

Study of ABO and Rh-D Blood Groups among the Common people of Multan City Corporation area of Pakistan

FAIZ UR REHMAN¹, MOHAMMAD MUSTAFA SIDDIQUI², IMRAN NAZIR³, MOHAMMAD MOHSIN KHAN⁴, SADIA ZAFAR⁵, ZAFAR ALI CH⁶, IRFAN QADIR⁷

ABSTRACT

This study was aimed to identify the distribution patterns of ABO and Rh-D blood group among the population of Multan city corporation area of Pakistan in order to promote social awareness and safe blood transfusion among the population. A cross sectional, analytical study was carried out on a total of 937 people in three different area of Multan City Corporation (i.e. Central railway station building area, District Commissioner office area and old city area). The ABO blood group system in the total sample showed the same trend of prevalence as for the general Indian subcontinent (B > O > A > AB). The same trend was found among males, but among females the order of prevalence was different (O > A > B > AB). Rh-D positive were 90.72% and Rh-D negative were 9.28%. Study of blood grouping is not only generating a simple database but also create a great social awareness about self-blood grouping and safe blood transfusion among the population of a country.

Keywords: ABO, Rh-D, social awareness, agglutination method, Pakistan

INTRODUCTION

ABO blood groups were discovered by Landsteiner in 1901 (Landsteiner et al., 1940). Later on in 1939, Rhesus blood groups were discovered by Landsteiner and Wiener in 1940. Since 1901, more than 20 distinct blood group systems have been identified but the ABO and Rhesus blood groups remain clinically the most important. Furthermore, they are also well defined genetic markers employed in population genetics (Amin-ud-Din M et al., 2004; Sigmon, 1992). Blood group or blood type is based on the presence or absence of inherited antigenic substance on the surface of red blood cells that can be determined by specific antibodies (Garg et al., 2014). The importance of blood group discovery lies in the transfusion of blood amongst different populations irrespective of their ethnic origin, in organ transplantation and in the development of legal medicine, genetic research and anthropology (Storry, 2003). The major ABO blood group system is divided into four blood types on the basis of presence or absence of A and B surface antigens. The blood groups are A, B, O and AB. The frequency of four main ABO blood groups varies in the population throughout the world. ABO blood group system

derives its importance from the fact that A and B are strongly antigenic and anti A and anti B naturally occurring antibodies present in the serum of persons lacking the corresponding antigen and these antibodies are capable of producing intravascular hemolysis in case of incompatible transfusion (Harmening et al., 2005). Blood group investigations in this subcontinent started during 1st World War with Hirschfeld in 1919 who determined blood groups in large number of soldiers including Indians and found high frequency of blood group B. Though records were not maintained separately for endogamous population groups, the studies revealed large regional and ethnic differences in blood group frequencies (Nydegger et al., 2007). The distribution of ABO and Rhesus blood group systems in Pakistanis was studied in South East zone of the country during 1984 to 1988; the predominant blood group was O followed by B group (Majumder et al, 1982). In Eastern part of Pakistan, O group was predominant and distribution of O and B was almost same in Western part (Nandy, 1986).

The present study was conducted among the common population of Multan city corporation area with the objective to observe the distribution pattern of ABO and Rhesus blood group system among them. This study will document a blood group data base as well as create social awareness among them, allow safe blood transfusion and prevent hemolytic disease of new born and fetus by knowing ABO and Rh typing.

¹ Assist. Prof. Community Medicine Amna Inayat Medical College

² Assistant Professor Radiology Multan Institute of Cardiology Multan

³ Asstt. Prof. Medicine, Nishtar Medical College, Multan

⁴ Associate Professor Community Medicine Amna Inayat Medical College Lahore, Pakistan

⁵ Associate Prof. Physiology, Amna Inayat Medical College Lahore

⁶ Professor Physiology/Principal Amna Inayat Medical College, Lhr

⁷ Associate Professor Anatomy Amna Inayat Medical College Lahore

Correspondence to Dr. Mohammad Mohsin Khan, Email: mohdmpk@yahoo.com Cell 03217302035

MATERIALS AND METHODS

This cross sectional study was conducted in three different places and those were at District commissioner office area on 21st February, at Multan railway station building area on 1st April and at old city area on 16th December. The duration of the study was 8 months from February 2014 to December 2014. A total sample of 937 participants irrespective of age and sex were included in the study. Samples were determined using random sampling technique. After aseptic washing with 70% ethyl alcohol, blood samples were collected on grease free clean slide from left ring finger tip with the help of a sterile lancet. Blood groups were determined in a single slide to minimize any errors.

