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Seroprevalence Of Parvo Virus B19 Igg Antibodies Among Voluntary Blood Donors In Blood Bank At Tertiary Centre

Dr. Vinutha Gali[1], Dr. S Revathy[2], Dr. P Subashini[3], Dr. Harish Mardavada[4]

[1]Associate professor, Department of Pathology, Sree Balaji Medical College, and Hospital, Chromepet, Chennai.

[2]Postgraduate, Department of Pathology, Sree Balaji Medical College, and Hospital, Chromepet, Chennai.

[3]Professor, Department of pathology, Sree Balaji Medical College, and Hospital, Chromepet, Chennai.

[4]Associate professor, Department of radiology, Sree Balaji Medical College, and Hospital, Chromepet, Chennai.

Corresponding author: Dr. Vinutha Gali*

Associate professor, Department of Pathology, Sree Balaji Medical College, and Hospital, Chromepet, Chennai

ABSTRACT

Background: Parvovirus B19 is a human pathogen classified under the genus Erythroparvovirus of the Parvoviridae family 1,2. It is a small, non-enveloped virus possessing a single-stranded DNA genome. Among the known Parvoviruses, B19 is the only strain pathogenic to humans (1). The virus primarily targets erythroid precursor cells, particularly in the bone marrow and foetal liver, through its affinity for the P blood group antigen located on red blood cell membranes (2).

Aim: To determine the seroprevalence of specific IgG antibodies among voluntary blood donors in tertiary care blood bank.

Materials And Methods: This prospective study was carried out in the blood bank of the pathology department of Sree Balaji Medical College in Chromepet, Chennai, over the course of two years, from December 2022 to December 2024. A total of 91 voluntary donors of blood were chosen who gave their consent to participate for the study.

Results: 33% of the donors were A positive, 22% were B positive, 32% were O positive, and 13% were AB positive. Based on the titre values, when the IgG value is less than 0.91(negative), it shows a lack of previous exposure to Parvovirus B19. When the values are between 0.91 and 0.99 (grey zone), re-testing the sample is necessary, and when the titre values are higher than 1.0 (positive), means the donor has had a history of Parvovirus B19 exposure.

Conclusion: This research emphasizes the need for heightened awareness and vigilant monitoring of ParvovirusB19 in transfusion medicine. It advocates from large-scale, multicentric serological and molecular studies to further elucidate the epidemiology and transfusion risk, which can guide the development of evidence-based national blood safety policies in India and other similar setting.

KEYWORDS: *Parvovirus, anaemia, hydrops fetalis, TTI.*

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1. INTRODUCTION

Parvovirus B19 is a human pathogen classified under the genus Erythroparvovirus of the Parvoviridae family 1,2. It is a small, non-enveloped virus possessing a single-stranded DNA genome. Among the known Parvoviruses, B19 is the only strain pathogenic to humans (1). The virus primarily targets erythroid precursor cells, particularly in the bone marrow and foetal liver, through its affinity for the P blood group antigen located on red blood cell membranes (2). Epidemiological studies indicate that seroprevalence rates of Parvovirus B19 increase with age, ranging from 5–10% in children to nearly 50% in adults, suggesting widespread exposure throughout life (2). Although respiratory droplets remain the predominant route of transmission, exposure to infected blood or blood products constitutes a significant transmission risk (1,2). This becomes particularly significant in settings involving transfusion-dependent individuals, pregnant women, and

immunocompromised patients, in whom Parvovirus B19 infection can cause complications such as anaemia or hydrops fetalis (1). Given its ability to persist in donor blood and its resistance to standard inactivation methods, Parvovirus B19 presents a notable transfusion-transmissible risk (6). Consequently, understanding the prevalence of anti-B19 antibodies among voluntary blood donors becomes essential to guide screening practices and minimize the chances of transfusion-related transmission (5).

AIMS AND OBJECTIVES
AIM:
To determine the seroprevalence of specific IgG antibodies among voluntary blood donors in tertiary care blood bank.

OBJECTIVES:
1. To assess the presence of specific Parvo B19- IgG antibodies among healthy voluntary blood donors, indicating past exposure or immunity.
2. To analyse the distribution of seropositivity across different age groups, genders, and blood groups.
3. To highlight the potential risk of transfusion-transmittedB19V infection in asymptomatic donors.
4. To emphasize the importance of screening for Parvovirus B19in blood donation, practices, especially in settings.

