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SEROPREVALENCE OF HUMAN PARVOVIRUS B19 AMONG VOLUNTARY BLOOD DONORS IN CHENNAI –A CROSS SECTIONAL STUDY

Immunohematology

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ABSTRACT

BACKGROUND: The transfusion transmitted emerging infectious agents has become a real threat to the transfusion safety. Human parvovirus B19 is one of the common viral infection worldwide with a potential threat of transfusion transmission.
AIM: To find out the Seroprevalence of Human parvovirus B19 among voluntary blood donors in Chennai.
MATERIALS AND METHODS: 106 blood samples from voluntary blood donors were collected in one year period from July 2015 to June 2016 and were subjected to, IgM and IgG serological tests using Novalisa ELISA kits.
RESULTS: Among 106 voluntary blood donors, 44.3% of the donors were positive for anti-B19V IgG and none were positive for anti-B19V IgM.
CONCLUSION: There is a high seroprevalence of anti-B19V IgG (44.3%) in blood donors. All donor samples in this study were seronegative for IgM.

KEYWORDS

Blood Donors, Human Parvovirus B19, Transfusion Transmission, Elisa Test.

INTRODUCTION:

Blood transfusion is a lifesaving therapy in hospital practices for patients. It is proven to be an invaluable human resource used for diverse kind of medical and surgical conditions.

Blood borne infections are common and can be transmitted by transfusion of infected blood donated by apparently healthy and asymptomatic blood donors.[1]

In India, it is essential to test every unit of blood collected for Hepatitis B (HBsAg), Hepatitis C (Anti-HCV), Human Immunodeficiency Virus (HIV 1&2 antibodies), Syphilis (VDRL/RPR/TPHA) and Malaria (Thick and Thin Blood Smear/ Antigen test).[2] If a donor test positive to any of the five infections, their blood is considered infectious and discarded. Moreover the threat of emerging infectious agents worldwide continues to place demands on the collectors of blood to ensure safety.[3]

Presently it has become essential to establish a risk control system against emerging infectious diseases.[4]

The risk control system usually includes (identifying emerging/re-emerging infectious agents, any potential cause that could be transmitted/transferred by blood transfusion, monitoring, assessing the severity, evaluation, intervention (tests, donor history, pathogen reduction) and outcome of the intervention.[3]

Ideally, blood for transfusion should be either tested for all pathogens that are prevalent in a given population that can cause serious disease, or treated to inactivate all such pathogens. In practice, neither is possible.[5]

Human parvovirus B19 is one of the emerging causative agents of blood borne infections worldwide.

The acute infection is mild and self-limited, but it is clinically significant in those with underlying haemolytic process, immunocompromised, transplant recipients and pregnant women.[6] Levels of viral DNA during acute infection can exceed 10^{12} IU/ml.[7]

According to FDA the recommended upper limit of viral load of parvovirus B19 for plasma derivatives should not exceed 10^4 IU/ml.[8] But since parvovirus B19 is emerging as a common viral infection with a serious threat of getting transmitted via blood transfusion, this cross sectional study was conducted to observe and analyse the seroprevalence of Human parvovirus B19 among voluntary blood donors.

AIMS AND OBJECTIVES

The aim of the study is to find the seroprevalence of Human parvovirus B19 among voluntary blood donors in Chennai.

1. To estimate the Seroprevalence of Human parvovirus B19 among the voluntary blood donors in Chennai.
2. To detect anti-B19 IgM and IgG antibodies by ELISA.
3. To confirm anti-B19 IgM screening positive samples by PCR.

MATERIALS AND METHODS

This Cross-sectional study was conducted over one year period from July 2015- June 2016 in the Department of Transfusion Medicine, The TamilNadu Dr.MGR Medical University, Guindy, Chennai.

The study was approved by the ethical committee of the Tamil Nadu Dr. MGR Medical University, Chennai. A total of 106 voluntary blood donors were selected as per DGHS guidelines.

5 ml of blood was collected directly from voluntary blood donors in a sterile plain test tube and allowed to clot; serum was separated and stored at -20°C for ELISA and PCR tests. The total sample size was split month wise from July 2015 to June 2016.

