



ABO and Rh Blood Groups and their Ethnic Distribution in a Teaching Hospital of Kathmandu, Nepal

Lava Shrestha,¹ Uzwali Malla,¹ Narayan Bahadur Mahotra¹

¹Department of Clinical Physiology, Institute of Medicine, Maharajgunj, Kathmandu, Nepal.

ABSTRACT

Introduction: ABO and Rh blood group systems are the most important blood grouping systems from clinical aspect. Determination of blood group is important for blood transfusion therapy, medico-legal purposes, organ transplantation, settlement of paternity disputes etc.

Methods: A cross-sectional descriptive study was carried out for a period of one year from 1st January 2011 to 31st December 2011 in blood bank of Tribhuvan University Teaching Hospital. All blood samples collected for blood group determination were included in the study. Blood group was determined by slide agglutination method using commercial antisera.

Results: A total of 13568 blood samples were analyzed, 5123 (37.75%) were male and 8445 (62.25%) were female. Frequencies of blood groups A, B, AB and O were found to be 4034 (29.7%), 3665 (27.0%), 1114 (8.2%) and 4755 (35.1%). Frequencies of Rh positive and Rh negative blood groups were found to be 13200 (97.3%) and 368 (2.7%). Blood group O was common in Brahmin, Chhetri, Tamang, Lama, Gurung, Sherpa, Terai Brahmin, Muslim and Yadav ethnicities; blood group A was common in Newar, Rai, Magar, Limbu and Sanyasi ethnicities; and blood group B was common in Tharu and Marwari ethnicities.

Conclusions: Blood group O was found to be the most common blood group while AB was the rarest one. It was found that blood group O is the more common in Sherpa, Brahmin and Yadav; A in Limbu, Rai and Newar; and B in Tharu and Marwari ethnicities.

Keywords: ABO; blood group; ethnic distribution.

INTRODUCTION

Human blood can be divided into different groups according to the presence or absence of antigens on the red blood cell membrane. There are at least 30 commonly occurring and hundreds of other rare antigens on the red blood cell membrane.¹ The International Society for Blood Transfusion (ISBT) Working Committee² catalogue currently lists antigens under 33 different blood grouping systems. ABO and Rh blood grouping systems are the most important ones clinically.

The most important clinical aspect of blood groups

remains to be blood transfusion therapy. Antigens of these two blood grouping systems are the most commonly involved ones in transfusion reactions. Other applied aspects of blood grouping systems are medico-legal use, organ transplantation, assistance in settlement of paternity disputes, association with certain disease etc.

This study was conducted to determine the frequencies

Correspondence: Dr. Lava Shrestha, Department of Clinical Physiology, Institute of Medicine, Maharajgunj, Kathmandu, Nepal. Email: shrestha.lava@gmail.com, Phone: 9851084376.

and ethnic distribution of ABO and Rh blood group in a teaching hospital.

METHODS

Cross-sectional descriptive study was conducted in Blood Bank of Tribhuvan University Teaching Hospital from 1st January, 2011 to 31st December, 2011 after obtaining ethical approval from Institutional Review Board (IRB). All blood samples collected for blood group determination during this one year period were included in the study after obtaining consent. Foreign nationals

were excluded from the study. ABO and Rh blood groups were determined by slide agglutination method using commercial blood grouping reagents. Data analysis was done with IBM SPSS Statistics version 20.

RESULTS

During the one year period of study, 13568 blood samples were received for blood group determination. Out of 13568 subjects, 5123 (37.75%) are male and 8445 (62.25%) are female.

Table 1. Ethnic distribution of ABO and Rh blood groups.

