

Distribution of ABO & Rh (D) Blood Groups Among Blood Donors of Jammu Region with Respect to Various Ethnic Groups

Urvershi Kotwal¹, Tilak Raj Raina², Meena Sidhu³, Mitu Dogra¹

¹MD Immunohematology & Blood Transfusion Medicine, GMC

Jammu

²MD Pathology, GMC Jammu

³MD Pathology, MAMC New Delhi

Institute at which research was conducted: GMC Jammu

University Affiliation of Thesis: Jammu University

Year of Acceptance: 2012.

Address of Correspondence

Dr Urvershi Kotwal

c/o Blood bank, Dr Ram Manohar Lohia Hospital

New building gate 6, Baba kahraghsinghmarg

New Delhi 110001.

Email: urvashikotwal@gmail.com



Dr. Urvershi Kotwal



Dr. Tilak Raj Raina



Dr. Meena Sidhu



Dr. Mitu Dogra

Abstract: Background: Out of twenty nine Blood group systems discovered so far, ABO & Rh system is the most important with respect to Blood Transfusion, Hematopoietic Stem Cell Transplantation & Solid Organ Transplantation.

Methods: It was a Cross-sectional, hospital based study involving blood donors over a period of one year. Blood donors were divided into five major ethnic groups and ABO & Rh D blood grouping was done by conventional tube technique.

Results: Among the total 13,281 Blood Donors 97.51% donors were male & 2.49% were females. 89.09% donors were below 40 years of age with mean age of the 29.87 years. Maximum Donors were Dogras (78.20%) followed by Non Gujar Muslims (9.28%), Sikhs (5.92%), Gujjars (4.31%) & Kashmiri Pandits (2.30%). The most prevalent ABO phenotype among donors was B (34.85%) followed by O (30.64%), A (24.77%) & AB (9.73%). Out of the total 3291 A blood group, there were 30 cases of A2 thus comprising of 0.91%. Among the study group 94.52% were positive for Rh D antigen & 5.48% were Rh D negative. Prevalence of Weak D was 0.0075% and among the Rh (D) antigen Negative Blood Donors (728) it was 0.14%. The prevalence of Rh D negative blood donors was highest among Non-Gujjar muslim donors 10.06%, followed by Kashmiri pundits 9%, Gujjars 8.22%, Sikhs 6.62% & Dogras 4.60%. In Dogra (34.80%), sikhs (38.80%) and non gujjar muslims (34.98%) donors B blood group was commonest. In Kashmiri Pandits (32.45) and Gujjars (34.09%) the O phenotype was common. To conclude our region is having a blood group distribution trend B > O > A > AB, which does not follow the Asiatic trend of O > B > A > AB with marked differences of distribution among the ethnic groups especially with reference to Rh D antigen.

THESIS SUMMARY

Introduction

Karl Landsteiner in 1901 discovered the ABO Blood Group System and by 1902, he described that there are four blood groups existing in human being & in this way Landsteiner truly opened the doors of blood banking. Out of the twenty nine Blood Group Systems discovered so far, ABO & Rh systems are the most important with respect to Blood Transfusion, Hematopoietic Stem Cell Transplantation and Solid Organ Transplantation. (Hod E.A.; 2009)¹. In spite of advancements in blood grouping & crossmatching techniques transfusion of

wrong ABO & Rh is one of the leading cause of deaths reported to FDA (Harmening D.M.; 2008)². The basis of pretransfusion testing is to detect ABO incompatibility between donor & the recipient. ABO Forward & Reverse grouping tests are required to be performed on all the donors & recipients as there is always a reciprocal relationship between the Forward & Reverse type, thus one serves as a check on the other. ABO subgroups are phenotypes that differ in the amount of A & B antigens carried on red cell membrane & also in body secretions. In general A subgroups are more common than B subgroups (Cooling Laura; 2008)³. In addition to A2 several other weaker

A subgroups are described (A₃, A_x, A_m etc.) the extremely weaker A(B) subgroups are infrequently encountered & are usually recognised by apparent discrepancies between red cell (forward) & serum (reverse) grouping results. The frequency of these blood groups in the white population is O-45%; A-40%; B-11%; AB-4%; O & A are most common & AB is rare among Westerns. However, frequencies of ABO groups differs in a few selected populations & ethnic groups like blood group B is found twice as frequently in Blacks & Asians as in whites & sub group A₂ is rarely found in Asians. The Rh System is next only to the ABO system in importance in Transfusion

