

Possible Correlation of Transfusion Transmitted Diseases with Rh type and ABO Blood Group System

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ABSTRACT

Background: Screening of blood is mandatory for transfusion transmitted diseases and is routinely done in the blood banks. As blood is the major source transmission of hepatitis B, hepatitis C, human immunodeficiency virus & many other diseases the hazards can be minimised by effective donor selection and screening.

Aim: To find out the correlation between the transfusion transmitted diseases and blood groups and the seroprevalence of HIV, HBV, HCV & syphilis among the apparently healthy human blood donors.

Study, Setting & Design: This retrospective study was conducted at the blood bank of a tertiary health care teaching centre for a period of four years.

Material and Methods: All voluntary and replacement donors reporting to the blood bank were screened for HIV-1 & 2, HBsAg, HCV and Syphilis. Anti-HIV -1 & 2, HBsAg & anti - HCV was tested using the appropriate Enzyme-linked immunosorbent assay (ELISA) technique using micro-elisa kit supplied by J.Mitra

& Co.Ltd. The seropositive samples were again tested on ELISA kits of RFCL &/or BIORAD for further confirmation & ruling out any false positive or false negative results. The rapid plasma reagin (RPR) test was used for estimation of syphilis infection.

Statistical Analysis: The data entry was carried out using Microsoft office excel worksheet and was analysed by percentage and comparison.

Results: Total of 6000 donors were screened which included voluntary and replacement donors. Seroprevalence of HIV (0.1833 %), HCV (1.28%), HBsAg (1.5833 %) and syphilis (0.4333 %) was detected. In the study done it was also noted - that the NEGATIVE blood groups were more prone to TTIs. Blood group A negative was more prone to TTIs with HIV, HBsAg and VDRL while blood group B negative was more affected by HCV.

Conclusion: Seroprevalence of these infections shows that routine screening is a must for blood and blood product safe transfusion.

Do negative blood groups predispose to TTIs? A finding which makes us think....

Key words: Blood donors, Seroprevalence, Transfusion transmitted diseases, Human immunodeficiency virus, Hepatitis C, Hepatitis B surface antigen

INTRODUCTION

Each transfusion carries a risk of transmitting blood-borne pathogens, including mainly human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV) and syphilis [1]. With every unit of blood there is a 1% chance of transfusion associated problems including transfusion transmitted diseases [2]. Host genetic and environmental factors may be important in the genesis of diseases [3]. Mourant et al., concluded that the differences in frequencies of blood Groups A and B are the result of random genetic drift and founder effects as well as of natural selection, arising from differences in fitness between the various blood groups [4]. The ABO blood group has been previously found to be associated with the risk of several malignancies, including gastric cancer, pancreatic cancer, epithelial ovarian and skin cancer [5]. Interaction of micro-organisms and RBC membrane is probably because of antigenic similarity, adherence through specific receptors or modulation of antibody response [6].

This study was done to know the seroprevalence of TTIs in different blood group in the national capital region (NCR) and to find out if there is any predisposition of infections to the blood groups.

MATERIAL AND METHODS

Study setting and design: This retrospective study was conducted at the blood bank of School of medical sciences and research, Sharda University, Greater Noida, NCR, for four years from January 2008 to January 2012. Sera of 6000 apparently healthy donors from different age groups and from different localities were screened.

Ethical clearance is done.

Data collection: The outcome variable was the serological report of the individual whether positive or negative or any TTIs.

Sample Collection and Lab Testing: The required sample was collected after informed consent from the donor and tested for Anti-HIV -1 & 2, HBsAg & anti - HCV using the appropriate Enzyme linked immunosorbent assay (ELISA) technique supplied by J.Mitra & Co.Ltd. The seropositive samples were again tested on ELISA kits of RFCL &/or BIORAD for further confirmation & ruling out any false positive or false negative results. The rapid plasma regain (RPR) test was used for estimation of syphilis infection.

Data Management and Statistical Analysis: Data entry was carried out by using Microsoft office excel worksheet and analysed by percentage and comparison.

RESULTS AND OBSERVATIONS

The seroprevalence rates of TTIs according to the various blood groups and Rh factor is given in [Table/Fig-1].

DISCUSSION

Association between blood groups and diseases is not something new. Diseases like peptic ulcer, gastric carcinoma, erythroblastosis foetalis, coronary artery diseases and venous thromboembolism, neuroendocrine tumors in MEN type 1, have shown their association with various blood groups. Evidence collected by David J. Anstee showed that selection by infectious diseases at the level of the ABO and secretor genes is persuasive but for other blood group antigens, founder effects appear more likely to account for the distribution of blood group polymorphisms [7].

Blood group	Total donors	Anti-HIV	Anti-HCV	HBsAg	VDRL
A positive	1349	03 (0.222%)	19 (1.408%)	25 (1.853%)	09 (0.667%)
A negative	93	01 (1.075%)	–	02 (2.1505%)	01 (1.075%)
B positive	1964	05 (0.2545%)	24 (1.221%)	25 (1.2729%)	04 (0.2036%)
B negative	159	–	03 (1.886%)	02 (1.2578%)	–
O positive	1856	02 (0.1077%)	26 (1.4008%)	30 (1.616%)	08 (0.4310%)
O negative	125	–	01 (0.800%)	02 (1.6%)	–
AB positive	429	–	04 (0.9324%)	09 (2.097%)	04 (0.932%)
AB Negative	25	–	–	–	–
Total	6000	11 (0.1833%)	77 (1.2833%)	95 (1.5833%)	26 (0.4333%)

[Table/Fig-1]: Distribution of seropositive blood donors based on blood groups

The study was done on the samples of 6000 apparently healthy human blood donors and it was found that “yes”, there does seem to be a preference of a particular infection to a particular blood group.