The determination of ABO blood group and Rh (D) blood group was done according to the principle of slide method (Sultana et al, 2013). A drop of blood from each volunteer was placed on a glass slide in three places. A drop of each of the antisera A, B and D was added and mixed with each blood sample, with the aid of glass rods. Then, the mixture was rocked gently for 60 seconds to observe for agglutination. The results of agglutination were recorded immediately after mixing. The agglutination in blood drop A was considered as group A, and agglutination in blood drop B as group B. The agglutination in both drops was considered as group AB, and if both blood drops were not agglutinated, it was considered as group O. The agglutination in rhesus blood drop was considered as rhesus positive and non-agglutination as rhesus negative.

All the participants were explained about the aims and objectives of the study and the blood grouping procedures were briefed to them. Written consent was taken from the participants aged more than 18 years and parents' consent was taken for those who were less than 18 years old. Particulars of the each participant were taken in a data collection sheet.

All statistical analyses were done by Microsoft Office Excel 2007. The result was calculated as frequency of each blood group expressed as percentage.

RESULTS

Out of 937 participants 90.82% was male and 9.18% was female. Table 1 shows the distribution of ABO blood group among the male and female volunteers. ABO blood grouping data revealed that group 'B' was predominant with 34.15%, followed by group O with 29.67%, group A with 26.57% and group AB with 9.61%. Figure 1 shows the distribution of ABO blood

groups among the total participants (for both male and female).

The frequency distribution of Rhesus blood group among the participants is shown in Figures 2 and 3. The Rhesus- negative blood group distribution is 2.45% for group A, 2.99% for both group B and O, 0.85% for group AB.

In the rhesus-positive blood group distribution, blood group A has percentage frequency of 24.12%; blood group B 31.16%; blood group AB 8.75% and blood group O 26.68%. Blood group B had the highest frequency followed by blood groups O and then A. Blood group AB had the least.

The Rhesus-positive and Rhesus-negative vary among the ABO blood group. Rhesus positive has the highest frequency (90.72%) while Rhesus negative has the lowest frequency (9.28%). The table 2 shows the distribution of Rhesus blood groups by sex among the participants.

The frequency distributions of ABO blood group based on Rhesus blood group is also shown in Figure 4. The percentages of the ABO blood group and Rhesus blood group varies significantly.

Fig. 1: ABO blood group distribution among the population of Multan city corporation area.

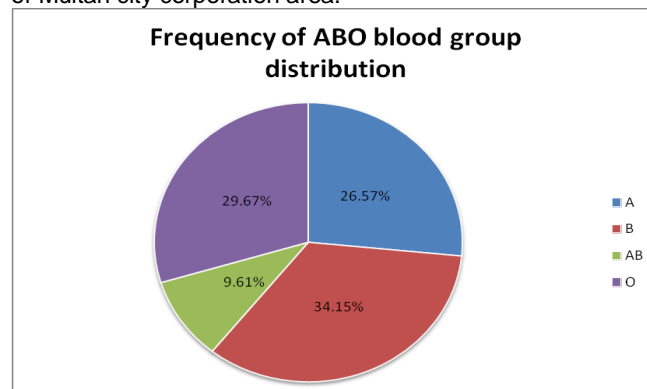


Fig. 2: Rhesus-negative blood group distribution among the total volunteers.

