of these antigens and agglutinins human blood is divided into four major blood groups A, B, AB and O.[9]

Apart from the antigens of the ABO system, those of the Rh system is of the greatest clinical importance. The Rh factor is a system composed primarily of the C, D, and E antigens. D is by far the most antigenic component. Rh-positive means that the individual has agglutinogen or antigen D. The Rh-negative individual has no D antigen or agglutinogen and forms the anti-D agglutinin when injected with D-positive cells. The Rh typing serum used in routine blood typing is anti-D serum.[10]

MATERIALS AND METHODS

A descriptive cross-sectional study was done and data were collected from voluntary donors during four different blood donation campaigns organized by the Nepal Red Cross Society Central Blood Transfusion Service Centre in Kalimati, Kathmandu, using the consecutive sampling method. The campaigns were conducted at the following locations: *Nepal Nijamati Karmachaari Sanghathan*, Maitighar; *Chakku Bakku* Park, Baneshwor; *Malpot* Office, Kalanki; and *Bhugol* Park, New Road. Study period from January 2023 to June 2023. Assuming the prevalence of O positive blood group as 61.0% from previous study,[11] margin of error as 10.0%, with 95.0% confidence interval, the minimum sample size was calculated to be 187 donors. Pretesting of the proforma was performed in 10.0% of the sample.

Descriptive analysis was done by using frequency, percentage, minimum, maximum, range, mean, standard deviation as per the nature of the data and inferential statistics will be done by using chi square test. Data analysis was done by using SPSS-17 and MS-Excel. Ethical approval was taken from Institutional Review Committee of Nepal Medical College.

During blood donation, approximately 2 ml of blood from each donor was collected in EDTA tubes for analysis. ABO and Rh status were analyzed by tube method using commercially prepared anti-A, anti-B, anti-AB and anti-D antisera blood types. To do so correctly, we followed the specific procedures outlined in the manufacturer's manual. Prepared 5.0% suspensions of red blood cells in normal saline were used. Four different tubes labeled with donor unit numbers were added with one drop of antisera A, B, AB and D. To every tube with specific antisera one drop of 5.0% cell suspension was added and each sample was macroscopically observed for agglutination.

RESULTS

A total of 187 donors from various blood donation campaigns were included in this study. The age of the donors ranged from 18 years to 55 years, with an average age of 35±0.58 years. The above figure showed that the majority (65.0%) fell into the age group of 26-40 years, followed by those aged 41-55 years, and finally, those aged 18-25 years, respectively (Fig. 1).

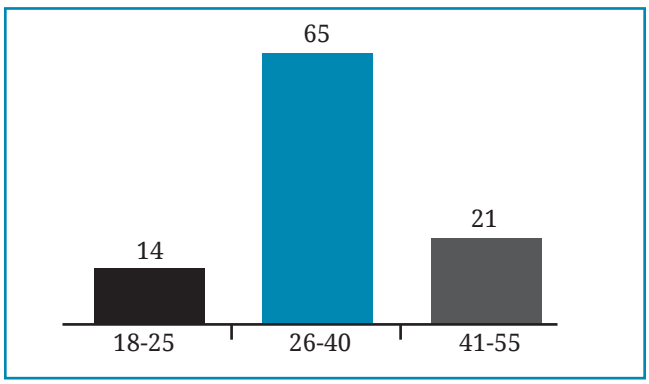

Fig. 1: Distribution of blood donors on the basis of age group (n=187)

Among all voluntary donors, the majority (71.0%) were male, while 29.0% were female donors (Fig. 2).

