



## TRANSFUSION TRANSMITTED INFECTIONS AND ITS ASSOCIATION WITH ABO AND RH BLOOD GROUP SYSTEM AMONG BLOOD DONORS IN VADODARA, GUJARAT.

### Immunohaematology

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### ABSTRACT

**Background:** Human blood groups are genetically inherited and exhibit varying degrees of polymorphism. There is significant difference in the frequency of distribution of the various blood groups in population. Of the various blood group systems, the ABO and Rh blood group system is the most important blood group system in health and disease.

**Aim:** To find out the correlation between the transfusion transmitted infections (TTIs) like Human Immunodeficiency Virus (HIV-1 and HIV-2), Hepatitis-B Virus (HBV), Hepatitis-C Virus (HCV), Syphilis and Malaria and ABO and Rh blood groups among the apparently healthy human blood donors.

**Material and Methods:** This was a retrospective record based study conducted at Department of Immunohematology and Blood Transfusion (I.H.B.T.) of Government Medical College and S.S.G. Hospital, Baroda, Gujarat from January 2016 to April 2019. A total of 45,549 donors were included in the study. All the blood units were screened for HIV, HBV, HCV, Syphilis, and Malaria.

**Results and conclusion:** Seropositivity for TTIs was found to be more in Rh positive donors. Blood group A positive showed highest seropositivity for TTIs (1.79%) and blood group AB negative showed least seropositivity for TTIs (0.56%).

### KEYWORDS

Transfusion transmitted infections, ABO, Rh, Blood group.

### INTRODUCTION:

India is a vast country with lot of diversity in race, religion & creed. The same diversity has been observed in geographical distribution of blood groups in population within country. The ABO & Rhesus (Rh) blood group system are the most prevalent & important for transfusion of blood & its component, organ transplant, genetic studies & in legal medicine study.

People have different blood types, known as Blood Groups. Antigens are hereditary determined & plays a vital role in transfusion safety.

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.<sup>[1]</sup> Host genetic and environmental factors may be important in the genesis of diseases.<sup>[2]</sup> 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.<sup>[3]</sup> 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.<sup>[4]</sup>

### AIM:

The present study was conducted with an aim to determine the distribution of TTIs in different ABO and Rh blood groups and for determining the association of TTI with any blood group system.

### MATERIAL AND METHOD:

This a retrospective study conducted at Blood Bank, Dept of I.H.B.T., Government Medical College and S.S.G Hospital, Baroda, Gujarat. All donations from January 2016 to April 2019 were reviewed.

All donors who passed through routine medical examination and pre-donation counseling were included in this study. Total 45,549 donors were found eligible to donate blood. All the serum samples of these donors were tested by third generation enzyme linked immune-sorbent assay (ELISA) kit for HIV, Hepatitis B and Hepatitis C, rapid plasma regain (RPR) tests for syphilis and Giemsa Stain for Malaria.

Blood grouping was done by conventional tube technique. Both forward grouping (cell grouping) and reverse grouping (serum grouping) were done. Final groups were confirmed only when both cell

type and serum type are identical. Antiglobulin technique was used to confirm Rh negative status of donor. All weak Du groups were considered Rh positive.

Collection of data was done from Easy Software Blood Bank Data Management system (it is the software used for blood banking in S.S.G Hospital, Baroda).

The data were recorded on specially formed Performa, tabulated and analyzed. Analysis was done correlating seropositive units with the blood group of the donor.

### RESULT:

In the present study, a total of 45,549 healthy donors were screened out of which 28103 (61.70%) were voluntary donations and 17446 (38.30%) were replacement donations. As shown in [Table-1] that the voluntary donations is highest in O positive blood group 62.60% (8999/14376) and the lowest is seen in A positive blood group. In case of replacement donations the highest is seen in A positive blood group 39.48% (3913/9912) and lowest is seen in O positive blood group 37.40% (5377/14376).

