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Original Research Paper

Pathology

BLOOD GROUP AND Rh TYPE DISTRIBUTION IN DONORS IN TERTIARY CARE TEACHING HOSPITAL IN PAURI-GARHWAL DISTRICT, UTTARAKHAND

Satish Kumar	Associate Professor, Department of Pathology, V.C.S.G. Government Medical College, Srinagar, Garhwal, Uttarakhand.
P. K. Modak	Assistant Professor, Department of Physiology, V.C.S.G. Government Medical College, Srinagar, Garhwal, Uttarakhand.
S. K. Barpanda*	Associate Professor, Department of Pathology, V.C.S.G. Government Medical College, Srinagar, Garhwal, Uttarakhand. *Corresponding Author
Haroon Ali S	Assistant Professor, Department of Community Medicine, V.C.S.G. Government Medical College, Srinagar, Garhwal, Uttarakhand.
S. Chaudhury	Professor, Department of Pathology, V.C.S.G. Government Medical College, Srinagar, Garhwal, Uttarakhand.

ABSTRACT

Introduction: At present 36 blood group system genes have been identified and sequenced. Each blood group system represents either a single gene or a cluster of closely linked homologous genes.

Materials and methods: A retrospective study was carried out at the tertiary care teaching hospital blood bank from January 2012 to December 2017. The blood groups of donors and other relevant data were accessed from the archived records.

Results: Of the total 11,615 donors B group was most prevalent (31.63%) followed by A group (30.54%), O group (26.01%) and AB group (11.81%). 93.51% were Rh positive with the remainder (6.49%) being Rh negative. Of the total donors 7.69% were females.

Discussion: In our study B group (31.68%) was the most prevalent followed by A group. AB group was the least prevalent. Similar studies in India show prevalence of B group in Rajasthan, Gujurat, West Bengal, Chattisgarh, Orissa and Tripura. Rest of the studies show prevalence of O group. Sikkim was the only state that showed a prevalence of A group.

Conclusion: B group was the dominant blood group in our study (31.63%) and Rh negative type constituted 6.65% of the donors. Females made up only 7.68% of donors.

KEYWORDS : Garhwali population, blood group, Rh type, blood donors.

INTRODUCTION

A blood group system, as defined by the International Society of Blood Transfusion, consists of one or more antigens controlled at a single gene locus, or by two or more closely linked homologous genes with little or no observable recombination between them[1]. Each blood group system represents either a single gene or a cluster of closely linked homologous genes.

At present 36 blood group system genes have been identified and sequenced. The blood group antigens have been divided into high incidence and low incidence groups and designated as 901 and 700 series respectively[1].

The seminal discovery of A, B, and O blood groups in 1901 by Karl Landsteiner, an Austrian immunologist, and the AB blood group in 1902 by Decastello and Sturli changed the surgical landscape[2].

In 1913 Ottenberg conclusively demonstrated the importance of preliminary compatibility testing for the prevention of transfusion accidents. He also observed the mendelian inheritance of blood groups[3]. In1939 Levine and Stetson reported the first case of Rh incompatible transfusion reaction[3]. In 1937 Fantus established the principle of"Blood Bank"[3].

With recognition and establishment of mendelian pattern of inheritance of blood groups it was used for testing biological parent-child relationship though at present it has been supplanted by genetic testing[4].

The ABO blood group system is also known as the histo-blood system being present on the surface of erythrocytes, platelets and various tissues including vascular, intestinal, hepatic and renal cells. This blood group system assumes importance during organ transplantation. ABO incompatible solid organ transplants have relatively poor graft survival rates compared to ABO compatible transplants. The same is also observed in ABO incompatible haematopoietic stem cell transplants[5].

A, B and H antigens are not directly encoded by the corresponding genes; rather, the genes encode glycosytransferases. The gene for H antigen encodes for fucosyltransferase that specifically adds fucose moiety to a terminal galactose. The genes for A and B antigens encode for glycosytransferases that add N-acetylgalactosamine or galactose respectively to the same galactose of the H antigen. Thus, in effect, H antigen is needed as a substrate for the formation of A and B antigens. The gene for H antigen is located on chromosome 19q13.3 and those for A and B antigens on 9q34.1-q34.2[6].

The "Bombay" blood group (O_h), originally identified in Bombay (Mumbai), India, belongs to the ABO blood group system and is an example of H antigen deficient phenotype. The clinical importance of this blood group lies in the fact that the erythrocytes as O blood group but do not express any H antigens. Their sera contain high titre of IgM haemolytic H antibodies that induce complement mediated lysis of erythrocytes of any of the other ABO blood groups except of another H antigen deficient individual[6].