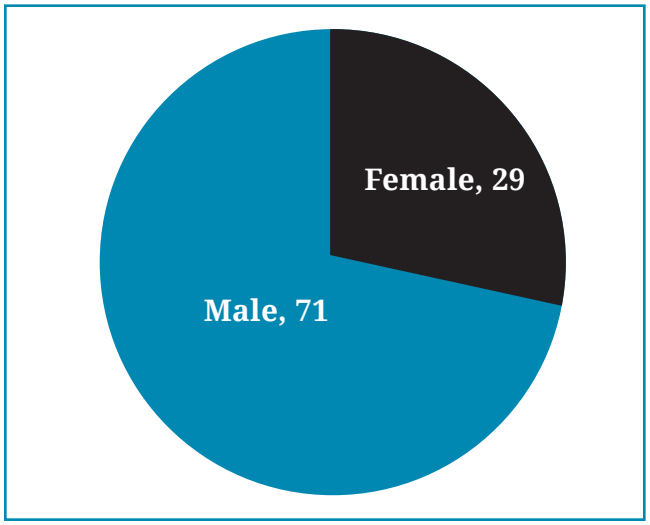

Fig. 2: Distribution of blood donors on the basis of gender

As shown in Table 1, the results show that the majority of donors (67.0%) are *Brahmin/Chhetri*, followed by *Adibasi-Janajati* (27.0%), *Dalit* (3.0%), *Madhesi* (2.0%), and others (1.0%), respectively.

It was found that the majority of donors (76.0%) were married, while the remaining 24.0% were unmarried (Fig. 3).

Table 1: Distribution of the donors on the basis of ethnic groups

Ethnicity	n (%)
Brahmin/Chhetri	125 (67)
Adibasi-Janajati	51 (27)
Madesi	3 (2)
Dalit	6 (3)
Others	2 (1)

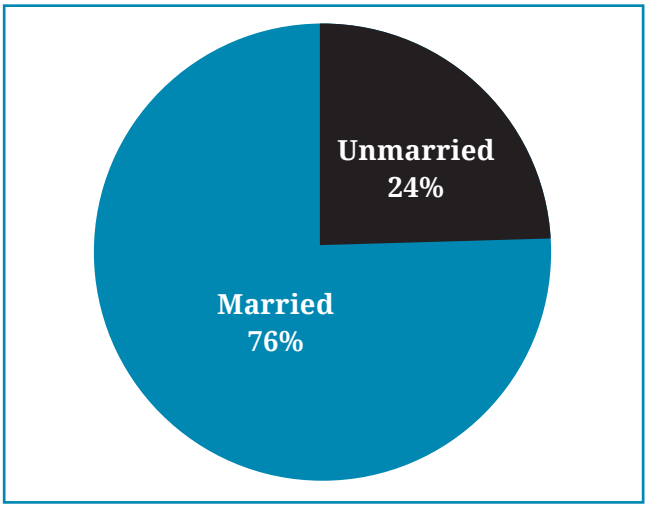

Fig. 3: Distribution of donors on the basis of marital status

Results showed that an equal number of voluntary donors came from Kathmandu Valley and outside of Kathmandu Valley (Fig. 4).

As seen in Fig. 5, among all voluntary donors, 34.0% had O blood type, 25.0% had B blood type, 19.0% had A blood type, and 16.0% have AB blood type. Surprisingly, 6.0% of donors were unaware of their blood type.

According to those findings, 92.0% were Rh-positive, and 8.0% were Rh-negative. Their distribution across different blood groups was shown in Table 2.