The samples that were frozen earlier were thawed and used. Sera were tested for Human PARVOVIRUS B19, IgG and IgM by the enzyme-linked immunosorbent assay (ELISA) test. Since there are no FDA (Food and Drug Administration) licensed blood donor screening tests available worldwide, commercial diagnostic recombinant Novatec parvovirus B19 Detect IgG, and commercial diagnostic recombinant Novatec parvovirus B19 Detect IgM ELISA kits have been used in our study. This is based upon the use of micro titer strip wells precoated with parvovirus B19 antigens (conformational epitopes of VP-2 and linear epitopes of specific part of VP-1) to bind corresponding antibodies of the specimen. All steps were done according to the manufacturer's instructions. Reading was taken at 450nm wavelength using a ELISA microwell plate reader. Data analysis was done using SPSS software.

RESULTS:

Human parvovirus B19 IgG antibody screening by ELISA showed that 59 were negative and 47 were positive, giving an overall parvovirus B19 prevalence rate of 44.3%. None of the 106 blood donors were reactive for parvovirus B19IgM antibodies by ELISA test.

Parvovirus b19 screening by elisa

PARVOVIRUS B19	Positive	Negative
IgM	0	106
IgG	47	59

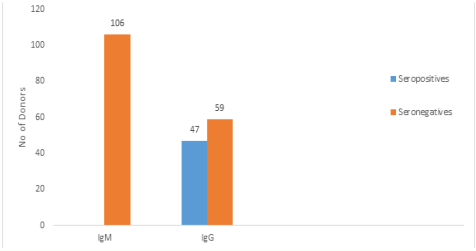

Figure 1: Human parvovirus B19screening by ELISA

DISCUSSION

In the present study, by testing serum of the 106 voluntary blood donors against VP1 linear and VP2 conformational recombinant B19V antigens (Novalisa In-vitro Diagnostic Kit) revealed the seroprevalence rate 44.3%. Since there is no FDA licensed blood donor screening test for B19V exists, the study was performed by using Novalisa in-vitro diagnostic kit.

The 44.3% of the donors in our study were found to be positive for IgG against VP1 linear and VP2 conformational antigens and none of them were IgM positive. This could probably be due to the development of immunity to the earlier infection.

Neal S. Young and Kevin E. Brown[13] in their review article on mechanism of disease Parvovirus B19 has mentioned that antibody production is correlated with the disappearance of virus from the blood and IgG antibodies appear to confer lasting protection against re-infection. They have also mentioned that antibodies to the unique amino-terminal region of VP1 are important for clearance of the virus.

Saikava[14] et al in their study on neutralizing linear epitopes of B19 parvovirus cluster in the VP1 unique and VP1-VP2 junction regions have also revealed that the antibodies against linear epitopes confer efficient immunity compare to antibodies against VP2 region alone.

Le Col Satish Kumar et al[8] in their study on seroprevalence of human parvovirus B19 in healthy blood donors by using very sensitive and specific nested PCR revealed absence of parvovirus B19 DNA in all donors found to be tested positive for IgM antibodies alone or IgM and IgG antibodies together or IgG antibodies alone.

For safe transfusion of B19V negative blood to the high risk groups such as pregnant women, patients with underlying haematological problems, immunodeficient patients who are constantly multitransfused and transplant recipients either the blood units have to be IgM and PCR negative as a first priority or else as a second priority IgG positive blood units may be preferred based on above studies.

In our study since none of the samples were IgM positive and IgG positive samples most often revealed absence viral DNA[15] PCR study was not carried out to confirm B19V infection.

Since the window period of human parvovirus B19 infection is 10 to 14 days[15], which is relatively shorter, if absolutely essential at least for high-risk groups PCR test to detect B19V DNA may be considered to rule out donors with asymptomatic infections.

IgG, IgM Seroprevalence of Human parvovirus B19in various studies

Study	Place	Elisa Kit	Coated Viral Antigens	IgG Seropositivity	IgM Seropositivity
Present study	Chennai, India (Blood donors) (n=106	Novalisa	Recombinant antigens. VP1&VP2	44.3%	0%
Satish Kumar et al[8]	Mumbai, India (Blood donors) (n=1633)	Serion Classic-IgG Novalisa-IgM	Recombinant VP2 Recombinant VP1&VP2	27.96%	7.53%
Kishore et al[9]	Lucknow, India (Blood donors) (n=1000)	In-house Elisa	Purified VP1 &VP2 antigens	39.9%	Not done
Manaresi et al[18]	Bologna, Italy (Blood donors) (n=446	Medac Elisa	Recombinant VP1&VP2	79.1%	Not done
Rohrer et al[16]	Germany (Healthy adults) (n=6583)	recomWell Elisa	Recombinant VP1&VP2	72.1%	Not done
Iheanacho et al[17]	Lagos, Nigeria (Blood donors) (n=150)	IBL Elisa	Parvovius B19 antigens	66.0%	1.2%

