



## Frequency Distribution of ABO and Rh blood group among Blood Donors at Centre Regional Referral Hospital, Gelephu: A Retrospective Study

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### Abstract

Blood group are inherited from our biological parents and the distribution of blood group varies among the population living in the country. The aim of this study was to study the frequency of distribution of blood group among the blood donors in Central Regional Referral Hospital (CRRH), Gelephu, Bhutan. The total of 6045 blood donors from 2011-2017 were included in this study. The frequency of distribution of A, B, AB and O blood group was found to be 29.31%, 23.90%, 8.42% and 38.21%, respectively. The blood group O is significantly higher. Only 0.15% of them were found to be Rhesus D negative. The sequence of frequency of ABO distribution among the blood donor at CRRH, Gelephu is;  $O > A > B > AB$ .

### Introduction

Blood is essential part for human life. The blood volume of normal adults is 3500ml to 5000ml in body. The amount of blood available in body is expressed in haemoglobin (Hb) mg/dl. Different components in blood functions differently, such as, defense of body (Leukocytes), natural coagulant (Platelets) and gas exchange transporter (Erythrocytes). It was discovered at the end of the First World War that the frequency of the ABO blood groups varied in different peoples. Since then, an enormous amount of work has been scientifically accumulated not only on the distribution of the ABO groups but also on that of the blood group systems elaborated afterwards (Dunsford et al., 1953). The basic ABO blood group system in human was first discovered by

Karl Landsteiner in 1900, which consists of four groups; A, B, AB and O (Schwarz and Dorner, 2003). The Rhesus (Rh) blood group system is clinically the second most important blood group system in human.

The term blood group is usually restricted to blood cell surface antigens. They are proteins and carbohydrates attached to lipids or proteins on the surface (Reid et al., 2012). The antigens are foreign substances which when introduced into the body can provoke the formation of specific antibodies (Hakomori and Kobata, 1974). The antigenic characters of red cells are inherited and the gene for ABO blood group are located on the chromosome 9 (Klein and Anstee, 2008). The ABO system has two antigens and two antibodies (Daniels, 2008). The Rhesus (Rh) blood group

system located on human chromosome 1 is the most polymorphic of the human blood groups, consisting of at least 50 independent antigens (Harmening, 2012) and, next to ABO, is the most clinically significant in transfusion medicine (Avent and Reid, 2000). The Rhesus system has antigen C, D, E, c, and e; of them only D (Rh D) is a potent antigen and accordingly in Rh system there are only two groups; Rh D positive and Rh D negative. The clinical significance of ABO antibodies is important during blood transfusion. Transfusion of ABO incompatible red cells will almost always result in symptoms of hemolytic transfusion reaction and may cause disseminated intravascular coagulation, renal failure, and deaths (Poole and Daniels, 2007). The identification of Rhesus blood system is important to prevent erythroblastosis fetalis or hemolytic disease of newborn (HDN), which commonly arises when a Rhesus negative mother carries Rhesus positive fetus (Avent and Reid, 2000).

### Materials and Methods

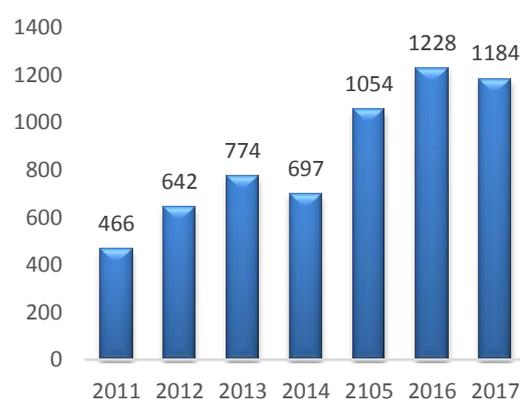
A retrospective study was conducted from routine to research method, using the consecutive 7 years blood donor's data (January 2011–December 2017) at CRRH, regional blood bank, Gelephu, Bhutan. These donors had donated blood in the hospital blood bank and in mobile camps conducted by the CRRH blood bank. The donor questionnaire and consent forms as mentioned in national guidelines on clinical use of blood and National Blood Transfusion Services, Bhutan (2009) was used. Blood grouping ABO and Rhesus was done by antigen antibody micro-agglutination test using commercially available standard antisera. Both forward (cell grouping) and reverse grouping (serum grouping) methods were used. The final blood group was confirmed only if both forward and reverse groups were identical. Rh negative blood groups were confirmed by anti-globulin technique. All weak D groups were considered as Rh positive.