**Table-1: Distribution of ABO and Rh blood group in voluntary and replacement donation**

Blood Group	No. of donors	Voluntary donors	Replacement donors
<b>A Positive</b>	9912	5999 (60.52%)	3913 (39.48%)
<b>A Negative</b>	523	320 (61.19%)	203 (38.81%)
<b>B Positive</b>	15128	9292 (61.42%)	5836 (38.58%)
<b>B Negative</b>	751	470 (62.58%)	281 (37.42%)
<b>AB Positive</b>	3930	2443 (62.16%)	1487 (37.84%)
<b>AB Negative</b>	178	110 (61.80%)	68 (38.20%)
<b>O Positive</b>	14376	8999 (62.60%)	5377 (37.40%)
<b>O Negative</b>	751	470 (62.58%)	281 (37.42%)
<b>Total</b>	45549	28103 (61.70%)	17446 (38.30%)

As [Table-2] shows the overall seropositivity for TTIs (HIV, HBV, HCV, Syphilis and Malaria) among donors in this study is found to be 1.71% (779/45549). Most common transfusion transmitted infection is HBV with a seropositivity of 0.87% (398/45549) while seropositivity is lowest for HIV 0.14% (62/45549) in all the donors. No donor is found to be positive for Malaria.

**Table-2: Seropositivity for TTI in ABO blood groups.**

Blood Group	No. of donors	HIV Positive	HBV Positive	HCV Positive	Syphilis Positive	Malaria Positive	Total
A	10435	12 (0.11%)	93 (0.89%)	56 (0.54%)	24 (0.23%)	00	185 (1.77%)
B	15879	22 (0.14%)	140 (0.88%)	80 (0.50%)	36 (0.23%)	00	278 (1.75%)
AB	4108	03 (0.07%)	36 (0.88%)	21 (0.51%)	11 (0.27%)	00	71 (1.73%)
O	15127	25 (0.17%)	129 (0.85%)	73 (0.48%)	18 (0.12%)	00	245 (1.62%)
Total	45549	62 (0.14%)	398 (0.87%)	230 (0.50%)	89 (0.20%)	00	779 (1.71%)

There is no significant difference in overall seroprevalence of TTIs in different ABO blood groups except for slightly increased seropositivity in blood group A (1.77%). Both HBV and HCV infection is slightly more prevalent in blood group A with 0.89% and 0.54% respectively. In HIV, Blood group O shows highest seropositivity with 0.17% and Blood group AB shows a lower positivity for HIV infection (0.07%). On contrary blood group AB shows slightly high seropositivity for syphilis (0.27%)

**Table-4: Seropositivity for TTIs according to ABO and Rh blood groups.**

Blood group	No. of donors	HIV positive	HBV positive	HCV positive	Syphilis positive	Malaria positive	Total
A Positive	9912	12 (0.12%)	89 (0.90%)	53 (0.53%)	23 (0.23%)	00	177 (1.79%)
A Negative	523	00	04 (0.76%)	03 (0.57%)	01 (0.19%)	00	08 (1.53%)
B Positive	15128	21 (0.14%)	135 (0.89%)	80 (0.53%)	32 (0.21%)	00	268 (1.77%)
B Negative	751	01 (0.13%)	05 (0.67%)	00	04 (0.53%)	00	10 (1.33%)
AB Positive	3930	03 (0.08%)	35 (0.89%)	21 (0.53%)	11 (0.28%)	00	70 (1.78%)
AB Negative	178	00	01 (0.56%)	00	00	00	01 (0.56%)
O Positive	14376	25 (0.17%)	125 (0.87%)	68 (0.47%)	17 (0.12%)	00	235 (1.63%)
O Negative	751	00	04 (0.53%)	05 (0.67%)	01 (0.13%)	00	10 (1.33%)
Total	45549	62 (0.14%)	398 (0.87%)	230 (0.50%)	89 (0.20%)	00	779 (1.71%)

As shown in [Table-4] the overall seropositivity for TTI is slightly more in A positive blood group 1.79 % (177/9912) while its significantly low in AB negative 0.56 % (01/178), B negative 1.33% (10/751) and O negative 1.33% (10/751) blood groups.

