

Distribution and Frequency of ABO and Rhesus blood groups among donors at Chughtai Institute of Pathology, Lahore

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ABSTRACT

Aim: To assess the demographic background of blood donors in a referral institution located in Lahore, as well as the distribution of blood groups among those who donate blood. Additionally, the study will investigate the distribution of blood groups among those who donate blood.

Study design: A cross-sectional study

Place of Study: Chughtai Institute of Pathology, Lahore

Study duration: March to June 2023

Results: Among the participants, blood group O was most common 202(49.26%), followed by A 110(27.1%), B 82(20%) and AB 15(3.65%). Blood group O was most common. Blood group O was the least common among participants. The least common blood group was AB, with 3.65% of male participants and 1.7% of female participants. A statistical analysis found no significant difference between gender and blood type ($\chi^2 = 2.9932$, P value = 0.912). All blood groups except AB had Rh-negative antigens. A comparison of blood types found no changes in RH ($\chi^2 = 2.112$, P value = 0.698).

Conclusion: For the functioning of a national health service, it is crucial to possess current information on the prevalence of blood types in various local settings. Currently, there is a lack of information on this important subject. Our research provides detailed information on the blood type and demographic characteristics of donors. Additional research and mobilisation are needed nationwide to adhere to the World Health Organization's suggestions regarding voluntary blood donation.

Keywords: Rhesus factor, ABO, blood donation, and transfusion medicine

INTRODUCTION

Gene therapy was developed upon the realisation that red blood cell surfaces contain antigens and blood plasma contains antibodies specific to certain antigens. This discovery is the basis of contemporary medicine, supporting the categorization of blood types and transfusions. In Lahore, there is a strong demand for whole blood and blood products, yet the supply is inadequate. In Lahore, the shortage of transfusion blood is a significant factor in postpartum haemorrhage, a primary cause of maternal death. This is a significant factor contributing to the issue. Car accidents, HIV, gastrointestinal bleeding, and elective procedures are prevalent. Blood banks require up-to-date data on the distribution and prevalence of blood groups to ensure a sufficient supply of the most advantageous blood types for medical purposes.

Red blood cell antigens cause most cases of blood clustering. Proteins and carbohydrates attached to lipids or proteins serve as antigens. These are their constituent parts (Tenorio et al., 2007). There are more than 500 antigens in each of the 100 blood group systems. Research on humans has concentrated on the ABO blood group. These antigens facilitate the movement of molecules across membranes and sustain membrane integrity. ABO antigens are abundantly present in human tissues and the majority of epithelial and endothelial cells. Infections, including those related to cancer, can be produced by antigen expression. (Blood Cells, Immunity, and Blood Coagulation - Guyton and Hall Textbook of Medical Physiology, 12th Ed, 2022) The Multinational Pancreatic Cancer Consortium identified ABO gene susceptibility loci related to the development of pancreatic cancer. Previous studies have associated stomach cancer with blood group A, which raises the likelihood of *Helicobacter pylori* infection. Multiple theoretical explanations have been suggested to elucidate the increased susceptibility of individuals with different blood types to cancer. This category comprises models related to

inflammation, immune system surveillance, and cell membrane signalling. A transfusion service needs to be aware of the Rhesus antigen distribution within the community. This understanding is essential for antenatal serology, paternity testing, and blood and blood product compatibility.

Transfusion reactions continued to occur despite Karl Landsteiner's discovery of blood types in 1900. Landsteiner and Weiner's discovery of the Rh factor in 1940 improved the safety of transfusion treatments. This finding revolutionised the field of medicine (Durand & Willis, 2010).

The Rh factor, associated with A and B antigens, was immunogenic and necessitated pre-transfusion testing. This was done out of necessity. There are over fifty antigens in the Rh blood type system, with the D, C, E, c, and e antigens being of medical importance. An individual possessing the Rhesus antigen is classified as Rhesus positive. Individuals with Rhesus negative blood type do not possess the antigen. Individuals without the Rhesus factor will generate antibodies upon exposure to Rh-positive blood. These antibodies trigger hemolytic reactions that can be fatal. Information on blood donor ABO and Rh distribution in Lahore is scarce throughout Asia. Furthermore, Lahore does not have this information. (Patients' perceptions of blood transfusion risks in Karachi, Pakistan., n.d)

This study analyses the demographics of blood donors at Lahore referral hospital. The study aims to ascertain the distribution of blood groups among donors.