### Result and Discussion

A total of 6045 blood donors were present at CRRH, blood bank from 2011-2017 and it was found that; blood group O (38.21%), A (29.31%), B (23.90%) and AB (8.42%) respectively. The most common being blood group O and the least prevailing blood group was AB. The prevalence of Rh-D negative group was found to be 0.15%.

**Table 3.1** Frequency distribution of blood group

Year	A	B	AB	O	Rh Neg
2011	150	99	48	169	0
2012	205	157	47	232	1
2013	179	134	82	374	5
2014	218	181	62	235	1
2015	315	263	92	383	1
2016	382	290	111	445	0
2017	323	321	67	472	1
%	29.31	23.90	8.42	38.21	0.15

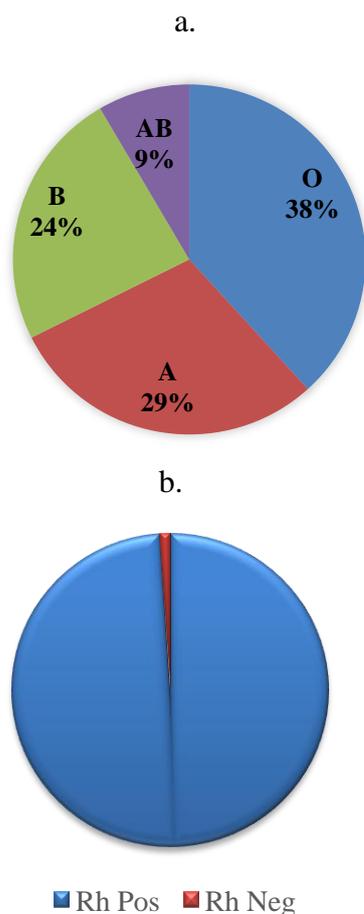


**Graph 3.1** Yearly total blood donor

The phenotype and genotype frequencies of ABO and Rh groups vary widely across different races and geographical areas of the world (Agrawal et al., 2014). No study has been conducted in Bhutan to find out this variation. Therefore, close comparison has been done with neighboring states of India, Tibet and Nepal. Pramanik and Adhikari (2006) did a study in Nepal and found blood group O (35.5%) as the predominant and blood group AB (8.7%) as the least prevailing group in the Nepalese population, which is similar to our current findings. A study among the Tibetan population by Singh et al. (1974) found blood group O and B

(35.2%) to be equally frequent, which is to a certain degree similar to our present study. Also a study done by Nag and Das (2012) in Durgapur, West Bengal found a similar result. On the other hand, Raja et al. (2016) in India found that blood group B (34%) as the predominating then followed by O (32%) blood group. In the current study only 0.15% of the blood donors were found to be Rh negative among the population studied which corroborates with the previous findings of Ganong (1999) which states Asians are mostly (99.0%) Rh positive. This indicates that Rh D negativity has the lowest distribution among the population. From the results, it is evident that in Bhutanese population at center region included in the study, the blood group O positive is predominant and low distribution of Rh negative.

**Chart 3.1** Frequency of different blood groups (a) ABO, (b) Rh-D



The finding also shows that there is increase in the number of blood donor each year as shown in graph no. 3.1, indicating that there is increase in

the use of blood and blood products. Therefore, strategy to encourage even more blood donor need to be developed to meet the demand of blood and its product. Moreover, these study would provide the national blood safety program with information critical for annual supply forecasting and even conduct more blood donation campaign. Finally, the results should be of importance to regional blood bank donor information on blood donor frequency distribution in the region including Rh negative blood groups.

### Conclusion

To conclude, the commonest blood group is O (38.21%) blood group and least prevailing is AB (8.42%). Rhesus group Rh D negative was found only in 0.15%, a very low in population. Similar studies should be undertaken for the other regions of the country to establish the blood group frequency distribution among Bhutanese population and also study gene allele frequency. On the other hand, analysis for subgroups of A and AB like A1 & A2, A1B & A2B would have provided a more detailed information.

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