	Total											
	O			A			B			AB		
	n	(%)	Rh Positive	n	(%)	Rh Positive	n	(%)	Rh Positive	n	(%)	Rh Positive
Brahmin	4547	(33.51)	1728	(38.0)	1234	(27.1)	1144	(25.2)	283	(6.2)	56	(1.2)
Chhetri	2382	(17.56)	776	(32.6)	731	(30.7)	600	(25.2)	196	(8.2)	21	(0.9)
Newar	1897	(13.98)	555	(29.3)	653	(34.4)	448	(23.6)	199	(10.5)	16	(0.8)
Tamang	660	(4.86)	219	(33.2)	201	(30.5)	170	(25.8)	57	(8.6)	8	(1.2)
Lama	479	(3.53)	168	(35.1)	149	(31.1)	127	(26.5)	27	(5.6)	3	(0.6)
Gurung	470	(3.46)	154	(32.8)	131	(27.9)	135	(28.7)	46	(9.8)	2	(0.4)
Magar	399	(2.94)	134	(33.6)	138	(34.6)	88	(22.1)	34	(8.5)	1	(0.3)
Rai	359	(2.65)	102	(28.4)	144	(40.1)	69	(19.2)	41	(11.4)	0	(0.0)
Tharu	224	(1.65)	58	(25.9)	53	(23.7)	76	(33.9)	37	(16.5)	0	(0.0)
Sherpa	156	(1.15)	63	(40.4)	29	(18.6)	53	(34.0)	11	(7.1)	0	(0.0)
Terai Brahmin	126	(0.93)	49	(38.9)	24	(19.0)	43	(34.1)	8	(6.3)	2	(1.6)
Muslim	91	(0.67)	31	(34.1)	22	(24.2)	29	(31.9)	4	(4.4)	5	(5.5)
Yadav	87	(0.64)	37	(42.5)	17	(19.5)	21	(24.1)	10	(11.5)	0	(0.0)
Limbu	61	(0.45)	15	(24.6)	27	(44.3)	10	(16.4)	8	(13.1)	1	(1.6)
Marwari	60	(0.44)	19	(31.7)	13	(21.7)	23	(38.3)	4	(6.7)	1	(1.7)
Thakali	30	(0.22)	10	(33.3)	9	(30.0)	10	(33.3)	0	(0.0)	0	(0.0)
Sanyasi	24	(0.18)	5	(20.8)	9	(37.5)	8	(33.3)	2	(8.3)	0	(0.0)
All subjects	13568	(100)	4624	(34.1)	3934	(29.0)	3555	(26.2)	1087	(8.0)	131	(1.0)
											110	(0.8)
											100	(0.7)
											27	(0.2)

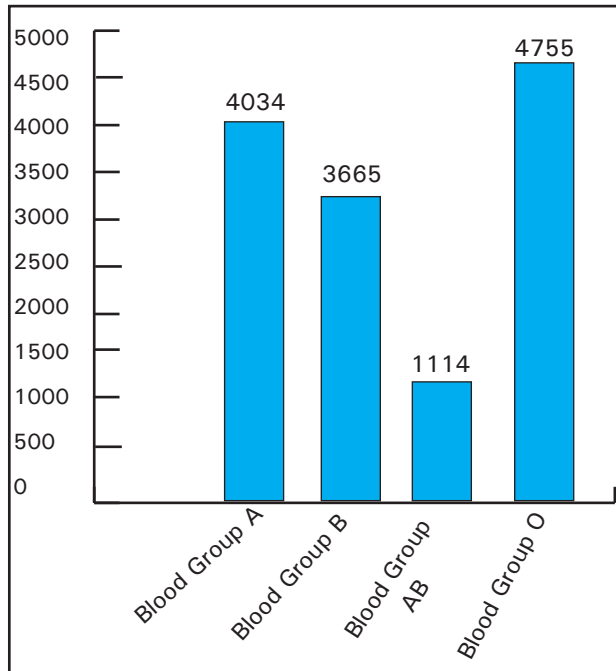


Figure 1. Bar diagram showing distribution of ABO blood groups.

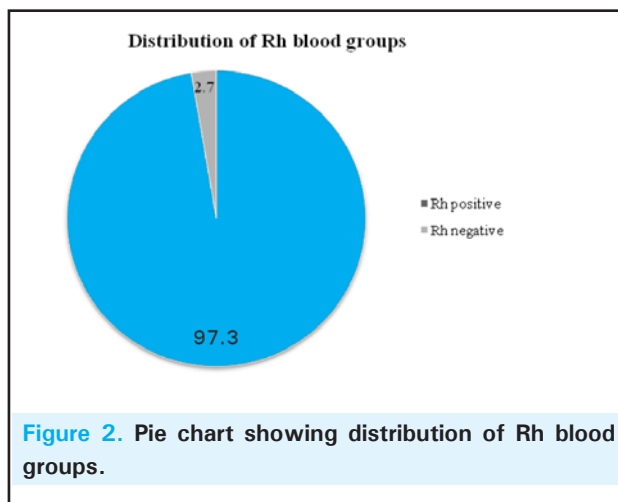


Figure 2. Pie chart showing distribution of Rh blood groups.

