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An overview of ABO and Rh blood group disseminationin general population of Azad Kashmir, Pakistan

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Abstract

Until now, about 400 red cell's antigens have been identified. The ABO and Rhesus (Rh) blood groups are considered much significant concerning blood transfusion.Based on the type of antigen carried by the red cells, every person has a blood group. Blood groups are hereditarily decided,and phenotypes havedifferent distribution both within and between geographical boundaries.The aim of the study was assessment of blood group distribution among the localpopulation of Azad Kashmir.The current research work was conducted at the medical laboratory of Government District Hospital, Kotli, Azad Kashmir, between the duration Oct 2017 to Jan 2018. A total of 3450 subjectswere included, and blood grouping was determined by the glass slide technique using commercially available antisera.Out of 3450 subjects, 1881 (54.52%) were men, whereas 1569 (45.48%) were women. The most frequent blood group present was B (36.64%) followed closely by O (29.33%), A (20.93%) and AB (13.1%).A majority of participants, i.e. 3092 (89.62%) were positive for Rh antigen, while 358 (10.38%) people were negative for Rh antigen.The outcomes would generate useful records for transfusion medicine practices at local level as well as at national level. Such inquiries need to be completed in other communities too.

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Introduction

Karl Landsteiner found that specific blood transfusions were effective, while others might be lethal. He exhibited that the specific antigens on the surface of red blood cells (RBC's) agglutinates the RBC's of another individual. Initially he declared the three types of blood groups A, B, and C later the C blood group was renamed the blood group O(Dean 2005). Due to his remarkable discovery of blood groups, he was awarded Nobel prize in physiology or medicine in 1930 (D Farhud).After that, antigen Rhesus was found in 1941 by Landsteiner and Wiener(Owen 2000).

The determination of all different types of blood groups and their distribution in various populations concerning transfusion medicine and blood banking is crucial(Garg *et al.* 2014).The allocation of the blood groups varies person to person based on the genetic makeup. Blood groups are hereditarily decided and show polymorphism in various populaces of the world. This way,the dispersion of blood groups differs in various areas of Pakistan(Alam 2005).The surface of the red blood cells carries different types of antigens, which leads to the almost 33 types of different blood groups(Lögdberg *et al.* 2011).

Amongst these, ABO plus Rh blood groups are clinically the most fundamental (Egesie *et al.* 2008).ABO is the leadinghuman blood group network, and it depends upon genetic factors(Daniels 2002). The antibodies in contrast to red cell antigens are called agglutinins, and based on these different antigens; people are separated into four significant blood groups A, B, AB, and O(William *et al.* 2005).

ABO blood group contained two RBC antigens (A & B) and are expressed by three different alleles "A", "B" and "O" located on chromosome no 9. This result in six different genotypes,i.e. OO, OA, OB, AA, BB, AB, and four phenotypes "A", "B", "AB" and "O". A person owning blood group A displays A antigen on RBCs and generates antibodies against B antigen in his serum and vice-versa, whereas blood group O population lacks A or B antigen but contains antibodies against both in their serum. The occurrence of these antibodies is the basis of hemolytic disease of the infant and hemolytic transfusion reaction(Ghasemi *et al.* 2011). A total of 54 antigens are involved in the Rhesus blood group, making it much more complicated as compared to ABO system(Olsson *et al.* 2001).

The ABO and Rh blood group antigens due to their immunogenic nature took the primary importance in transfusion system. Therefore, the success of blood transfusion requires ideal matching between donor and recipient of these two primary blood group antigens. Careful and reliable blood group determination in a blood donation centre is necessary to lessen the danger of transfusion diseases(Agarwal *et al.* 2015).The ABO incompatibility is reported as the most common reason fordeath during blood transfusion (Vamvakas *et al.* 2009). The relationship of various blood groups with the infections is also reported in literature critically, as a portion of the blood group antigen is especially inclined to develop many diseases(Cooling 2015).