2. MATERIALS AND METHODS

This prospective study was carried out in the blood bank of the pathology department of Sree Balaji Medical College in Chromepet, Chennai, over the course of two years, from December 2022 to December 2024. A total of 91 voluntary donors of blood were chosen who gave their consent to participate for the study.The Sree Balaji Medical College ethical committee in Chromepet, Chennai, gave its approval for the study. Donors who experienced a deferment. In a sterile-capped tube, five millilitres of blood were extracted from each donor collecting bag. The plasma was then separated and kept until needed, after which it was centrifuged.

3. RESULTS

A total of 91 donors were selected between November 2022 and April 2022 to evaluate the seroprevalence of Parvo Virus B19based on gender, age, and blood group.

CHART 1: Study group's gender distribution

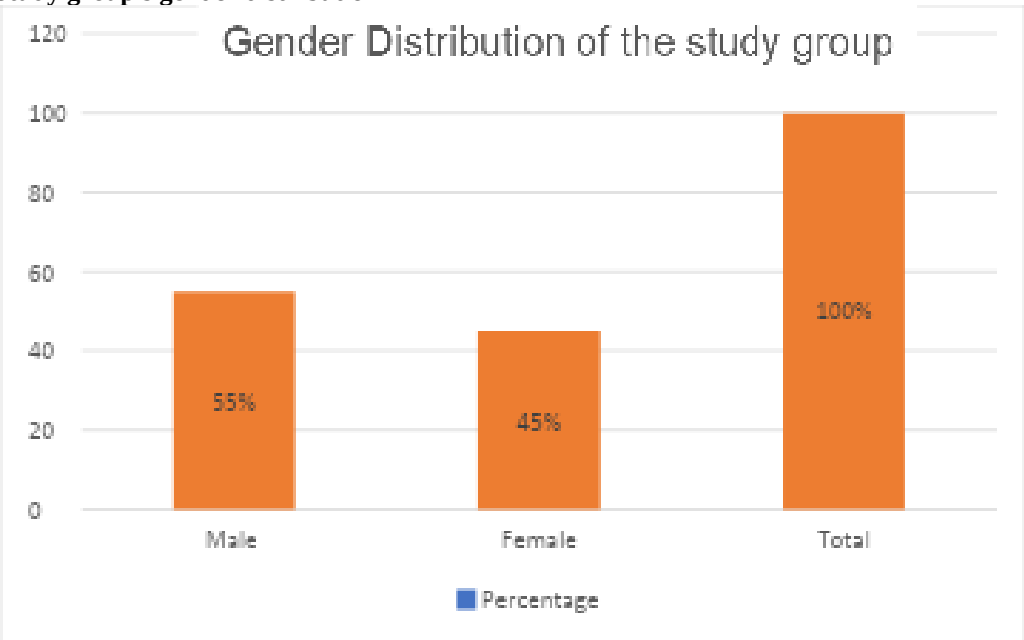

Chart 1 shows 50 (54.9%) of the 91 donors were men, and 41 (45.1%) were women.

Table 1: The study group's age distribution

Age group in yrs	No. of donors	Percentage %
>20 and <25	30	33%

>26 and <30	24	26%
>31and <35	18	20%
>36 and <39	08	9%
More than 40	11	11%
	91	100%

The blood donors' ages were distributed as follows: 11% in >40 years, 9% in thirty-six to thirty-nine years, 20% in thirty-one to thirty-five years, 26% in twenty-six to thirty years, 33% in twenty to twenty-five years and 34.1% in eighteen to twenty years.

Table 2: **The study group's blood group's distribution**

Blood group	**No. of. Patients**	**Percentage**
A+	28	33%
B+	18	22%
O+	34	32%
AB+	11	13%
Total	91	100%

33% of the donors were A positive, 22% were B positive, 32% were O positive, and 13% were AB positive.

Table 3: Status of transfusion-transmitted infections of the study group

TTI status	**Donor's(total)**	**Percentage%**
Reactive	0(91)	0
Non-reactive	91(91)	100%

None of the 91 donors tested positive for the hepatitis B surface antigen (HbsAg).