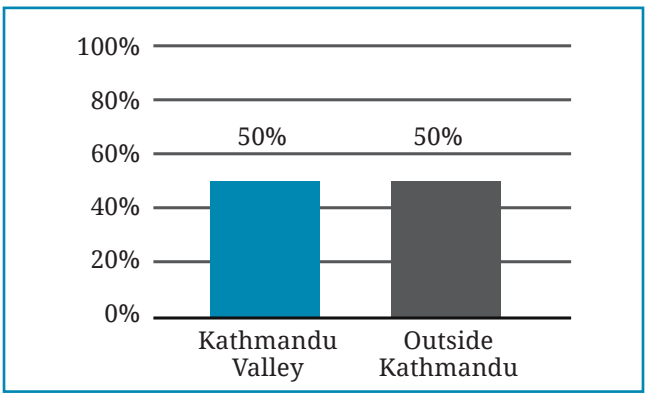

Fig. 4: Distribution of donors on the basis of address

Table 2: Distribution of Rh antigens per ABO blood group among participants

Blood groups	Rh-positive	n (%)	Rh-negative	n (%)
A	A Rh-positive	33 (18)	A Rh-negative	2 (1)
B	B Rh-positive	45 (24)	B Rh-negative	2 (1)
O	O Rh-positive	57 (31)	O Rh-negative	7 (4)
AB	AB Rh-positive	25 (13)	AB Rh-negative	4 (2)

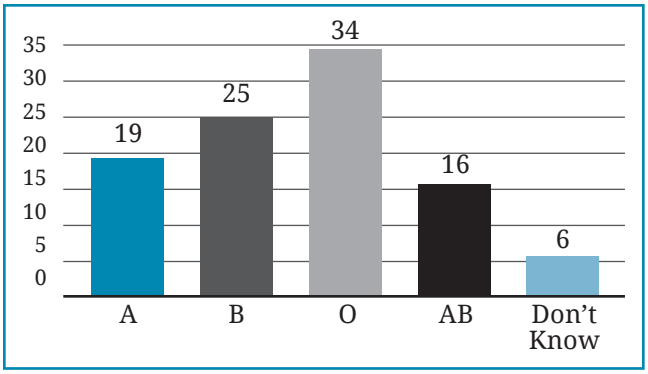

Fig. 5: Distribution of donors on the basis of blood groups types

DISCUSSION

In the present study, we found that O positive was the most prevalent. This finding was silmilar to the finding of Joshi *et al*[18] done in Chitwan Medical College in 2,031 students. In their study, 1,147 were male and 884 were female and the most common blood group was O (739, 36.4%) followed by B (624, 30.7%) and A (522, 25.7%) and the least common blood group was AB (146, 7.2%). Among all participants, as reported by Joshi *et al*,[18] 96.8% of the people were Rh-positive and 3.2% were Rh-negative which was similar to our findings.

Shrestha *et al*[17] conducted a cross-sectional descriptive study from 1st January 2011 to 31st December 2011, in Kathmandu among 13,568 students which revealed that frequencies of Rh-positive and Rh-negative blood groups were found to be 13,200 (97.3%) and 368 (2.7%) which is similar to our study. Also, blood group O was common in *Brahmin, Chhetri, Tamang, Lama, Gurung* and *Sherpa*.

Mohamed *et al*[11] did a retrospective cross-sectional study in Somalia from December 2017 to December 2020 which revealed that the most prevalent was blood group O (61.0%), followed by A (27.0%), B (10.0%), and AB (2.0%). Rh-positive participants were 97.0% and 3.0% were Rh-negative. The findings were in agreement with the findings of present study.

Upadhyay *et al*[16] studied the blood group distribution in five different medical colleges in Nepal. Blood sample were taken to determine the blood group of 2,208 Nepalese students from five different medical colleges viz. Manipal College of Medical Sciences, Kaski; Nepalgunj Medical College, Chisapani, Banke; College of Medical Sciences, Chitwan; Kist Medical College, Lalitpur and Janaki Medical College, Janakpur. They found that 28.2% were blood group A, 30.1% were blood group B, 34.87% were blood group O and 6.7% were blood group AB. These findings were not in agreement with the findings of present study. However, the findings with regard to Rh-positive (92.0%) and -negative (8.0) were similar to the findings of present study.

Our study showed that among the various ABO and Rh blood groups, group O is the commonest, followed by blood group B, blood group A and then blood group AB. Blood donation by females was low and needs to be increased by improving the awareness level and health status of women as well. The present study is, therefore, useful in providing information on the status of ABO and Rh blood group distribution that will help us in effective management of central blood transfusion service in Nepal as well as in the preparation of a database in the blood banks.

Conflict of interest: None

Source of research fund: None

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