IgG, IgM Seroprevalence of Human parvovirus B19in various studies

Since all our donors included in our study were voluntary blood donors, the prevalence of infections (HIV, HBV, HCV, Syphilis and Malaria) that are screened for mandatory tests in the study group were low. Among 106 blood donors one was found to be positive for HBsAg and two were positive for anti-HCV. These three donors were

Study	Place	Elisa Kit	Coated Viral Antigens	IgG Seropositivity	IgM Seropositivity
Aldo Gaggero et al[19]	Santiago, Chile (Blood donors) (n=400)	Focus Diagnostics Elisa	VP1 antigens	54.8%	Not done
Ayman K. johargy[20]	Makkah, Saudi Arabia (Blood donors) (n=578)	Novalisa	Recombinant antigens. VP1&VP2	76.3%	Not done
DeokJa oh et al[21]	Korea (Apheresis donors) (n=928)	recomWell Elisa	Recombinant VP1&VP2	60.1%	Not done
Mahmoodian-Shooshtari M et a[112]	Tehran, Iran (Blood donors) (n=1640)	IBL Elisa	Parvovius B19 antigens	41.2%	0.5%

Al-Danani D.A, Hadia Ahmed Abou-Donia et al[22]	Aden, Yemen (Blood Donors) (n=100) Alexandria, Egypt (Blood Donors) (n=100)	IBL Elisa	Parvovius B19 antigens	46% 26%	26%
Gini GC. Van Rijickevorsel et al[23]	Amsterdam,Netherlands (adult population) (n=1323)	Novalisa	Recombinant antigens. VP1&VP2	62.3%	Not done

positive for anti B19V IgG antibody.

Parvovirus B19 is considered as a major contaminant of blood and blood products. Since the virus is resistant to different inactivation procedures, most blood products that contain Parvovirus B19 DNA are considered to be potentially infectious. Currently the Food and Drug Administration (FDA) guidelines and the European regulatory requirements recommend testing plasma pools by PCR and discard those with a Parvovirus B19 viral load of $>10^4$ genome equivalent/ml.[15] It is considered that the blood products containing virus titres below 10^4 IU/mL were not infectious. The significance of the neutralizing effect of anti-B19 IgG has been considered in parvovirus B19 infection. The anti-B19 IgG in the donated blood or recipients can neutralize the virus and prevent parvovirus B19 infection. 11 U/ml of anti-parvovirus B19 antibody can neutralize 4.3 log of parvovirus B19 DNA.[24] The safety of blood and plasma derivatives with regard to parvovirus B19 has been a major concern to date.

Currently interventions for preventing parvovirus B19 transfusion from blood components have not been implemented in the majority of developed countries because of the existing view that the blood components with low levels of B19 DNA will not transmit B19 infection.

Since it would be expensive to test all blood products for this emerging pathogen, risk group approach in which only selected groups of patients are given tested blood products. This ensures maximum safety to patients for whom B19 could cause problems.[1]This method is similar to the measures taken in blood transfusion medicine with respect to cytomegalovirus.

CONCLUSION

In our study on seroprevalence of Human parvovirus B19 among voluntary blood donors, 44.3% showed IgG positivity and none of them were IgM positive. Since Human parvovirus B19 infection preferentially affects erythroblasts in bone marrow, it is imperative to screen IgM B19V antibodies before transfusion for at least high-risk groups.

For exclusion of donors with asymptomatic infections, advanced techniques like PCR study to detect viral DNA shall be considered.