Table 4: Analyzation of results based on titre value (Parvovirus B19 IgG by EIA)

IgG Titre Value	**Interpretation**	**No. Of Donors**
IgG<0.91	Negative	69
IgG<0.91-0.99	Grey Zone	0
IgG>1.0	Positive	22

Based on the above titre values, when the IgG value is less than 0.91(negative), it shows a lack of previous exposure to Parvovirus B19. When the values are between 0.91 and 0.99 (grey zone), re-testing the sample is necessary, and when the titre values are higher than 1.0 (positive), means the donor has had a history of Parvovirus B19 exposure.

Table 5: Anti-Parvovirus B19 EIA-based antibody screening

Anti- Parvovirus B19 Ab	**Positive (Total)**	**Negative**
Immunoglobulin G	69(91)	22

69 people tested positive and 22 tested negatives for IgG during the EIA screening process for anti-Parvovirus B19 antibodies, yielding a 64.6% total Parvovirus B19 prevalence rate.

Table 6: The study group's prevalence of IgG seropositive by age

Age range expressed in years	**Donors who test positive for IgG (total donors)**	**Donors who tested negative**	**Positive Percentage %**
21-25	24(30)	6	80%
26-30	18(24)	6	75%
31-35	12(18)	6	66%
36-40	6(8)	2	75%
>40	9(11)	2	81%
Total	69(91)	22	76%

P-<0.05

An increased prevalence of IgG positivity among individuals aged twenty-six and above.

Table 7: The study group's prevalence of IgG seropositive by gender

Sex	Donors who test positive for IgG (total donors)	Donors who tested negative for IgG	Positive Percentage %
Male	38(50)	12	76%
Female	32(41)	09	78%
Total	70(91)	21	77%

P-value <0.05

Among the IgG serology-positive individuals, the number of males who showed positivity was 38 and females were 32.

Table 8: The study group's prevalence of IgG seropositive by blood group

Blood group	IgG positive donors (Total)	IgG negative donors	Percentage%
A+	19(28)	9	68%
B+	7(18)	11	64%
O+	28(34)	6	82%
AB+	9(11)	2	82%
Total	63(91)	28	100%

P<0.05

The immunoglobulin G positivity was 19 (A positive), 7 were (B positive), 28 were (O positive), and 9 were AB positive.

4. DISCUSSION

Parvovirus B19 is a common viral infection, particularly prevalent among children. In immunocompetent individuals, the infection follows a self-limiting and mild course. However, in certain high-risk groups, B19 infections can result in serious complications. The high-risk populations include pregnant women, patients with underlying haematological problems, and immunodeficient patients who constantly receiving multiple transfusions. Routine Screening is not mandatory for all blood donations. However current blood safety practice, use multiple sensitive screening assays, to minimize the risk of transfusion-transmitted infections. These protocols primarily aim to detect and eliminate blood units contaminated with known infectious agents. Other than primary respiratory route of transmission, infection is also acquired through: Nosocomial (hospital-acquired) transmission, Intra-familial spread, Transmission between patients or from patients to healthcare workers. Of potential concern for blood safety is increasing evidence of long term B19 persistence in the circulation and tissues of not only immunocompromised but also immunocompetent individuals (7). Majority of the problems are due to prevalence of asymptomatic carriers in the society, as well as blood donations during the window period of infections. Transfusion transmissible infections (TTI) is a major challenge to the blood transfusion service all over the world. The problem of TTI is directly proportional to SSION: the prevalence of infection in the blood donor's community. Patients requiring blood transfusion are more prone to acquire HBV, HIV and HCV (7). B19V infection has a biphasic clinical course. There is a phase of high viremia during the first few days initially, which gradually diminishes to undetectable levels in the later phase by the eighth day as IgM production begins. The antibody levels will peak which may coincide with a decline in viral load. By 10–12 days post-infection, seroconversion from IgM to IgG antibodies occurs. In patient with defined indication if we detect B19V IgG in two separate blood samples taken 6 months apart, it is considered & B19V-safe for patients with defined indications. Blood donors who test positive for B19V IgM should be tested for B19V DNA by NAT; qPCR is the gold-standard method for most viral nucleic acid-based clinical diagnostics (8).

Age wise distribution of voluntary blood donors in the present study.