METHODOLOGY

A cross-sectional study was conducted at the Chughtai Institute of Pathology, Lahore between March to June 2023. The experiment spanned three months, running from March to June 2023. The Chughtai Clinical Laboratory in Lahore gathered samples in March to June 2023. The samples were assessed in the laboratory from donors who volunteered or replaced others. Voluntary blood donors contribute blood, plasma, or cells. Donors are individuals who contribute blood, plasma, or cells. relatives donors, also

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referred to as replacement donors, provide blood upon request from relatives or friends. Family donors are substitute donors. Donors needed to be aged 20-50, weigh over 60 kilograms, and meet the haemoglobin requirements for the study. Donors were required to have a haemoglobin level of 12.0 g/dL for females and 13.0 g/dL for males, according to WHO guidelines. 410 out of 540 donors satisfied the inclusion requirements. 410 individuals possessed all the analytical data in this investigation. Each donor provided three millilitres of blood for analysis in EDTA tubes. Commercially obtained anti-A, anti-B, anti-AB, and anti-D antisera were utilised to establish ABO and Rh status. The analysis was conducted using the tube method.

We were able to do this task by adhering to the manufacturer's manual. Red blood cell suspensions at a concentration of 5% in normal saline were utilised. After adding a single drop of antisera A, B, AB, and D, four tubes labelled with donor unit numbers were inserted. Every sample was inspected under a microscope for the process of antisera agglutination. Each tube was treated with a single drop of 5% cell solution containing specific antisera. We reached our objective by utilising descriptive statistics, which presented data through frequency and percentages. Fisher's exact test was employed to assess the correlation between exposures and outcomes. A P value less than 0.05 was deemed statistically significant.

RESULTS

The conditions for inclusion were met by a total of 540 individuals, making them eligible for inclusion. Among the entire number of individuals who submitted complete information, there were a total of four hundred and ten blood donors. When compared to the number of female participants, which accounted for 10% of the total (n = 41), there were much more male participants, which accounted for 90% of the total (n= 369). The age distribution of the participants was as follows: 190(46.34%), 108(26.34%), and 112(27.31%) for the age groups of 20–29, 30–39, and 40–50, respectively.

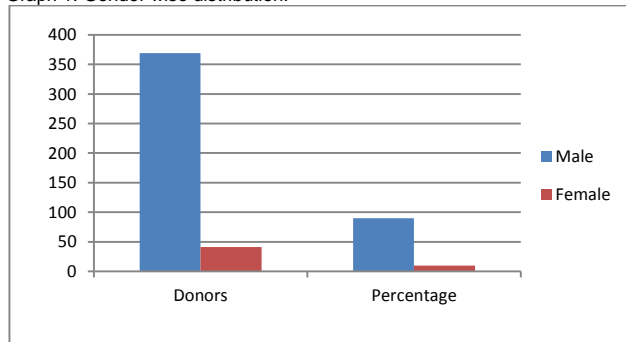
Among the participants, blood group O was the most common 202(49.26%), followed by blood group A 110(27.1%), blood group B 82(20%) and blood group AB 15(3.65%). The proportion of individuals who had blood group O was the highest. On the other hand, blood group O was the blood type that was found the least frequently among the participants.

Blood group AB was the blood group that was found to be the least common, with only 3.65% of male participants and 1.7% of female participants belonging to this blood group, respectively. The results of the statistical analysis indicated that there was no statistically significant difference between the gender and the blood type ($\chi^2 = 2.9932$, while the P value was 0.912). Rh-negative antigens were found in every blood group other than blood group AB, with the exception of blood group AB, which was the only blood group that did not contain these antigens. A comparison of different blood types revealed that there were no differences in relative humidity (RH) ($\chi^2 = 2.112$, P value = 0.698 among the blood types). The distribution of blood groups and Rh(D) factors among the patients revealed that the most common blood group was O, accounting for 41.46% of the total patients, followed by A with 24.39%. Among the Rh (D) factors, positive (+) was predominant, comprising 78.05% of the patients, while negative (-) accounted for 21.95%. The majority of patients with blood group O were Rh(D) positive, with 34.15% falling into this category. Conversely, blood group AB had the smallest representation, with 9.76% being Rh(D) positive and 4.88% being Rh(D) negative.

Table 1: Distribution of ABO antigens

Blood Group	Count	%age
O	202	49.26%
A	110	27.1%
B	82	20%
AB	15	3.65%

Graph 1: Gender wise distribution.