REFERENCES

1. Kishore, Srivastava, Choudhary et al. Standardization of B19 IgG ELISA to study the seroepidemiology of parvovirus B19 in north Indian voluntary blood donors. Asian J Transfus Sci. 2010 Jul; 4(2): 86-90
2. Saran RK. . In: Transfusion Medicine.Technical Manual. New Delhi. Directorate General of Health Services, Ministry of Health & Family Welfare, Government of India; 2003.p
3. Stramer S. L. Current perspectives in Transfusion- transmitted infectious diseases: emerging and re-emerging infections. Vox Sang. 2014 9: 30-36.
4. Sharad S, Kapur S. Emerging human infections : An overview on Parvovirus B19. Journal, Indian Academy of Clinical Medicine. 2005; 6(4) : 319-26.
5. Harvey G, David J. Mollison's Blood Transfusion in Clinical Medicine, 12th ed.UK: John Wiley & Sons; 2014.
6. Mei-ying W, Harvey J, Maria Lusia A et al. Parvovirus B19 infection transmitted by transfusion of red blood cells confirmed by molecular analysis of linked donor and recipient samples. Transfusion. 2010 Aug; jkj50: 1712-1721.
7. Mark K. Fung, Brenda J, Hillyer D, Westhoff M. Techinical Manual. 18th ed. United States: AABB; 2014.
8. W Kumar S, Gupta RM, Sen S, et al. Seroprevalence of human parvovirus B19 in healthy blood donors. Medical Journal, Armed Forces India. 2013; 69(3):268-272. doi:10.1016/j.mjafi.2012.11.009.
9. Kishore J, Srivastava M, Choudhury N. Serological study on parvovirus B19 infection in multitransfused thalassemia major patients and its transmission through donor units. Asian Journal of Transfusion Science. 2011;5(2):140-143. doi:10.4103/0973-6247.83239.
10. Cohen BJ, Buckley MM. The prevalence of antibodies to human parvovirus B19 in England and Wales. J Med Microbiol.1988; 25:151-3.
11. Musa, Sunday A. U, Banwat et al. Risk of Transfusion-Transmitted Human Parvovirus B19 Infection in Anyigba and Lokoja, Kogi State – Nigeria. Iosr Journal Of Pharmacy. 2013 April Vol-3(3): 66-70.
12. Mahmoodian, Sharif. Detection of Human Parvovirus B19 markers in blood Samples of Donors. Iran J Virol. 2011; 5(2): 9-12.
13. Neal S. Young, M.D., and Kevin E. Brown, M.D. N Engl J Med 2004; 350:586-597 February 5, 2004DOI: 10.1056/NEJMra030840.
14. Saikawa T, Anderson S, Momoeda M et al. Neutralising linear epitopes of B19 parvovirus cluster in the VP1 unique and VP1-VP2 junction regions. J Virol 1993; 67: 3004-9.
15. Marano G, Vaglio S, Pupella S, et al. Human Parvovirus B19 and blood product safety: a tale of twenty years of improvements. Blood Transfusion. 2015; 13(2):184-196. doi:10.2450/2014.0174.14.
16. Rohrer C, Gartner B, Sauerbrei A et al. Seroprevalence of Parvovirus B19 in German Population. Epideimiol. Infect. 2008, 136, 1564-1575
17. Iheanacho, M.C, Akanmu S.A.& Nwogoh B. et al Seroprevalence of Parvovirus B19 Antibody in blood donors and sickle cell disease patients at lagos university teaching hospital (LUTH): A comparative study. In. AFR.J. CLN.EXPER.MICROBIOL. 15(1):14-20.
18. Rodis JF, Quinn DL, Gary GW Jr, et al. Management and outcomes of pregnancies complicated by human B19 parvovirus infection: a prospective study. Am J Obstet Gynecol 1990; 163:1168-71.
19. Gaggero, Rrivera, Calquin et al. Seroprevalence of IgG antibodies against parvovirus B19 among blood donors from Santiago, chile. Rev Med Chile. 2007; 135: 443-448.
20. Ayman K. Seroprevalence of Erythrovirus B19 IgG among Saudi Blood Donors in Makka, Saudi Arabia. J Fam Community Med 2009; 16(3): 111-114.
21. Deok, La Lee, Won Kang et al. Investigation of the prevalence of Human Parvovirus B19 DNA in Korean Plasmapheresis Donors. Korean J Lab Med. 2010; 30: 58-64.
22. Al-Danani D.A, Hadia Ahmed, Mokhtara, Seroprevalence of parvovirus B19 IgG among blood donors in Aden, Yemen and Alexandria, Egypt. J Chin Clin Medicine 2008 Mar; 3(3). 173-176.
23. Van Rijckevorsel, sonder, Maarten et al. Population –based study on the Seroprevalence of Parvovirus B19 in Amsterdam. J Med Virol 2009; 81: 1305-1309.
24. Deok, La Lee, Won Kang et al. Investigation of the prevalence of Human Parvovirus B19 DNA in Korean Plasmapheresis Donors. Korean J Lab Med. 2010; 30: 58-64.