Medicine. Rh system was discovered by Levine & Stetson in 1939 who detected an irregular antibody in the serum of a mother whose foetus had Haemolytic Disease of Foetus & Newborn. (Makroo RN.;2009)⁴. Rh Antigens especially D are highly immunogenic & Clinical importance of Rh Blood Group System lies in the fact that the Haemolytic Disease of Foetus & Newborn may occur in Rh Negative pregnant women having a Rh Positive foetus & Rh antibodies may develop in any Rh Negative individual if transfused Rh Positive blood leading to Haemolytic Transfusion Reaction's (Makroo RN.;2010)⁵. Even exposure of 0.1 ml of Rh (D) antigen Positive cells can elicit an antibody response in Rh Negative persons. Rh antigens are present only on red blood cells. Once initiated Rh antibody production is irreversible & circulating antibodies last for years. Weaker variants of D are defined as the weakened expression of normal D antigen i.e. fewer than normal D antigens present per red cell. Previously known as Du. This is an inherited characteristic. In Blood Donors Weak D is taken as D positive & in recipients Weak D is taken Rh Negative. Mothers with Du positive foetus require Rh immunoprophylaxis. (Mayne K.; 1990)⁶. Jammu also known as Duggar Desh, is one of the three administrative divisions within the state of Jammu and Kashmir. Population of Jammu division consists of 65% Hindus, 30% Muslims & remainder are Sikhs. Hindus are subdivided into different ethnic groups like Dogras, Kashmiri Pandits, Sikhs, Brahmans, Rajputs, Thakkars, Jats etc. Muslims are subdivided mainly into Gujjars and Non-Gujjars. Aim of the study was to determine the prevalence of ABO & Rh D blood groups among blood donors (voluntary & replacement) of Jammu region and their distribution in various ethnic groups of Jammu Province. Also to report the cases of Weak D & Bombay Phenotype in Jammu Province if any.

Methods

It was a Cross-sectional, prospective hospital based study involving blood donors carried out in the Post-Graduate Department Transfusion Medicine, Government Medical College, Jammu from November 2010 to October 2011. Blood Donors were selected & rejected as per per the Donor Questionnaire framed under DGHS/NACO guidelines & SOP available in the Department. Blood Donors belonging to five major ethnic groups namely Dogras, Gujjars, Kashmiri pandits Non-Gujjar Muslims and Sikhs donated blood at our centre after undergoing pre-blood donation check up & being declared medically fit. Approximately, 3 ml of blood sample was taken in the EDTA vial which was then used for blood phenotyping & blood screening. ABO & Rh D blood grouping was done by conventional tube technique. The Rh D negative donors were further typed for the Weak D antigen. Bombay phenotyping of all the Blood group O donors was done.

Results

During the one year study period, a total of 13,281 Blood units were subjected to ABO & Rh (D) Blood Grouping. Among the study group, 12,950 donors (97.51%) were male & 331 (2.49%) were females. There were 11,832 (89.08%) Blood Donors in the age group of 18-40 years and 1,449 (10.91%) Blood Donors in the age group of 41-60 years. Mean age of study group came out to be 29.87 years. Our study population consisted of Blood Donors belonging to five main Ethnic Groups namely Dogras, Kashmiri Pandits, Sikhs, Gujjars & Non-Gujjar Muslims as shown in figure

1 Among all the Blood Donors included in the study, the ABO Phenotypic distribution irrespective of Rh (D) antigenic expression is shown in fig 2. Among the total A Positive Blood Donors 30 cases of Blood group A2 were found having a prevalence of 0.91% (Confidence Interval -2.48-4.30) among the total 3,291 A Positive Blood Donors & 0.23% (Confidence Interval -1.47-1.93) among total 13,281 Blood Donors taken in the present study. On RhD antigen phenotyping, 12,553 donors (94.52%) were Rh D Antigen Positive & 728 donors (5.48%) were Rh D Antigen Negative. Weak D (Du) testing was done using Indirect Antiglobulin test and only one Blood Donor was Weak D positive. So, the prevalence of Weak D (Du) among the total Blood Donor population in the present study came out to be 0.0075% (Confidence Interval -1.69-1.71) & among the Rh (D) antigen Negative Blood Donors it was 0.14% (Confidence Interval -7.19-7.47). The distribution of ABO & Rh (D) Blood Group in study group is shown in Fig 3.