The dissemination of ABO and Rh blood groups fluctuates starting with one populace then onto the next and time to time in a similar area (Garratty *et al.* 2004). The awareness of the prevalence of ABO and Rh blood groups at regional and local stagesis useful in the powerful administration of blood donation centres and harmless blood transfusion administrations. Identification of Rh group is significant to stop the erythroblastosis fetalis, which usually emerges when an Rh-negative mother conceives Rh-positive baby (Enosolease *et al.* 2008). The clinical significance of the ABO and Rh blood group networkis linked with the capacity of agglutinins of these two blood group systems to cause hemolytic transfusion reaction and hemolytic disease of the fetus and newborn (HDFN)(Bhat *et al.* 2012, Hughes *et al.* 1994, Mandisodza *et al.* 2008).

This study was done to figure out the prevalence of different ABO and Rh blood groups in the population of Kotli, Azad Kashmir, Pakistan, and to compare the

results with othervarious investigations directed in Pakistan and somewhere else in the world to offer future multipurpose utilities for the wellbeing organisers. As much less work has been done concerning determine the prevalence of ABO and Rh blood groups in Azad Kasmir.

Materials and methods

This investigation was led in the medical laboratory of district headquarter hospital Kotli, Azad Kashmir, from Oct 2017 to Jan 2018.

It comprised a total of 3450 subjects, and both males and females were incorporated into this investigation. After taking informed consent from the participants, their blood samples were collected from anti cubital vein keeping up sterile conditions. A 1.0-2.0ml of blood was collected in a dispensable syringe and was transferred instantly to a tube having ethylene diamine tetra acetic acid (EDTA). For determination of ABO blood group, the glass slide technique was used while using the commercially available antisera, anti-A, anti-B, and anti-AB. (Biotec laboratories). The Rh D antigen prevalence was recognisedby anti-D antiserum (Biotec Laboratories). Cases that revealed doubtful results by slide technique were confirmed by tube agglutination technique and reverse blood grouping method using pooled A and B known cells.

Results

About 3450 subjects were studied, from which 1569 (45.48%) were females and 1881 (54.52%) were males, as mentioned in Table 1.

Table 1. Gender-wise distribution of subjects.

Gender	Frequency	Percentage
Male	1881	54.52 %
Female	1569	45.48 %
Total	3450	100.0 %

Inthe ABO network, from the considerable number of people tested, 36.64% (1264/3450) subjects carried blood group B, ranking it with the most frequent distribution, prevailing by group O owned by 29.33% subjects (1012/3450). Group A revealed a frequency of 20.93% (722/3450) and the minimum occurrence was observed for the group AB 13.10% (452/3450), as given in Table 2.

Table 2. A pattern of ABO blood groups distribution.

Blood group	Number of subjects	Percentage
A	722	20.93 %
B	1264	36.64 %
AB	452	13.10 %
O	1012	29.33 %
Total	3450	100 %

Out of all participants, 3092 (89.62%) were positive for Rh antigen, while 358 (10.38%) people were negative for Rh antigen (Table 3). The overall prevalence ABO and Rhesus blood groups in both genders are shown in Table 4. Both the gender revealed almost asimilar array of dissemination regarding frequency of various types of blood groups. B+ve (32.97%), the most prevalent blood group was found in 33.45% of males and 32.02% of females. O+ve (26.28%) was the second most prevalent one and was in 26.6% of males and 26.0% of females. A+ve (18.8%) was 3rd on the listand was possessed by17.99% of males and 19.8% of females.

Fig.1 shows that in combination, ABO and Rhesus groups in the total sample were; B +ve 1134, O +ve 907, A +ve 647, AB +ve 404, B – ve 130, O– ve 105, A – ve 75 and AB – ve 48. Result revealed that B +ve was the most prevalent blood group with a combined percentage of 32.97% and AB – ve was the least common blood group with a total percentage of 1.39%.