Particular ABO blood groups show an increased predilection to certain diseases. Blood group A has been linked to gastric carcinoma[7], coronary artery disease[8] and endometriosis[9]. Some have not found any association between any particular ABO blood group and ischaemic heart disease[10]. Blood group B has been linked to hypertension and obesity[11]. Blood group O has been shown to have an association with severe disability scores in rheumatoid arthritis[12] and a better clinical outcome in malaria[13].

MATERIALS AND METHODS

A retrospective study was carried out at the tertiary care teaching hospital blood bank from January 2012 to December 2017. The blood groups of donors and other relevant data were accessed from the archived records.

The donors had been selected only after they fulfilled all the eligibility criteria of a healthy donor. The considered eligibility

criteria of healthy donor were –

- Age more than 18 years.
- Haemoglobin level more than 12.5 gms/dL.
- Absence of any febrile episode in the preceding 3 weeks.
- Absence of any immunization in prior 6 weeks.
- Absence of any history of jaundice in the preceding 6 months.
- Blood pressure less than 130/100 mm Hg.
- Absence of any blood donation in the past 3 months.

The blood collections were from voluntary donors either at the outdoor camps or in the blood bank and from replacement donors donating in the blood bank.

A total of 11,615 donors were considered fit in the study period and their blood collected.

ABO blood grouping and Rh typing was performed for each sample by tube agglutination method using monoclonal anti-sera (Tulip Diagnostics, India). Reverse typing was performed using pooled A, B and O erythrocytes.

Forward and reverse typing was performed separately by two different technicians without knowledge of each other's results. This served as a quality check and also as a help for screening and detection of "Bombay" and 'para-Bombay" blood groups and for the presence of any agglutinating or abnormal antibodies. Any weakly agglutinating reaction for Rh factor was considered as a positive reaction.

Blood group and Rh type were assigned only when the results of forward and reverse typing matched.

RESULTS

Of the total 11,615 donors B group was most prevalent (31.63%) followed by A group (30.54%), O group (26.01%) and AB group (11.81%). No "Bombay" or "para-Bombay" blood groups were detected. 93.51% were Rh positive with the remainder (6.49%) being Rh negative. 7.11% and 7.20% of male and female donors respectively were Rh negative.

Of the total donors 7.69% were females.

DISCUSSION

The ABO and Rh blood group systems act as major immunogens during blood transfusion. Also, being the major histo-blood system preliminary matching is essential for a successful organ transplant.

Association of ABO blood group system with diseases is debatable with many studies demonstrating a statistical association[7-9, 12, 13] and some failing to do so[10].The ABO blood groups and Rh type frequency varies from race to race as well as population of various geographical locations.

In our study B group (31.68%) was the most prevalent followed by A group. AB group was the least prevalent. Similar studies in India show prevalence of B group in Rajasthan[15, 16, 17], Gujurat[18, 19], West Bengal[20], Chattisgarh[21], Orissa[22] and Tripura[23]. Rest of the studies show prevalence of O group[14, 17, 20, 25-34]. Sikkim[24] was the only state that showed a prevalence of A group.

In our study "Bombay" or "para-Bombay" blood groups were not detected. Studies conducted in Southern Gujurat[19] and Mangalore[26] did report finding 'Bombay" group, 01 case (0.00245%) and 02 cases (0.0046%) respectively in their series. Balgir[35] has reported an incidence of 1 in 33 among the Kutia Kondh tribe, 1 in 127 among the Kondh tribe, and 1 in 1,244 among the tribal populations of Odisha. This finding is significant for the fact that blood banks in these areas have to keep stock of "Bombay" group. Further, blood bank personnel will have to be aware and have high degree of alertness when issuing blood unit for any person belonging to these areas or tribes.

Our study shows 95.31% of donors were Rh positive and 7.69% were Rh negative. Studies from other parts of India show frequency of Rh negative varying from 1.3% to 8.83%; Sikkim[24] shows only 0.53% as Rh negative. Study by Balgir[22] amongst the Scheduled Tribes of Odisha showed the lowest frequency (0.4%) of Rh negative.

In our study female donors constituted only 7.69%. Similarly other studies in India show female donors to be in substantial minority with frequencies ranging from 0.16% - 17.1%. With females constituting nearly half the population the number of female donors are comparatively very less. This causes a scarcity of valuable and labile resource. The possible causes for paucity of female donors are pre-selection criteria (haemoglobin level and weight), social taboos and cultural habits. The last two factors should be countered by intense public propaganda targeting females so as to mobilize and encourage them to donate blood. Also, with increasing adoption of component fractionation haemoglobin level may no longer be deemed to be an important pre-selection criterion except when a unit is being collected for erythrocytes.

CONCLUSION

B group was the dominant blood group in our study (31.63%) and Rh negative type constituted 6.65% of the donors. Females made up only 7.68% of donors.

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