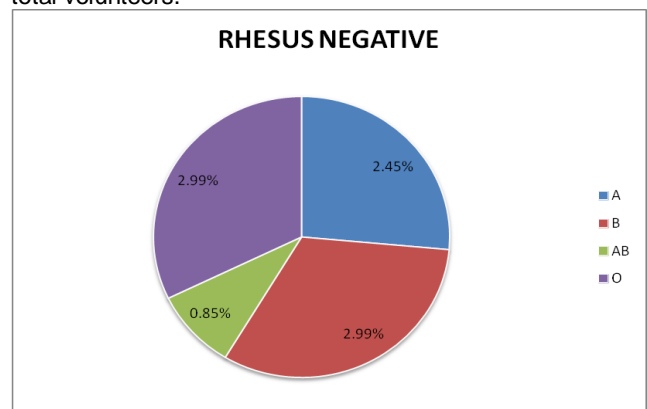


Fig. 3: Rhesus-positive blood group distribution among the total volunteers

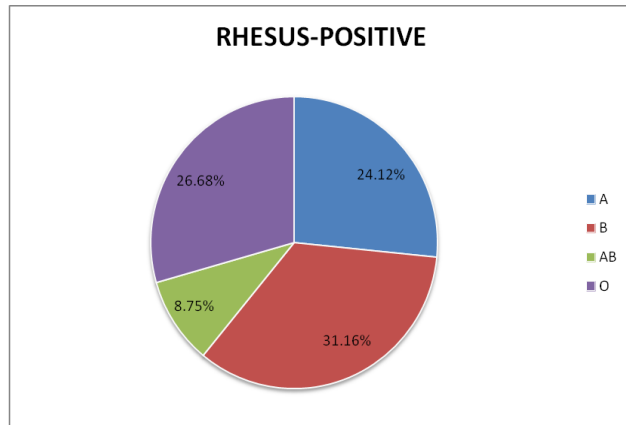


Fig. 4: Distribution of ABO Blood Group among Total Volunteers based on Rhesus Blood Group.

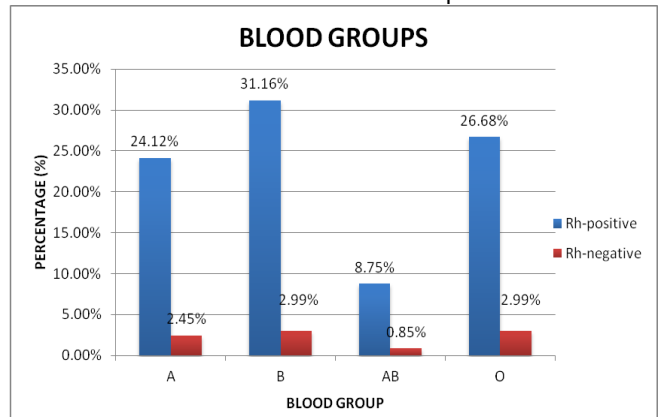


Table 1. Distribution of ABO blood group among the male and female volunteers of Multan City Corporation Area.

Gender	A	B	AB	O	Total
Male	223	298	81	249	851(90.82%)
Female	26	22	9	29	86(9.18%)
Total	249(26.57%)	320(34.15%)	90(9.61%)	278(29.67%)	937

Table 2: Distribution of Rhesus blood groups by sex among the participants.

Gender	Rh-positive	Rh-negative	Number of volunteers
Male	772	79	851
Female	78	8	86

Table .: Order of blood groups (ABO) studied in different populations across the world.

Population	Blood Group order	Reference
Swat (Pakistan)	B>O>A>AB	(Khattaket al., 2008)
India	O>B>A>AB	(Khattaket al., 2008)
Gujrat (Pakistan)	O>B>A>AB	(Anees et al., 2005)
Pakistan	B>O>A>AB	(Rahman, 1975)
Kuwait	O>A>B>AB	Al-Bustan et al., 2002
Saudi Arabia	O>A>B>AB	(Khattak et al., 2008)
Kenya	O>A>B>AB	Lyko et al., 1992
Sudan	O>A>B>AB	Khalil et al., 1989
Nigeria	O>A>B>AB	Falusiet al., 2000
Britain	O>A>B>AB	(Frances, 2002)
Hungry	O>A>B>AB	Tuaszik, 1995
Turkey	O>A>B>AB	Akbas et al., 2003
This study	B>O>A>AB	

Table 4: Frequency of Rh blood groups studied in different populations across the world.