Table 3. Frequency of Rh Group.

Rh Group	Total	Percentage
Rh(D)-positive	3092	89.62 %
Rh(D)-negative	358	10.38 %
Total	3450	100 %

Discussion

The investigation under discussion has decided on the dissemination of both types of blood groups in general individuals of Azad Kashmir. Results express that Group 'B' (36.64 %) was observed to be the most dominant blood group, followed by"O" (29.33%), "A" (20.93 %), and "AB" group (13.10 %). Also the Rh-positive blood group constituted 89.65% of the observed population, and Rh-negative was less frequent with frequency of just 10.35%.

Among the Rh-negative blood groups, B -ve again was the predominant taken after by O -ve, A -ve, and AB -ve was the rarest.

Table 4. Gender wise distribution of ABO and Rhesus blood groups frequency.

Blood groups	Men	Women	Total
A+ve	336 (17.86%)	311 (19.82)	647 (18.85)
A-ve	43 (2.29%)	32(2.04)	75 (2.17)
B+ve	632 (33.60%)	502 (32.00)	1134 (32.87)
B-ve	66 (3.51%)	64 (4.08)	130 (3.77)
AB+ve	221 (11.75%)	183 (11.66)	404 (11.71)
AB-ve	25 (1.33%)	23 (1.47)	48 (1.39)
O+ve	501 (26.63%)	406 (25.88)	907 (26.29)
O-ve	57 (3.03%)	48 (3.06)	105 (3.04)
Total	1881 (100%)	1569	3450

A comparison of the current investigation was made with different investigations accomplished in different regions of Pakistan and around the world. In the present study, a similar B +ve blood group pervasiveness was found, as reported by other studies in Azad Kashmir's major district Poonch and Muzafarabad (Khan *et al.* 2009, Shehzada *et al.* 2018). Also the least frequent blood group observed in Poonch was AB-ve,as indicated by current study(Khan *et al.* 2009). An analysis in a Jammu provincial hospital to ascertain the recurrence of ABO and Rhesus blood groups in blood donors determined the similar results, i.e. B blood group was the most frequent class of blood donors, and AB was the rarest blood group (Gupta *et al.* 2016).

Another research work related to the prevalence of blood groups was conducted at Rawalpindi / Islamabad, Pakistan's twin cities, which revealed that the B blood group was the most dominant and Rh positivity was the most common among the Rh blood group network (Shakir *et al.* 2012). However, the current outcomes differ from an examination carried in Baluchistan, demonstrating the most frequent blood group was Oblood group37.07%, then he found a bit lower occurrence of blood group which was 34.32%;further the Ablood group showed the 21.12% occurrence and the least common blood group wasAB blood group (7.57%)(Hussain *et al.* 2001). A researcher in Peshawar demonstrated that quite similar results with current study in which blood group B was the commonest and then came A and O, although blood group AB was rare in females of Peshawar(Nazli *et al.* 2015).Another investigation conducted by Sharif *et al.*who revealed that B +ve was the most frequent blood group which was quite

similar to current findings (Sharif *et al.* 2014). A study conducted by Khan *et al.* revealed that the B +ve blood group was the most significant among blood donors in Lahore, and these findings are quite similar to current study(Umer Khan *et al.* 2014).

In India, a researcher demonstrated his results, which were quite similar tothe current studyas he also found the B blood group the most frequent one(Kaur *et al.* 2013). Paridar *et al.,* conducted a study on a large scale to determine the overall trend of the blood groups in different areas of Khuzestan, Iran., and he found the differentiating patterns thatthe most common blood group wasO in overall all the ethnicities and the B blood group was the second-highest blood group while AB was the least regular (Paridar *et al.* 2016).

Further the Chinese demonstrated that blood group A was the most significant 30.54%, followed by the O blood group which was 30.37%, B blood group showed a frequency of 29.42% and AB blood group was 9.66% whereas 99.98% of subjects were Rh-D positive(Liu *et al.* 2018).