The frequencies of blood groups A, B, AB and O are found to be 4034 (29.7%), 3665 (27.0%), 1114 (8.2%) and 4755 (35.1%) respectively (Figure 1). The frequencies of Rh positive and Rh negative blood groups are found to be 13200 (97.3%) and 368 (2.7%) respectively (Figure 2).

Table 2. Distribution of Rh blood groups within ABO blood groups.

Blood group	Rh Positive n (%)	Rh Negative n (%)	Total n (%)
Group A	3934 (97.5)	100 (2.5)	4034 (100)
Group B	3555 (97.0)	110 (3.0)	3665 (100)
Group AB	1087 (97.6)	27 (2.4)	1114 (100)
Group O	4624 (97.2)	131 (2.8)	4755 (100)
Total	13200 (97.3)	368 (2.7)	13568 (100)

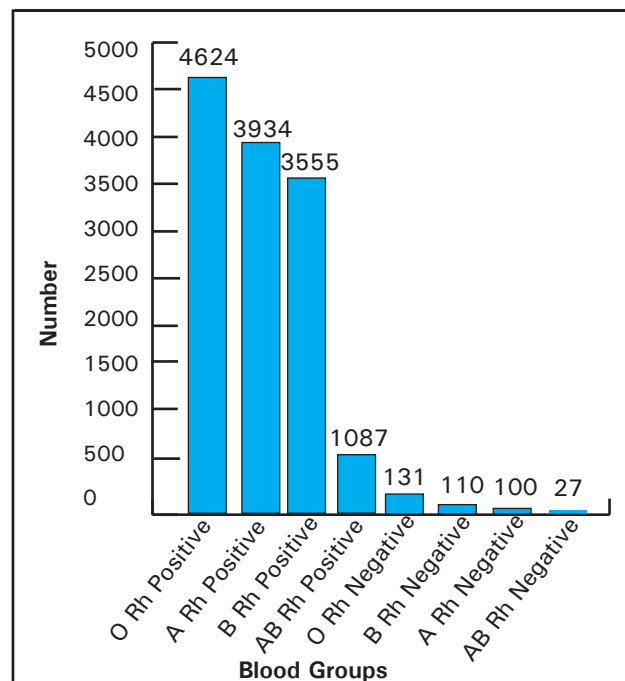


Figure 3. Frequencies of blood groups in decreasing order.

The most common blood group was O positive 4624 (34.1%) while, AB negative 27 (0.2%) blood group is the rarest one (Figure 3).

Table 3. Frequencies of ABO and Rh blood groups in Nepal reported by various studies

SN	Year	Author(s)	Sample size	Blood groups					
				A (%)	B (%)	AB (%)	O (%)	Rh positive (%)	Rh negative (%)
1.	1985	Singh R	11934 blood donors	32	26	12	29	-	-
2.	2000	Pramanik T, Pramanik S	120 medical students	34	29	4	33	96.67	3.33
3.	2001	Pramanik T, Saikia TC, Bandyopadhyaya M	322 medical students	29	26	13	32	98.44	1.56
4.	2005	Chapagain RH, Subba B, Kunwar CB et al	2093 Jirels	55	15	22	8	99.86	0.14
5.	2006	Pramanik T, Adhikari P	1310 hospital patients	29	27	9	36	99.92	0.08
6.	2013	Shrestha L, Malla U, Mahotra NB	13568 hospital patients	29.7	27	8.2	35.1	97.3	2.7