Prevalence for HIV was more in O positive 0.17% (25/14376) lowest in AB positive blood group 0.08% (03/3930). Only B negative showed seropositivity for HIV among Rh negative blood group.

HBV infection is more prevalent in A positive 0.90% (89/9912) and less in O negative 0.53% (04/751) blood group.

HCV positivity is more prevalent in O negative 0.67% (05/751) and less in O positive 0.47% (68/14376) and no seropositivity was seen in cases of B negative and AB negative blood groups.

Prevalence for Syphilis is significantly more in B negative 0.53% (04/751) and less in O positive blood group 0.12% (17/14376) and no cases of seropositivity is seen in AB negative blood group.

## DISCUSSION:

The ABO and Rh blood group systems have proved to be the most important, for blood transfusion purposes. ABO was the first human blood group system to be discovered by Landsteiner in 1901 while Rh blood group was defined by Landsteiner and Weiner in 1941.<sup>[5]</sup>

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.<sup>[6]</sup>

The above study demonstrated that donors having blood group "B" positive with frequency of 15128 (33.21%) were most common where as those with blood group "AB" Negative with frequency of 178 (0.39%) were least. This is consistent with study done by sumit *et al.*<sup>[7]</sup>

The study was done on the samples of 45549 apparently healthy human blood donors and it was found that, there does seem to be a preference of a particular infection to a particular blood group.

Results show a significant preponderance of TTI in Rh positive blood groups (1.73%) as compared to Rh negative blood groups (1.32%)

**Table-3: Seropositivity for TTIs according to Rh status.**

Rh Status	No. of donors	No. of TTIs positive cases	% of positive cases
Rh Positive	43346	750	1.73%
Rh Negative	2203	29	1.32%
Total	45549	779	1.71%

As shown in [Table-3] the overall seropositivity for all TTI is significantly less in Rh negative blood groups being 1.32%.

(Table-2).

This is similar to the study done by Puja *et al*, Mandal *et al* and Anumanthan *et al.*<sup>[8-10]</sup> However, results of some other studies show that the negative blood groups are more prone to TTIs.<sup>[11,12]</sup>

In present study, the seroprevalence for TTI was lowest in AB negative Blood group (0.56%) and showed highest with A positive blood group (1.79%). This finding differs with other studies.<sup>[10,13]</sup> This may be due to non-availability of blood group as per demand leading to increase in replacement donation; as seen in present study A positive donation is highest with replacement donations. On the contrary; AB positive donors are generally non-remunerated regular repeat donors [Table-1].

Among all the five TTI's, Hepatitis B (0.87%) was the commonest followed by Hepatitis C (0.50%), syphilis (0.20%) and HIV (0.14%) in all the donors. None of the donor was positive for MP. HBV was predominantly observed in A positive blood group, HCV was seen in O negative blood group, syphilis was seen in B negative blood group and HIV was seen in O positive blood group which is similar to study done by J.S. Nigam *et al.*<sup>[12]</sup>

The results of given study is not in agreement with other studies 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 negative" is more prone to TTIs. In present study, the blood group "A" and "Rhesus Positive" is more prone to TTIs. The probable reason may be an association with the type of donors and their blood groups and the circumstances of donations to TTIs is likely to be more significant.

## CONCLUSION:

This study clearly shows that there is preference for positive blood groups by the TTIs and even the specificity of a particular infection to a particular blood group is noted. Blood group A positive showed highest positivity for TTIs and Blood group AB negative showed least seropositivity for TTIs. This may be due to an association between the type of donation and non-availability of particular blood group as per demand; leading to increase in replacement donation of a particular blood group and its association with TTIs.

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