Discussion

Blood groups are genetically determined and the incidence of ABO and Rh genes and their phenotypes vary widely across races and geographical boundaries despite the fact that the antigens involved are stable throughout life. The resultant polymorphism remains important in population genetic studies, estimating the availability of compatible blood, evaluating the probability of haemolytic disease in the new born, resolving disputes in paternity/maternity and for forensic purposes. The present study has therefore provided useful information on the status of ABO and Rh (D) blood group distribution in Jammu region. In present study there were 97.51% male donors & 2.49% female. It may be because of the prevalent customs, lack of exposure, awareness and opportunity among them. Another reason is deferral of females for being anaemic which is in accordance to the overall prevailing prevalence of anaemia among the females all over India as more than 50% females in the reproductive age group in India are anaemic. (REF). Range of the age distribution among the Blood Donors taken in the present study was 18-60 years. 89.09% donors were below 40 years of age with mean age of the 29.87 years. The most prevalent ABO phenotype among our population came out to be B (34.85%) followed by O (30.64%), A (24.77%) & AB (9.73%). Thus, it is concluded that the parts of North India & its adjoining areas of Pakistan show the predominance of Blood Group B as supported by various studies. Khan MS et al. (2004)⁷ Khalid M and Qureshi M A (2006)⁸ Tiwari A et al. (2010)⁹ Maheshwari P (2010)¹⁰ table 3. Studies from the South India generally show a variable pattern of Blood group predominance showing O to be the most commonest blood group like Das P K et al. (2001)¹¹ Periyavan S. et al. (2010)¹² Nag I et al. (2009)¹³. Frequency of Rh D Negative is in accordance with many studies across the country like Nanu A. et al. (1997)¹⁴ Calcutti R A et al. (2003)¹⁵ Alam M. (2005)¹⁶ Nag I et al. (2009)¹¹, Periyavan S et al. (2010)¹². There are a few studies which show a higher prevalence of Rh (D) Negative phenotype like Sharma S et al. (2011)¹⁷ Khan MS et al. (2004)⁷. As per the ethnic distribution, prevalence of the Rh D Negative Blood Donors was highest among Non-Gujjar Muslim donors (10.06%), followed by Kashmiri Pandits (9%), Gujjars (8.22%), Sikhs (6.62%) & Dogras

(4.60%). There are no studies regarding the distribution of ABO and D antigens in various ethnic groups. The prevalence of Weak D positivity among the total Blood Donor population (13281) in the present study came out to be 0.0075% (Confidence Interval - 1.69-1.71) & among the Rh (D) antigen Negative Blood Donors (728) it was 0.14% (Confidence Interval - 7.19-7.47). Frequency of weak D is low in present study in accordance with study by Makroo et al⁵. In Dogras B phenotype, Kashmiri Pandit ethnicity the O, Sikh Blood Donors B phenotype, Gujjar ethnicity O, Non-Gujjar muslims B phenotype are the commonest. Non-Gujjar muslims have shown a relatively higher percentage of Rh (D) Negative (10.06%) phenotype as compared to Rh (D) Negative prevalence among the various studies done across the country as well as the prevalence of Rh (D) Negative (5.48%) as seen among Blood Donors in our study. This high prevalence of the Rh (D) Negative phenotype among a particular ethnic group may be because of the consanguinity which is a very common practice seen among the Non-Gujjar Muslims as it is their custom. The terrain of our state is hilly & there are a few areas which still are inaccessible and there the population is isolated and people living there have a less exposure to the people living in the other parts of the state and the rest of the country. Other factor responsible may be that it is believed that the ancestors of the people living here have migrated from Pakistan and other adjoining countries where similar pattern of distribution has been found. (REF). Present study is having a blood group distribution trend as B>O>A>AB. This trend doesn't follow the trend as seen in rest of Asia that is O > B > A > AB. The knowledge of the distribution of ABO and Rh (D) blood groups is essential for the effective management of a Blood Bank's inventory, whether it is in a smaller Local Transfusion centre or a Regional or National Blood Transfusion Service. Blood Transfusion Service (BTS) is an integral part of modern health care system without which efficient medical care is impossible. The main aim of a Blood Transfusion Service is to provide effective blood and blood products, which should be as safe as possible, and adequate to meet patient's need. It is therefore hoped that the data generated in this study would assist in the planning and establishment of a more efficient functioning Blood Transfusion Service that would meet the ever-increasing demand for safe blood and blood products. Jammu as a region has got some special constraints & peculiarities like a very low density of population, difficult and hilly terrain, poor connectivity by roads, lack of infrastructure and limited presence of private sector/NGO's. This study has provided a very valuable information regarding the distribution of Blood Groups in Jammu region as generation of a simple database of blood groups provides data about the availability of human blood in case of regional calamities to which our area is more prone. In spite of the valuable information provided by this study, it is suggested to extend this study to the district & sub-district levels to have an assessment of the needs & provision of the better health care facilities even to the grass root level, especially in view of the special constraints of the region & the needs of the people. Thus, the data generated by this study will be useful for the health planners, while making efforts in delivering the better health care facilities like establishing the FRU's so that all the people living in the region have the access to and have the maximum benefit of

these health care facilities.