DISCUSSION

In our study, blood group O was found to be the most common blood group 4755 (35.1%) amongst ABO blood groups, followed by blood group A (29.0%), blood group B (27.0%) and blood group AB (8.2%). Similar results were obtained from a study on 322 medical students by Pramanik T, Saikia TC and Bandyopadhyaya M,³ which reported blood group O as the most prevalent one (32%), followed by A (29%), B (26%) and AB (13%); and another study on 1310 hospital patients by Pramanik T and Adhikari P,⁴ where frequencies of distribution of blood groups O, A, B and AB were found to be 35.5%, 28.5%, 27.3% and 8.7%. Studies by Singh R⁵ and Pramanik T and Pramanik S⁶ have reported blood group A to be the most prevalent one (32% and 34%) followed by blood group O, blood group B and blood group AB. Study by Singh R in 11934 blood samples collected from different areas of Nepal revealed blood group A as the most common blood group (32.47%) of ABO blood grouping system, followed by O (29.11%), B (26.36%) and AB (12.06%). A study on 2093 Jirels, a small Kirat tribe of Nepal showed blood group A to be the most prevalent one (55%) while blood group O to be the least prevalent one (8%) among Jirels.⁷

The frequency of ABO blood groups are reported as blood group O 44-45%, blood group A 41-42%, blood group B 10% and blood group AB 4% in European and American people.^{1,8,9} Study by Garratty G et al reported blood group O (46.6%) as the most frequent blood group amongst Americans, followed by A (37.1%), B (12.2%) and AB (4.1%).¹⁰ Although blood group O is the commonest of the blood groups in our study, the frequency of blood group B is much higher than that reported in European and American population.

Studies done in India, Pakistan and Bangladesh have found similar trends in distribution of ABO blood groups with higher frequencies of blood group B.¹¹⁻¹⁷ A study in Zammu and Kashmir reported blood group B as the commonest one (36.6%) followed by groups O (35%), A (21.4%) and AB (7%).¹¹ In another study in Kashmir, blood group O was reported as the most common one (38.43%), followed by groups B (32.05%), A (22.95%) and AB (6.55%).¹² In Vellore, blood group O was the most common (38.75%) followed by B (32.69%), A (18.85%) and AB (5.27%).¹³ In Bangalore, blood group O was most frequent (39.81%) followed by B (29.95%), A (23.85%) and AB 6.37%.¹⁴ In a study done in Swat of Pakistan, blood group B was found to be the most prevalent one (32.40%), followed by groups O (29.10%), A (27.92%) and AB (10.58%).¹⁵ Another study from Punjab of Pakistan also reported blood group B as the most common one (36.9%), followed by O (31.3%), A (22.0%) and AB (9.9%).¹⁶ In Bangladesh, O was found to be the commonest blood group (40.6%), followed by A (26.6%), B (23.2%) and AB (9.6%).¹⁷

The prevalence of Rh positive blood group was found to be 97.3% in our study. The prevalence of Rh positive blood group has been reported as 85% in Caucasians, 95% in American blacks, 99% in Asians and virtually 100% in African blacks.^{1,8} Garratty G et al also reported similar findings in a study done on US whites, US blacks and Asians, where Rh positive cases were 82.7% in White non-Hispanics, 92.9% in Black non-Hispanics and 98.3% in Asians.¹⁰ In Nepal, different studies have reported prevalence of Rh positive blood group from 96.67 to 99.86%.³⁻⁶ In India, studies report prevalence of Rh positive blood group ranging from 87.1% to

94.53%.¹¹⁻¹⁴ Rh positive blood group was found in 87.1 to 90% of Pakistani population¹⁵ and 96.8% of Bangladeshi population.¹⁶

Blood group O was the commonest blood group in Brahmin, Chhetri, Tamang, Lama, Gurung, Sherpa, Terai Brahmin, Muslim and Yadav ethnicities; blood group A was the commonest blood group in Newar, Magar, Limbu and Sanyasi ethnicities; and blood group B was the commonest blood group in Tharu and Marwari ethnicities (Table 1). Singh R reported blood group O as the most common one amongst Brahmin and Gurung ethnicities; blood group A amongst Newar, Chhetri and Tamang ethnicities; and blood group B among Sherpa ethnicity.⁵ Pramanik T and Adhikari P found blood group O predominantly among Brahmin, Magar and Gurung ethnicities; blood group A among Chhetri and Newar ethnicities; and blood group B among Sherpa and Lama ethnicities.⁴

CONCLUSIONS

In our study, blood group O was the most common blood group amongst ABO blood groups, followed by blood group A, blood group B and blood group AB. Blood group O was the commonest blood group in Brahmin, Chhetri, Tamang, Lama, Gurung, Sherpa, Terai Brahmin, Muslim and Yadav ethnicities; blood group A was the commonest blood group in Newar, Magar, Limbu and Sanyasi ethnicities; and blood group B was the commonest blood group in Tharu and Marwari ethnicities.