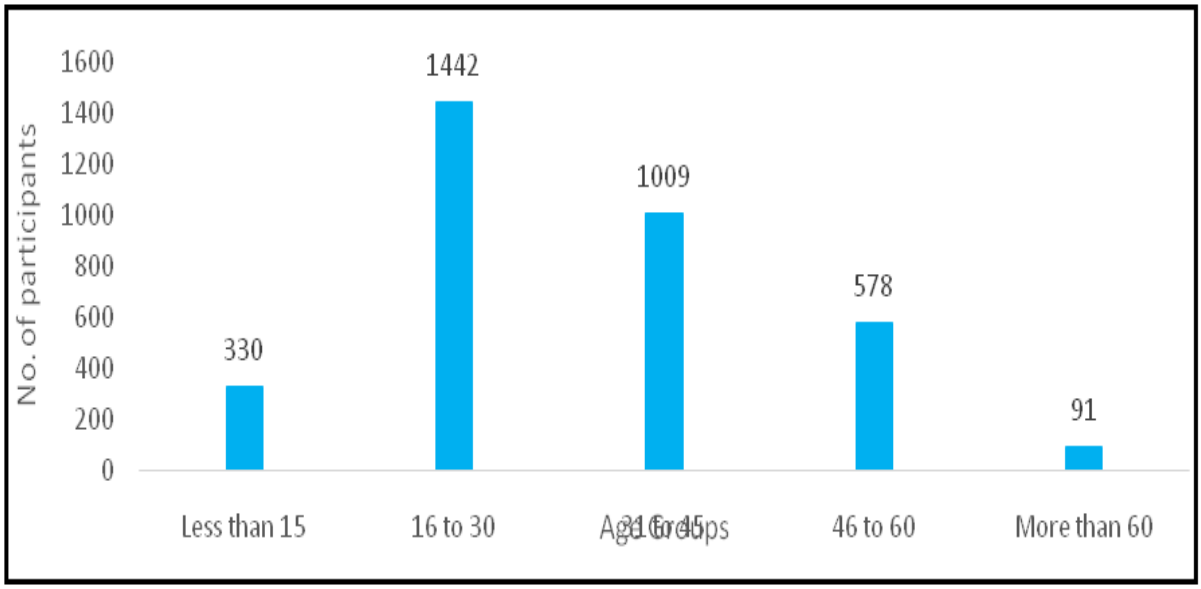

Fig. 1. A total number of subjects possessing various combinations of ABO and Rhesus groups in different age groups.

While the quite contrast results have been obtained concerning the current study in Nepal where the maximum occurrence of blood group was A followed by O.However, the minimum regular blood group was AB in Nepal, which is similar to our population(Pramanik *et al.* 2000). In an examination led in USA, the dominant blood group found was A took after by O and B, while blood group AB was uncommon(Frances 2002).

Such investigation of frequency dispersion of blood groups in a population is vital in all communities for the generation of simple databases of blood groups to discover the effortlessly accessible ones and the blood groups which are hard to secure and henceforth a needed way to assess intentional people. This data is valuable in administration of blood donation centre stock and transfusion administrations to needy patients. The information produced in the current study will be invaluable to organisers for drafting national transfusion approaches and serves to empower knowledge into conceivable outcomes of future.

Conclusion

The most frequent blood group was Blood group 'B' while the 'AB' had the least distribution through the Azad Kashmir. While concerningRh, the majority of blood groups were Rh (D) positive. This investigation exhibited the overall trend of blood group distribution

of clinically critical blood groups in Azad Kashmir. However, the study showed the comparative findings because of the differences and contrasts of ABO and Rh frequencies circulating in different areas of Pakistan and other countries.

Conflicts of interest

There are no conflicts of interest regarding this research work or its publication.

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