ASSESSMENT OF BLOOD GROUPS OF HUMAN SUBJECTS FROM DIFFERENT LOCATIONS OF RAWALPINDI AREAS

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ABSTRACTS

Blood is a specialized body fluid and has four main components: plasma, red blood cells, white blood cells, and platelets. Blood has many different functions, including: transporting oxygen and nutrients to the lungs and tissues. The four different blood groups in the ABO system are A, B, AB and O. A person's blood group is determined by a pair of genes - one gene inherited from each parent. Each blood group is identified by its own set of molecules (called antigens), which are located on the surface of red blood cells. The information was collected through a designed questionnaires which was included several questions based on reported studies from various parts of the world. About 500 questionnaires were distributed in different areas of Rawalpindi city. Nearly equal number of males and females were participated in this exercise . According to results , the blood group O^+ was dominated (47.5%) followed by A^+ (20.1) B^+ (18.5) and AB^+(5.2%). However, ABO negative groups were only reported in one region and represented a total of 0.8%. While 7.9% information about ABO blood groups was not included in this study. The information regarding awareness about association of the ABO blood groups with serious disease described by various authors were difficult to assessed and results based on available information are given in results and discussion section.

Keywords: ABO blood groups, Rh factor , Diseases relevant to blood groups Blood groups

INTRODUCTION

Blood is made up of red blood cells , white blood cells and platelets in liquid called plasma, while blood groups is identified by antibodies and antigens in the blood .The main 4 blood groups defined as the ABO system . Blood group A has antigens on the red blood cells with anti- B antibodies in the plasma. Blood group B has B antigens with anti- A antibodies in the plasma. Blood group O has no antigens ,but both anti-A and anti-B antibodies in the plasma, while blood group AB has both A and B antigens but no antibodies. However, blood group O is the most common blood group (Al-Arrayed et al.,2001).

Human ABO blood type antigens exhibit alternative phenotypes and genetically derived glycoconjugate structures that are located on the red cell surface which play an active role in the cells' physiology and pathology (Alouzan,2014).Furthermore, oligosaccharide structures specific to the antigens defined the blood type. Thus, blood group antigens are secondary gene products, whereas various glycosyltransferase enzymes that help attach the sugar molecules to the oligosaccharide chain are primary gene products. These carbohydrate components are perceived as extraneous by the immune system of others and produce antibodies to them Medically, the ABO blood group system has been of great importance in different disease studies (Edimur et al., 2016). However, due to lack of antigens of some blood groups, there have been some contentious issues with the association between the ABO blood group and vulnerability to certain infectious and noninfectious diseases. The presence and absence of antigens in some blood types result in blood membrane alterations in both morphology and function. The functions dependent on the structure of blood types can associate the blood groups with diseases as well as health (Epidi et al., 2008)In addition to RBCs, blood group antigens can be found on leukocytes, certain tissues, plasma proteins, platelets, and various cell surface enzymes Blood group antigens can also be present in body fluids such as sweat, saliva, breast milk, seminal fluid, urine, gastric secretions, and amniotic fluid with soluble form (Greer et al., 2010). Most antigens however are the end product of a single gene, and modifications at the genetic level

such as deletions, inversions, insertions, alternative splicing, or single-nucleotide polymorphisms (SNPs) lead to antigenic changes but can also give rise to new antigens or even complete loss of expression .The ABO blood group antigens are possibly the most significant and intensively studied and were the first to be recognized (Khan et al., 2004).The glycoconjugate structures on RBCs have many functions including receptors for exogenous ligands, viruses, bacteria, and parasites, transporters, channels, structural proteins, adhesion molecules, and enzymes (Kolmakova and Konovoa ,1999).The exact mechanisms that would explain the associations between blood group antigens and disease in adhesion molecules however have not yet known. But an unexpected number of these structures contribute to normal RBC development; some act as cell adhesion molecules (CAMs), and some play a role in human disease The ABO, Hh, Sese (secretor), and Lele (Lewis) genes play different roles in the final ABO antigen structure of an individual's body tissues as well as secretions However, this basic evidence can be revised as new information was obtained The ABO blood group has been associated with many diseases and easily accessed in a patient's genetic makeup (Osakue and Onaiwu, 2014) .ABO blood types were shown to have some associations with various infectious and noninfectious diseases(Rudmann,2005)Environmental and host genetic factors may be imperative in the genesis of diseases. During 1901 Landsteiner's discovery, the ABO blood group system was studied as an etiological factor of many diseases, for example, carcinoma of the stomach and peptic ulcer (Sirina and Clement, 2013). ABO antigens are thought to be evolutionarily beneficial in conferring resistance against pathogens. However, the susceptibility to various diseases, such as cancer, cardiovascular diseases, infections, and hematologic disorders, has been linked with ABO blood groups .Mostly A and B antigens are secreted by the cells and are found in human blood circulation. Therefore, nonsecretors are at risk to a variety of infections .The likely pathogenesis for this vulnerability is that many organisms may bind to polysaccharides on the cell surface but soluble blood group antigens may block this binding (Sultana et al., 2013). The ABO alternative phenotype can prevent the species carrying it from being threatened by a pathogen using a given carbohydrate as a receptor. On the other hand, the ABO polymorphism leads to a polymorphic production of anti-A and anti-B natural antibodies, which potentially protect individuals from several infectious agents expressing A and B motifs (Yuzhalin and Kutikhin, 2012).