Graph 2: Age wise distribution

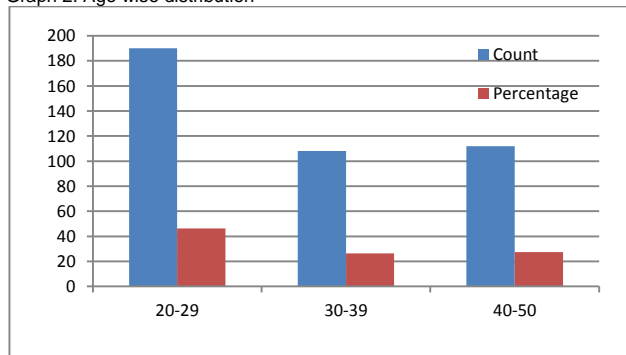


Table 2 Distribution of Rh blood group

Rh(D) Factor	n	%age
Positive (+)	320	78.04
Negative (-)	90	21.95
Total	410	100

Table 3 Blood Group and Rh prevalence among voluntary blood donors and the correlation with gender

Blood Group	Rh(D) Factor	n	%age
A	Positive (+)	80	19.51%
A	Negative (-)	20	4.88%
B	Positive (+)	60	14.63%
B	Negative (-)	20	4.88%
AB	Positive (+)	40	9.76%
AB	Negative (-)	20	4.88%
O	Positive (+)	140	34.15%
O	Negative (-)	30	7.32%
Total		410	100.00%

DISCUSSION

This study aimed to establish the frequency of ABO and Rh antigens among blood donors in Lahore, Pakistan, a region with limited data on this subject. A recent study discovered that most donors were male. This result aligns with previous research conducted in Pakistan and in other areas.

Most blood donors in Lahore were male. The ABO and Rh antigen distribution among blood donors in Lahore aligns with the worldwide pattern. This aligns with prior research conducted in Pakistan and numerous other countries and regions. The research will focus on analyzing the prevalence of ABO and Rh antigen types in Lahore's donor community to gain insights into their demographics and genetics. To understand contributors, this will be accomplished (Asghar et al., 2020).

Various factors such as regular monthly cycles, excessive menstrual bleeding, iron deficiency anemia during pregnancy, and blood loss after childbirth can hinder women from reaching the hemoglobin donation requirements. The cause is menorrhagia. This may have played a part. Women may fail to satisfy

hemoglobin cut-off values because of menorrhagia, regular menstrual cycles, prenatal iron deficiency anemia, and postnatal blood loss. All of these factors may lead to this outcome (Akbar et al., 2018). This issue has presented a potential barrier for women who wish to donate blood independently. Research and communication are essential to overcome these barriers and promote increased blood donation among women. Therefore, in the upcoming phase of the study project, a thorough investigation of these variables is necessary, along with the development of strategies to increase the number of female blood donors in Lahore. In some Asian countries, males may donate more blood than females because of the belief that women are less strong. Asian countries are similar in this manner (Kaur et al., 2013). There is a cultural phenomenon present here. Western women, especially in Europe, experience more vasovagal episodes and are less likely to meet the criteria for donating haemoglobin. This was verified.

The gender disparity in blood donation rates in Lahore may be attributed to cultural attitudes and societal norms that are disregarded. Women in several Asian countries, such as Pakistan, are perceived as inferior to men. This cultural perspective is widespread. This assumption could increase male involvement in blood donation. Similarly, women in Western countries such as Europe experience higher rates of adverse reactions post-donation, specifically vasovagal episodes, and may struggle to reach haemoglobin cut-off criteria. This is similar to the discovery mentioned earlier (Qureshi, 2018). To advance gender equality in blood donation, we need to acknowledge and tackle these cultural and economic challenges. This information can be obtained through study. It is crucial to educate the public about female blood donation, debunk illusions about female strength, and provide assistance to women with physiological concerns. Targeted outreach and awareness activities for women in Lahore could help reduce the gap and boost blood donation rates (Bani & Giussani, 2010). Future research should investigate cultural and socioeconomic issues in order to create specific blood donation initiatives that promote tolerance and diversity. Addressing these concerns could lead to a more fair and enduring blood donor community in Lahore.