Population	Rh+ (%)	Rh- (%)	Reference
Pakistan	91.40	8.60	Anees et al., 2007
India	94.45	5.50	Khattaket al., 2008
Pakistan	97.4	2.6	Haque et al., 2013
Saudi Arabia	93.00	7.00	Khattak et al., 2008
Nigeria	94.30	5.70	Falusiet al., 2000
USA	85.00	15.00	Khattaket al., 2008
Britain	83.00	17.00	Khattaket al., 2008
Germany	95.00	5.00	Akbas et al., 2003
This study	90.72	9.28	

DISCUSSION

The present study has been carried out to determine the distribution pattern of ABO and Rh-D blood groups in common people of Multan City Corporation. The knowledge of the blood groups and Rhesus factor is important in evolution, related to diseases and environment, essential in blood transfusion, organ transplantation, forensic pathology, anthropology and tracing ancestral relation of human (Khurshid et al, 1992) and also helps to prevent complications due to Rhesus Incompatibility (Bamidele et al., 2013).

This study showed that among the common people of Multan city corporation area, blood group B was the commonest followed by O. The distribution pattern of A, B, O, and AB were 26.57%, 34.15%, 29.67% and 9.61% respectively. The study regarding the distribution of ABO and Rhesus Blood Group systems among the people of central part of Pakistan was first done in 1975 by Rahman et al., (1975) where blood group B was found most predominant among the population. Another study (Pathan et al, 2008) conducted in the rural and urban areas of Pakistan showed the similar results of predominant blood group, B (35.54%) followed by blood group O (32.57%). These findings are almost similar to that of common people in the current study. However, study in South East and Western part of Pakistan demonstrated the most frequent blood group was O (Majumder, 1982; Hussain et al., 1990).

There are several factors such as genetic and environmental factors on variation of blood group frequency in different parts of the world. Comparative study on data among the different studies in the Indo-Pak sub-continent revealed that there was an equal dominance of group B and O (Khan et al., 2004). Studies in Pakistan explored that B blood group predominated in many regions of Punjab, Swat, Gilgit, and Rawalpindi/Islamabad, while in Sindh and in Baluchistan, group O was predominated (Sultana et al, 2013; Khattak et al. 2008). Study in India showed group O is the predominant followed by B, A and AB (Das et al., 2001; Reddy et al., 2009; Periyavan et al., 2010). However, in contrast, other studies showed group B is the most prevalent followed by group O, A, and AB (Chandra et al., 2012; Nanu et al., 1997). Data from neighboring country Nepal revealed that different structure of higher frequency of group A (Pramanik et al., 2000). In Australia (Australian Red Cross Blood service, 2013), Britain (Frances, 2002), and USA (Mourant, 1976), group 'O' and 'A' were the commonest followed by B and 'AB'. In African subcontinent phenotypic frequency order is follows; O>A>B>AB.

The phenotypic frequency order is quite similar in Europe and Africa (Table 3).

Our study suggests blood group order similar to the reports of other Indian subcontinent countries. But it differs from the reports of the middle-east countries (Table 3). The present investigation demonstrated similarities with the findings of previous research done in Pakistan. The implication of our finding is that Blood group B and O are readily available among the population of Pakistan and it is advantageous for the population in the event of blood transfusion. The higher proportion of blood group B and O is also advantageous from the point of pancreatic cancer. Previous studies have shown that the frequency of blood group A was significantly higher among people suffering from pancreatic cancer (Greer JB et al., 2010). It also indicates that one out of five of the studied population is probably at elevated risk of pancreatic and other types of cancer. For instance early independent studies showed association of rectal, cervical, leukemia, pancreatic, breast, ovarian, gastric cancers among individuals with blood groups A, AB, or B more likely to have elevated risk of pancreatic cancer than individual belonging to blood group O (Wolpin BM et al., 2009; Greer JB et al., 2010; Amundadottir L et al., 2009) From our study, we also found that Rh (+ve) blood group is dominant in Multan which is consistent with the available data from previous reports of other population in Pakistan. Moreover, Rh (+ve) group remains higher than Rh (-ve) group throughout the world (Table 4).