- The NEGATIVE blood groups were found to be more prone to TTIs.
- More patients with blood Group A negative were found to be affected with HIV, HBsAg and VDRL while blood Group B negative was more common in patients affected by HCV

In a study conducted in Karnataka, India. A. Banu reported that “O Rhesus positive” was the most prevalent blood group in both adult (40.13%) and paediatric (43.33%) HIV seropositives [8].

Omar and co-workers reported that seroprevalence of HBs Ag and HCVAb were found to be higher in donors who has blood group O and lowest in blood group AB donors, while the distribution of Rh in hepatitis infections was higher between Rh positive donors [9]. Kumar and associates reported that the highest prevalence of HIV and HBV infection were found in individuals with blood group O and Rh positive [10].

In an analysis for sero-prevalence of antibodies to HIV, HBV and syphilis and its relationship to blood group in healthy Nepalese males, Joshi and Ghimire showed a tendency of high affinity of those diseases in the subjects with O “positive” blood group. However, no real association of those infections was found with the blood group (HIV: $X^2=0.902$, $p=0.99$; HBsAg: $X^2=1.212$, $p=0.99$; RPR: $X^2=3.975$, $p=0.789$ [11].

Not much studies have been reported establishing relation between ABO and Rh blood group system. Sathe et al conducted a study in Aurangabad but reported that “There is no evidence of any association between sero-positivity for syphilis and ABO blood groups” [12].

The results of given study is not in agreement with other studies reported on association of Transfusion transmitted infection with ABO and Rh-system blood group. Most of similar studies have reported that blood group “O” and “Rhesus positive” is more prone to

TTI. The probable reason may be that the sample size in given study is large as compared to other similar studies reported in the text.

CONCLUSION

This study clearly shows that there is preference for negative blood groups by the TTIs and even the specificity of a particular infection to a particular blood group is noted.

Other similar large scale studies are required to find out how can this association help us to improve our screening programmes?

Can particular blood groups be categorized as high risk donors?

Should they be given some extra attention while screening?

Should such people be otherwise also advised in good faith to get their blood tested for TTIs even if they do not intend to donate?

What about the list of second choice blood groups which are transfused considering them safer.

How safe is to routinely transfuse them in other emergency conditions?

What about the so called universally safe O – negative, the exchange transfusions done in newborns in the window period.

Food for thought and follow up....

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REFERENCES

- [1] Stokx J, Gillet P, Wegheleire AD, Casas EC, Maendaenda R, Beulane AJ, et al. Seroprevalence of transfusion-transmissible infections and evaluation of the pre-donation screening performance at the Provincial Hospital of Tete, Mozambique *BMC Infectious Diseases* 2011, 11:141.
- [2] Widman FK (ed) (1985) Technical manual. American Association of Blood Banks, Arlington, pp 325–44.
- [3] Naeini AE, Rostami M and Naeini SE. Chronic viral hepatitis and their relation to ABO blood groups and rhesus (Rh) factor. *Med. Case Stud.* October 2010; 1(1), 5-7.
- [4] Mourant AE, Kope AC, Domaniewska-Sobczak K. *Blood Groups and Diseases*. Oxford, United Kingdom: Oxford University Press; 1978.
- [5] Greenwell P (1997) Blood group antigens: molecules seeking a function? *Glycoconj J.* 14: 159–73.
- [6] Gerald L. Mandell. Douglas. Principles and practice of infectious disease, *Churchill*. 2000; 5th Ed. 1: 39.
- [7] Anstee DJ. The relationship between blood groups and disease. *Blood*. 2010 Jun 10;115(23):4635-43.
- [8] Banu A, Ahmed SM, Shastri S. Distribution Of Abo And Rh Blood Groups In Hiv Seropositives At An Integrated Counseling And Testing Centre In Karnataka, India. *SAARCTB*. 2011; 8(2): 42-45.
- [9] Omar AAA, Al-Hayan NN, Mohammed MJ. The infection with HBV and HCV and their relationship to ABO blood group among blood donors. *J Fac Med Baghdad*. Vol.54, No.1, 2012: 52-55.
- [10] Kumar MR, Rao MS, Pulicherla KK, Ghosh M, Kumar MH, Rekha VPB, et al. Studies on the distribution of hepatitis B (HBV) and human immunodeficiency virus (HIV) - their relation to blood groups and rhesus (Rh) factor in Guntur district of Andhra Pradesh, India. *Asian J Pharm Clin Res.* (2013): 6(1): 109-11.
- [11] Joshi SK, Ghimire GR. Serological prevalence of antibodies to human immunodeficiency virus (HIV) and hepatitis B virus (HBV) among healthy Nepalese males--a retrospective study. *Kathmandu Univ Med J (KUMJ)*. 2003 Oct-Dec;1(4):251-05.
- [12] Sathe PV, Toshniwal MH, Gosawi SB. Abo Blood Groups and Sero-positivity For Syphilis in Blood Donors and Antenatal Cases. 1973 : 39: 4: 170–71.

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