Conclusion

The present study has given us a very valuable information because the knowledge of Red Cell ABO & Rh (D) Antigen phenotype frequencies in a given population in terms of their ethnic distribution, is helpful in creating a Blood Donor data base which not only provides data about the availability of human blood in case of regional calamities, but is also helpful for preparation of indigenous cell panels, and also providing the compatible blood to the patients. Some ethnic groups like Kashmiri Pandits & Non-Gujjar Muslims have a very high prevalence of Rh (D) Negative phenotype suggesting that Haemolytic Disease of Foetus & Newborn may be a particular concern in these subgroups. Thus, it would make the data generated by the study, to be useful for health planners, while making efforts to face the future health challenges in the region.

Bibliography

1. Hod E.A., Spitalnik P.F, & Spitalnik S.L *Carbohydrate Blood Groups, Rossi's Principles Of Transfusion Medicine Fourth Edition 2009 page no 89-108.*
2. Harmening D.M.; Firestone D. *The ABO Blood Group System, Modern Blood Banking & Transfusion Practices Fifth Edition 2008 page no 108-132*
3. Cooling Laura ; *ABO, H, Lewis Blood Groups & Structurally Related Antigens, Technical manual AABB sixteenth edition 2008'p.no 361-385*
4. Makroo RN. *2nd ed. New Delhi: 2009. Compendium of transfusion medicines*
5. Makroo RN, Raina V, Chowdhry M, Bhatia A, Gupta R, and Rosamma NL *Weak D prevalence among Indian blood donors Asian J Transfus Sci. 2010 July; 4(2): 137-139*
6. Mayne K, Bowell P, Woodward T, Sibley C, Lomas C, Tippett P. *Rh immunization by the partial D antigen of category DVa. Br J Haematol. 1990;76:537-9*
7. Khan MS, Subhan F, Tahir F, Kazi BM, Dil AS, Sultan S, Deepa F, Khan F and Sheikh MA *Prevalence of blood groups and Rh factor in Bannu region (NWFP) Pakistan Pakistan J. Med. Res. Vol. 43 No.1, 2004*
8. Khalid M and Qureshi M A *Frequencies of blood group antigens and corresponding alleles in the population of Mirpur, Azad Jammu & Kashmir, Pakistan J. Anim. Pl. Sci. 16(3-4): 2006*
9. Tiwari A, Pandey P, Joseph NP, *Frequency of ABO blood group system in northern India Abstract of 37 th Annual Conference of Indian Society of Blood Transfusion and Immunohematology (ISBTI). Asian J Transfus Sci 2011;5:63-109*
10. Maheshwari P *Distribution of ABO and Rh blood group- A population based study from north India Abstract of 37 th*

- Annual Conference of Indian Society of Blood Transfusion and Immunohematology (ISBTI). Asian J Transfus Sci 2011;5:63-109*
11. Das PK, Nair SC, Harris VK, Rose D, Mammen JJ, Bose YN, Sudarsanam A. Distribution of ABO and Rh-D blood groups among blood donors in a tertiary care centre in South India. *Trop Doct. 2001 Jan;31(1):47-8.*
12. 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 [serial online] 2010 [cited 2010 Sep 21];4:41*
13. Nag I, Das S S et al ABO and rhesus blood groups in potential blood donors at Urgapur steel city of the district of Burdwan, West Bengal Abstract of 37 th Annual Conference of Indian Society of Blood Transfusion and Immunohematology (ISBTI). *Asian J Transfus Sci 2011;5:63-109*
14. Nanu A, Thapliyal RMBlood group gene frequency in a selected north Indian population. *Indian J Med Res. 1997 Sep;106:242-6.*
15. Calcutti RA, Lone MK, Ahmed S, Shah BA, Jan N Blood Groups in the Kashmir Valley ,JK SCIENCEVol. 5 No, 3, July-Septembcr 2003
16. Alam M ABO and Rhesus blood groups in potential blood donors at Skardu(northern areas)*Pak J Pathol Jul - Sep 2005;16(3):94-7.*
17. Sharma S et al Prevalence of phenotypes and genes of ABO and Rhesus (Rh) bloodgroups in and around Amritsar district, Punjab – A four year study (June 2007- June 2011) Abstract of 38 th Annual Conference of Indian Society of Blood Transfusion and Immunohematology (ISBTI). *Asian J Transfus Sci 2012;6:63-109.*

Conflict of Interest: Nil
Source of Support: None

Full Thesis and Master Chart available on
www.journalmedicalthesis.com

How to Cite this Article:

Kotwal U, Raina TR, Sidhu M, Dogra M. Distribution Of ABO & Rh (D) Blood Groups Among Blood Donors Of Jammu Region With Respect To Various Ethnic Groups. *Journal Medical Thesis 2014 Jan-Apr; 2(1): 31-34*