CONCLUSION

This study showed higher frequency of group B followed by group O, A and AB which reflects the same blood group pattern with the previous studies conducted in Pakistan. Rh blood group system is also similar to other previous studies. Study of blood grouping not only generates a simple database but also create a great social awareness about self-blood grouping and safe blood transfusion among the population of a country. This study will serve as a reference for other studies particularly to the geneticists and to the clinicians especially in the planning of blood transfusion programs since they play integral role of the genetic profile of the Pakistani population.

REFERENCES

1. Landsteiner K and Wiener AS (1940).An agglutinable factor in human blood recognized by immune sera for Rhesus blood. *Proc Soc Exp Biol Med.* 43:223-224.
2. Amin-ud-Din M, Fazeli N, Rafiq MA and Malik S (2004). Serological study among the municipal employees of Tehran,

- Iran: distribution of ABO and Rh blood groups. *Haema*. 7(4): 502-504.
3. Sigmon JM (1992). Basic principles of the ABO and Rh blood group systems for hemapheresis practitioners. *Journal of clinical apheresis*. 7(3):158-62.
 4. Garg P, Upadhyay S, Chufal SS, Hasan Y and Tayal I (2014). Prevalence of ABO and Rhesus Blood Groups in Blood Donors: A Study from a Tertiary Care Teaching Hospital of Kumaon Region of Uttarakhand. *J Clin Diagn Res*. 8(12): FC16-FC19.
 5. Storry JR (2003). Human blood groups: inheritance and importance in transfusion medicine. *J Infus Nurs*. 26(6):367-72.
 6. Harmening MD and Firestone D (2005). The ABO blood group system. In: Harmening MN, editor. *Modern Blood Banking and Transfusion Practices*. 5th ed. USA: FA Davis Company, Philadelphia, USA. p. 108-32.
 7. Nydegger UE, Riedler GF and Fliegel WA (2007). Histoblood groups other than HLA in organ transplantation. *Transplant Proc*. 39(1):64-68.
 8. Majumder PP and Roy J (1982). Distribution of ABO Blood groups on the Indian subcontinent: A cluster-analytic approach. *Current anthropology*. 23(5):539-66.
 9. Nandy CK (1986). Frequencies of the ABO blood groups in Jessore (Pakistan). *Journal of IPGMR*. 1:40-42.
 10. Sultana R, Yousuf R, Rahman Z, Helali AM, Mustafa S, Salam A and Haque M (2013). Study of ABO and RH-D Blood Groups among the common people of capital city of Pakistan. *Int'l J Pharm and Pharm Sci*. 5(3): 814-816.
 11. Khurshid B, Naz M, Hassan M, Mabood SF (1992). Frequency of ABO and Rh (D) blood groups in district Swabi, NWFP, Pakistan. *J. Sci. Tech Univ. Peshawar* 16:5-6.
 12. Bamidele O, Arokoyo DS and Akinbola AO (2013). Distribution of ABO and rhesus blood groups among medical students in Bowen University, Iwo, Nigeria. *Annals of Biological Research* 4(11):1-6.
 13. Rahman M (1975). Incidence of important blood groups in Pakistan. *Pakistan Med Rs Council Bull*. 1(1):60-63.
 14. Pathan AH, Apu AS, Jamaluddin ATM, Asaduzzaman M, Rahman ZM, Rahman A and Rahman MJ (2008). Prevalence of ABO blood groups and Rh factor in Pakistan. *Pakistan J. Life Sci*. 20(2):131-35.
 15. Hussain M, Nandy CK, Kabir KM and Haque KMG (1990). The distribution of ABO and Rhesus (D) blood group systems in greater Multan, Noakhali and Comilla (South East zone of Pakistan). *Medicine Today*. 2:33-36.
 16. Khan MS, Subhan F, Tahir F, Kazi BM, Dil AS, Sultan S, Deepa F, Khan F and Sheikh MA (2004). Prevalence of blood groups and Rh factor in Bannu region (NWFP) Pakistan. *Pakistan J. Med. Res*. 43(1): 5-7.