Surveys conducted across various ethnic and geographical populations indicate that the most common age range for blood donation is between 25 and 45 years old. Our investigation indicates that this phenomenon is worldwide. Youthful blood donors may exhibit increased enthusiasm and ability due to a range of factors (Mishra et al., 2016). Examples include heightened consciousness, bodily well-being, and movement capabilities. Elderly individuals may experience ischemic heart disease, diabetes, cancer, and hypertension. These illnesses can hinder persons from donating blood due to their health concerns. Nevertheless, this study did not assess adolescent contributions. Recognizing the capacity of adolescents to make valuable contributions is essential.

The investigation revealed that the majority of donors were replacements, while the remaining donors were service providers. This aligns with other research and the worldwide pattern. (Singh, 2018) Unpaid donors must contribute to sustain the nation's blood supply. Donating blood helps maintain the country's blood supplies. The study revealed that the highest prevalence of blood donation occurs among those aged 20 to 45 years old. This aligns with the worldwide pattern. The inclination of younger adults to offer more may be attributed to their heightened awareness, improved physical health, and increased mobility. These factors may also account for the inclination. Elderly individuals are more inclined to donate blood since medical conditions such as ischemic heart disease, diabetes, cancer, and hypertension may impede their ability to do so. Further research is required to investigate how teenagers can contribute to blood donation, as this study did not address this issue.

The research project primarily used replacement donors with a minority of free gifts. Other studies and worldwide trends

corroborate this pattern. Encouraging voluntary blood donation is essential to safeguard the safety and sustainability of the national blood supply. Furthermore, there must be access to blood supplies. Ensuring a strong and safe blood donation system in Lahore will necessitate ongoing efforts (Singh, 2018). These techniques aim to encourage voluntary blood donation and reduce donor reliance. This should be a significant strategic goal. To make progress, we need to focus on the factors that influence the age distribution of blood donors and the prevalence of replacement donations. This is essential for advancement. Understanding these patterns and utilising that knowledge to develop strategies can help design targeted campaigns to promote a more varied donor pool and ensure a consistent supply of safe blood for individuals requiring it. The World Health Organisation advocates for constructing health systems based exclusively on voluntary contributions. The study revealed that type O blood groups are the most prevalent, whereas AB blood groups are the least prevalent. Group O was found to be the most abundant, while Group AB was the least widespread based on the analysis. Correlation is present. Similarly, the research indicated that blood group O was the most prevalent while AB was the least prevalent. These trends, in line with previous research, indicate that blood group AB is the least common across the continent, whereas blood group O is the most widespread globally.

Blood group B was prevalent in eastern and southern Punjab, whereas blood group O was the most common. All these areas are located in Punjab. Blood group B is the predominant blood type in Pakistan, according to a study. Researchers discovered that the most prevalent blood group in Nepal is B. In Britain, the most prevalent blood group is O, and the least prevalent is AB. Genetic mapping and the varied origins of ethnic groups contribute to understanding these spatial variations (Kaur et al., 2013).

Rh status screening is essential in clinical settings to ensure patient safety. The Rh factor's immunogenicity makes it highly interesting. Individuals who lack the D antigen may develop anti-D when they come into contact with transfused or administered red blood cells that contain this antigen. This operation may result in a hemolytic transfusion reaction or neonatal hemolytic disease. Both symptoms are plausible. Therefore, determining Rh status is essential in therapeutic and research settings.

Our investigation identified a 3.1% prevalence of Rhesus-negative individuals, contrasting with the 6–14% reported in previous studies. This percentage is significantly lower compared to those reported in other studies. We discovered a somewhat reduced occurrence of Rh-positive blood donors compared to findings from prior research conducted in Pakistan and globally. This was true regardless of whether the investigations took place in Pakistan or other locations. Examine worldwide patterns (Younis et al., 2020).

Statistics indicate a significant influence. While blood group types are universal, variations can be influenced by geography, region, and ethnicity. Notice significant variances. Having a sufficient supply of Rh + blood is essential for ensuring patient safety. Research on blood types and cancer necessitates local Rh distribution data, among other factors. To disseminate knowledge, it is necessary to make it public.

CONCLUSION

For the functioning of a national health service, it is crucial to possess current information on the prevalence of blood types in various local settings. Currently, there is a lack of information on this important subject. Our research provides detailed information on the blood type and demographic characteristics of donors. Additional research and mobilisation are needed nationwide to adhere to the World Health Organization's suggestions regarding voluntary blood donation.

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1. Conception and design of or acquisition of data or analysis and interpretation of data.
2. Drafting the manuscript or revising it critically for important intellectual content.
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All authors agree to be responsible for all aspects of their research work.

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