Age group (years)	Number of donors(n)	Percentage (%)	Findings in present study	Comparison with literature
21-25	30	33.0%	Most common age group among donors	Kumari S et al.: similar donor age trend (8)
26-30	24	26.4%	Second most common age group	Jaiswal R et al.: High IgG positivity in younger adults.
31-35	18	19.8%	Moderate representation.	Limited literature details for this specific age subgroup
36-39	8	8.8%	Less frequently represented.	Older age groups underrepresented in most donor studies.
More than 40	11	12.0%	Least represented age group.	Often grouped as more than 35 or more than 40 without specific analysis.

Gender wise distribution of voluntary blood donors in the present study.

Gender	Number of donors (n)	Percentage (%)	Findings in present study	Comparison with literature
Male	50	55%	Higher participation among male donors	Kumar S et al.: Reported male predominance in donor population
Female	41	45%	Lower proportion compared to males	Memory Chirambo et al.: Found higher parvovirus IgG in males.

Blood Group: In our study, 28 donors were A positive, 18 donors were B positive, 34 donors were O positive, and 11 donors were AB positive.

Parvovirus B19 Positivity Among Our Voluntary Blood Donors Based on EIA (IgG/IgM) Titre Values
Interpretation criteria for IgG titre values in Parvovirus B19 serology

IgG Titre range	Result	Interpretation
Less than 0.91	Negative	No previous exposure to parvovirus B19
0.91 -0.99	Equivocal zone	Borderline, repeat testing advised.
More or equal to 1.0	Positive	Indicates past infection and immune response.

Serological Results of Donors for Parvovirus B19 Antibodies

Antibody type	Total tested(n)	Positive (n)	Negative(n)	Interpretation
IgG	91	69	22	Majority showed past exposure to Parvovirus B19

Age-wise and Gender-wise Distribution of IgG Anti-Parvovirus B19 Seropositivity

Age Group (in years)	Total Donors (n)	IgG Positive (n)	IgG Positivity (%)	Interpretation
21–25	30	24	80.0%	Most IgG reactivity observed in this age group
26-30	24	18	75.0%	High seropositivity in second most common group
31–35	18	12	66.7%	Moderate IgG positivity
36-40	8	6	75.0%	Comparable to younger groups
>40	11	9	81.8%	Slightly higher, suggesting age-linked exposure

Overall age wise differences were statically significant ($P < 0.05$).

IgG Anti-Parvovirus B19 Positivity by ABO Blood Group

Blood group	IgG Positive(n)	Observation
A positive	19	Moderate number of seropositive cases.
B positive	7	Lowest IgG positive among blood groups
O positive	28	Highest IgG seropositivity; aligns with previous studies (Jaiswal R et al.)
AB positive	9	High relative to its small population.

Other TT-Infection: Screening Our present study group's screening for required tests for other transfusion transmitted infections like human immunodeficiency virus, Hep B, Hep C, syphilis, and malaria was low because all the blood donors included in the study gave their consent voluntarily. Out of 91 blood donors in our study, none had a HbsAg positive result. According to a study by Kumari S et al., none of them shows HbsAg positivity.

5. CONCLUSION

The study evaluated the seroprevalence of Parvovirus B19 among voluntary blood donors at a tertiary care centre to assess its potential as a transfusion-transmitted infection (TTI). A high proportion of donors demonstrated IgG Seropositivity, indicating past exposure. These findings imply that although Parvovirus B19exposure is common in the donor population, the immediate risk of transmission via blood transfusion is low (9). However, the ability of B19V to persist in circulation, its resistance to standard viral inactivation procedures and its potential to cause serious complication in immunocompromised and transfusion-dependent patients under its clinical relevance. Given these concerns, routine universal screening for B19V may not be cost-effective in low prevalence regions. Nevertheless, the results of this study

support the study support the implementation of targeted screening or nucleic acid testing (NAT)in high-risk recipient populations, such as paediatric oncology patients, pregnant women, or individuals with chronic haemolytic anaemia (9). This research emphasizes the need for heightened awareness and vigilant monitoring of ParvovirusB19 in transfusion medicine. It advocates from large-scale, multicentric serological and molecular studies to further elucidate the epidemiology and transfusion risk, which can guide the development of evidence-based national blood safety policies in India and other similar setting.

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