 17. Khattak ID, Khan TM, Khan P, Shah SM, Khattak ST, Ali A (2008). Frequency of ABO and Rhesus blood group in district Swat, Pakistan. *J Ayub Med Coll*. 20(4):127-29.
 18. Das PK, Nair SC, Harris VK, Rose D and Mammen JJ, Bose YN and Sudersanam A (2001). Distribution of ABO and Rh-D blood groups among blood donors in a tertiary care centre in South India. *Tropical Doctor* 31(1): 3147-48.
 19. Reddy KS and Sudha G (2009). ABO and Rh(D) blood groups among the Desuri Reddis of Chittoor District, Andhra Pradesh. *Anthropologist*. 11(3):237-38.
 20. Periyavan S, Sangeetha SK, Marimuthu P, Manjunath BK and Seema DM (2010). Distribution of ABO and Rhesus-D blood groups in and around Bangalore. *Asian Journal of Transfusion Science*. 4(1):41.
 21. Chandra T and Gupta A (2012). Frequency of ABO and Rhesus blood groups in blood donors. *Asian J Transfus Sci*. 6(1):52-53.
 22. Nanu A and Thapliyal RM (1997). Blood group gene frequency in a selected North Indian Population. *Indian J Med Res* 106:242-46.
 23. Pramanik T and Praminic S (2000). Distribution of ABO and Rh blood groups in Nepalese medical students: a report. *East Mediterr Health J*. 6(1):156-58.
 24. Australian Red Cross Blood service. About blood. (Accessed on 14th March, 2015) Available from: <http://www.donateblood.com.au/about-blood/types>
 25. Frances TF (2002). Blood groups (ABO groups). *Common Laboratory and Diagnostic Tests*. 3rd ed. USA: Lippincott, Williams & Wilkins, Philadelphia. p. 19-25.
 26. Mourant AE, Kopec AC and Domaniewska-Sobczak K (1976). The distribution of the human blood groups and other polymorphisms. 2nd ed. London: Oxford University Press 1.005.
 27. Greer JB, Yazer MH, Raval JS, Barmada MM, Brand RE and Whitcomb DC (2010). Significant association between ABO blood group and pancreatic cancer. *World J Gastroenterol* 16(44): 5588-91.
 28. Wolpin BM, Chan AT, Hartge P, Chanock SJ, Kraft P, Hunter DJ, Giovannucci EL and Fuchs CS (2009). ABO blood group and the risk of pancreatic cancer. *J Natl Cancer Inst* 101(6):424-31.
 29. Amundadottir L, Kraft P, Stolzenberg-Solomon RZ, Fuchs CS, Petersen GM, Arslan AA, et al., (2009). Genome-wide association study identifies variants in the ABO locus associated with susceptibility to pancreatic cancer. *Nat Genet* 41(9):986-90.
 30. Anees M, Shabir Mirza M. (2005) Distribution of ABO and Rh blood group alleles in Gujrat region of Punjab, Pakistan. *Proc Pakistan Acad Sci* :42(4):233-8.
 31. Al-Bustan SA, EL-Zawahri MM, AL-Adsani AM, Bang RL, Ghunaim I, Maher BS, Weinberg S and Marazita ML (2002). Epidemiological and genetic study of 121 cases of oral clefts in Kuwait. *Orthod Craniofac Res*. 5:154-160.
 32. Lyko J, Gaertner H, Kaviti JN, Karithi MW and Akoto B (1992). The blood group antigens ABO and Rh in Kenyans. *Hamdard Medicus* 35:59-67.
 33. Khalil IA, Phrykian S and Farr AD (1989). Blood group distribution in Sudan. *Gene Geogr* 3:7-10.
 34. Falusi AG, Ademowo OG, Latunji CA, Okeke AC, Olatunji PO, Onyekwere TO, Jimmy EO, Raji Y, Hedo CC, Otukonyong EE and Itata EO (2000). Distribution of ABO and Rh genes in Nigeria. *Afr J Med Sci* 29: 23-6.
 35. Tuaszik T (1995). Heterogeneity in the distribution of ABO blood groups in Hungary. *Gene Geogr* 9: 169-76.
 36. Akbas F, Aydin M and Cenani A (2003). ABO blood subgroup allele frequencies in the Turkish population. *Anthropol Anz* 61: 257-60.
 37. Anees M, Jawad A and Hashmi I (2007). Distribution of ABO and Rh blood group alleles in Mandi Bahauddin district of Punjab, Pakistan. *Proc Pakistan Acad Sci* 44(4):289-94.