ACKNOWLEDGEMENTS

We thank blood bank of TUTH for helping us to conduct this work. We thank Dr. Barun Mahat, Dr. Amod Dhungana, Dr. Sait Pradhan, Dr. Neha Malla Pradhan and Dr. Gita Khakurel for their contribution.

REFERENCES

1. Blood types; transfusion; tissue and organ transplantation. In: Hall JE. Guyton and Hall Textbook of Medical Physiology. 12th ed. Philadelphia: Saunders; 2011.
2. International Society for Blood Transfusion. ISBT. Blood group terminology [Online] [cited 2013 Feb 12]. Available from: URL: http://www.isbtweb.org/fileadmin/user_upload/WP_on_Red_Cell_Immunogenetics_and/Table_of_blood_group_systems_v3.0_121028.pdf
3. Pramanik T, Saikia TC, Bandopadhyaya M. Preliminary report on the trend of blood group distribution among Nepalese and Indian medical students. J Nepal Med Assoc. 2001;41:258-61.
4. Pramanik T, Adhikari P. Trend of blood group distribution among the different ethnic groups of Kathmandu valley. Nepal Med Coll J. 2006;8(4):248-9.
5. Singh R. Distribution of ABO blood group in Nepal. J Nepal Med Assoc. 1985;23:1.87-1.92
6. Pramanik T, Pramanik S. Distribution of ABO and Rh blood groups in Nepalese medical students: a report. East Mediterr Health J. 2000 Jan;6(1):156-8.
7. Chapagain RH, Subba B, Kunwar CB, Subedi J, Blengero J, Williams S et al. Trend of blood group distribution among the Jirels of Nepal. J Nepal Med Assoc. 2005;44(160):121-3.
8. Blood types. In: Barrett KE, Barman SM, Boitano S, Brooks HL. Ganong's Review of Medical Physiology. 23rd ed. New York: McGraw Hill Medical; 2010.
9. NHS blood and transplant. NHSBT. Blood group basics [Online]. [cited 2013 Feb 12] Available from: URL: www.blood.co.uk/about-blood/blood-group-basics/
10. Garratty G, Glynn SA, McEntire R; Retrovirus Epidemiology Donor Study. ABO and Rh(D) phenotype frequencies of different racial/ethnic groups in the United States. Transfusion. 2004;44(5):703-6.
11. Khan MN, Khaliq I, Bakhsh A, Akhtar MS, Amin-ud-Din M. Distribution of ABO and Rh D blood groups in the population of Poonch District, Azad Jammu and Kashmir. East Mediterr Health J. 2009;15(3):717-21.
12. Latoo JA, Masoodi NA, Bhat NA, Khan GQ, Kadla SA. The ABO and Rh blood groups in Kashmiri Population. Indian Journal for the Practising Doctor. [Online]. 2006 [cited 2013 Feb 12]; 3(2). Available from: URL: <http://www.indmedica.com/journals.php?journalid=3&issueid=75&articleid=965&action=article>
13. Das PK, Nair SC, Harris VK, Rose D, Mammen JJ, 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):47-8.
14. Periyavan S, Sangeetha SK, Marimuthu P, Manjunath BK, Seema DM. Distribution of ABO and Rhesus-D blood groups in and around Bangalore. Asian J Transfus Sci. 2010;4(1):41.
15. Khattak ID, Khan TM, Khan P, Shah SM, Khattak ST, Ali A. Frequency of ABO and Rhesus blood groups in District Swat, Pakistan. J Ayub Med Coll. 2008;20(4):127-9.
16. Anees M, Jawad A. Distribution of ABO and Rh Blood Group Alleles in Sahiwal district of the Punjab, Pakistan. Proceedings of the Pakistan Academy of Sciences. 2011;48(1):39-43.
17. Talukder SI, Das RK. Distribution of ABO and Rh blood groups among blood donors of Dinajpur district of Bangladesh. Dinajpur Med Coll J. 2010;3(2):55-8.