MATERIAL AND METHODS

Sample Size and Sampling Technique

The study was conducted from November , 2024 to February, 2025 at Rawalpindi city of Pakistan. It is located near the Soan River in north-western Punjab, and is the largest Pothwari-speaking city in the world. Rawalpindi is situated adjacent to Pakistan's capital Islamabad (about 14 km) and the two are jointly known as "twin cities" because of the social and economic links between them. From sea level Its elevation is 540 meters (1,770 feet). Furthermore due to its warm comfortable mean annual temperature of 21.3 °C (70 °F) attracts people to live here permanently from all over Pakistan. The average annual rainfall is abundant at 1,346.8 millimeters (53.02 in), most of which falls in the monsoon season.

Study design and Data collection

ABO blood groups information were collected through a questionnaires distributed in different institutes/ offices were both male and female employees were working. An interview based structured questionnaire was used for those individuals available during data collection to collect sociodemographic data such as sex, age, birth place, educational status etc (Edinur et al., 2016).

Ethical consideration:

The clearance about study was obtained from relevant department prior start of study after a detail discussion about importance of study

RESULTS AND DISCUSSION

From the total of 500 individuals screened for blood group types 300 male (60 %) and 200 female (40%). All information regarding human subjects and ABO groups are given in following sections

Table 1. General information about human subjects with blood groups

Location number	Number human subjects	Gender Male/Female	Age	Profession	Blood group
1	95	Male	30-40	0ffice workers	O
2	75	Male	35 45	Business men	O
3	75	Female	30-37	General worker	O
4	65	Female	30- 35	General workers	O
5	50	Male	20-30	Office workers	A
6	50	Female	20-32	Lab. workers	A
7	40	Male	20-25	Students	B
8	30	Female	18-26	Students	B
9	10	Male	15-18	General public	AB
10	10	Female	14-17	Students	AB

Every location indicates data of 50 human subjects. However, at final following percentage of ABO system was calculated and was mentioned in table 2

Table 2. Phenotypic distribution of ABO blood group among human subjects(Male/ Female) from Rawalpindi areas . Total human subjects =500

Sr.No	Blood group	Percentage of ABO groups
1	A+	21.1
2	A -	-
3	B+	18.5
4	B-	-
5	O+	47.5

6	O-	-
7	AB+	5.2
8	AB-	0.8

whereas types ABO system shows that O +. (47.5 %), A+ (20.1 %), B+ (18.5%),AB + (5.2), ABO (0.8%)

Some information regarding ABO blood groups was not included that was about 7.9 %.

DISCUSSION

In this study, high percentage of blood group O + (42.1%) phenotype was observed among study participants followed by A+ (32.7%), B+ (20.9%), and AB+ (4.3%). This goes in line with some recent studies reporting high group O frequency compared to group A (Rudmann, 2005). A phenotype is more common than O+ (Greer et al., 2010)Hence findings in the present study substantiate the hypothesis has evolutionarily shaped the distribution of ABO phenotype. Other studies areas of show that B phenotype is the most abundant ABO blood group suggesting that the above scenario is not exclusive .The frequency of ABO and RhD blood group vary from one population to another all over the world (Sutana et al., 2013). Blood grouping is used in blood transfusion, because it is preferable for patients to receive blood of the same ABO and RhD group (Alfouzan,2014). It is also important in determining migration of races and in hereditary diseases. Some diseases are more common to develop in certain blood groups; hence relationship of different blood groups with diseases is important . Studies in different areas of Pakistan show the incidence and division of ABO and RhD blood groups in different regions (Aly et al., 2014).A study from Rawalpindi and Islamabad had shown the percentages of various groups among female subjects, as 32.87% for blood group B, 31.91% for blood group O, 24.02% for blood group A, and 11.20% for blood group AB.

Distribution of Rh positive and negative in the considered population was 92.45% and 7.55% respectively (Epidi et al.,2008)

The current practice of serologic testing of blood groups, the progress in molecular diagnosis allows the prediction of phenotype based on the knowledge of the molecular basis of the currently used antigens. This will improve the process of blood matching for the transfusion (Epidi et al., 2008)

Finally, the association of the ABO blood groups with the serious diseases that have been reported in various literatures (Khan et al., 2004). However, the present study may also help to promote the awareness of the whole community rather than the selected individuals about such association since the reported association was based on clinical evidences.

Conclusion

Based on the obtained results, the pattern of the blood group distribution was found to be similar to those reported earlier . The knowledge of the ABO system is also important in transfusion medicine and tissue transplants and play important role in medico legal issues. So many diseases are reported to be associated with of the different types of the ABO system. This might also help to increase the awareness of the people throughout the world

Blood groups O and AB phenotypes are the most and the least frequent ABO blood groups, respectively, in the study population.. Donors with blood group O are significantly more susceptible to asymptomatic infections as compared to non-group-O donors. Further studies are recommended to assess the biological basis of association between ABO/Rh blood group having common human disorders

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