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ORIGINAL ARTICLES

New Pathogens in Blood Donors and Patients in Albania

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Abstract

Introduction: The emergence of novel pathogens poses a significant and immediate threat to global blood safety, particularly in regions experiencing epidemiological shifts. This study undertakes an urgent examination of the prevalence and impact of newly identified pathogens among blood donors and recipients in Albania, focusing on assessing their implications for public health and transfusion medicine.

Results revealed a prevalence of new pathogens among donors and patients, highlighting the potential risk of transmission through blood transfusion. Travel history, socioeconomic status, and urban-rural disparities significantly influenced pathogen prevalence. This study underscores the urgent need for enhanced screening protocols and public health interventions to mitigate the risks associated with emerging pathogens. Our findings contribute to a growing body of evidence emphasizing the crucial role of continuous surveillance and adaptive strategies in transfusion medicine to ensure blood safety and protect vulnerable populations in Albania and beyond.

Conclusion: The study highlights the presence of emerging pathogens in blood donors and patients in Albania, underscoring their potential to impact blood safety and public health significantly. The findings emphasize the necessity for improved screening protocols, continuous epidemiological surveillance, and targeted public health interventions to address the risks associated with these pathogens. Adopting adaptive strategies in transfusion medicine is critical to safeguarding the health of donors and recipients in the region.

Keywords: Blood donors, Emerging pathogens, Blood safety, Transfusion medicine,

Introduction:

After the successful implementation of NAT testing for HBV/HCV/HIV for every blood donation at the national level, blood safety related to conventional pathogens has reached a reasonably high level, and attention should be given to new pathogens.[1]

Another safety measure implemented by the NBTC is the inactivation of pathogens. However, this technique is currently restricted to platelet concentrates and plasma and has yet to be developed for erythrocyte concentrates.

Understanding the prevalence of emerging pathogens in donor and patient populations within our country is a crucial initial step in developing novel testing algorithms for donated blood. This would minimize the risk for all transfused patient populations, particularly those with compromised immune systems.

Parvovirus B19 (B19V)

The tropism of (B19V), particularly (B19V), infects only cells with the P antigen on the surface. The P antigen is present in about 80% of people and is expressed in erythrocyte precursor cells, megakaryocytes, endothelial cells, and fetal myocardium.[2] Although (B19V) enters all cells expressing the P antigen, productive infection with viral replication occurs only in erythrocyte progenitor cells, leading to apoptosis of the infected cell. [3]

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Mass apoptosis of these cells results in a short-term arrest of hemopoiesis, and this in most infected individuals results in only a mild drop and rapidly recoverable Hb.[4]

In patients who have accelerated destruction of erythrocytes due to hemolytic or hemoglobinopathy anemia, even short-term arrest of hemopoiesis due to infection (B19V) can cause a life-threatening aplastic crisis.[5]

The seroprevalence of this infection in blood donors is 9.78-79.1% in different countries.[6]

West Nile Virus (WNV)

Arbovirus infections have been identified as threatening human health due to their biological complexity, epidemic, and medical potential. Since the first case of WNV transmitted by blood transfusion in the USA in 2002, this infection has received special attention in the transfusion field. In addition to the risk of local transmission, there is a high risk of infected donations due to travel to risk areas.[7]

The reported seroprevalence in blood donors varies from 0.5 to 74%. [8] After the 2018 epidemic in Europe, the risk of having infected blood components due to travel and internal circulation was assessed. Countries such as Croatia, Greece, Hungary, Italy, Romania, and Serbia have a higher risk due to internal circulation, whilst Germany and France have a higher risk due to travel.[9]

Hepatitis E

Hepatitis E constitutes the central part of hepatitis transmitted by the enteric route. [10]

The seroprevalence of HEV in blood donors ranges from 13% in the USA to 19% in Europe. Chronic hepatitis E has been found in immunosuppressed patients, including patients undergoing solid organ transplants, stem cell transplants, HIV patients, and chemotherapy patients. [11]

Patients suffering from chronic hepatitis E are at risk of developing life-threatening liver cirrhosis within the next five years. In addition to the risk of acquiring the infection through food, there is also the risk of parenteral transmission through transfusion.[12] About 50% of transplant recipients who become infected with the hepatitis E virus develop chronic hepatitis E and have a high risk of developing cirrhosis. [13] Immunosuppressed patients receiving transfusions are at risk, so countries such as the UK, the Netherlands, Japan, Austria, Germany, and France have introduced testing of blood products for HEV when these are intended for immunosuppressed patients.[14]

Materials and Methods:

Three hundred voluntary blood donors (173 women and 120 men) and 62 patients (26 women and 36 men) were serologically tested for hepatitis E (HEV), WNV, and Parvovirus B19. Likewise, 100 serology-negative donors were NAT tested for HEV/WNV/Parvo B19.

The age group distribution of tested blood donors was 251 (18-35 years), 37 (36-50 years), and 12 (over 51 years). The screening of IgM and IgG antibodies was performed using the semiquantitative ELISA (Enzyme Immunoassay) technique with the Euroimmun kit. NAT molecular testing was performed by qualitative RT-PCR test (WNV, DPX, HEV Roche Diagnostic)

For the statistical evaluation, the Pearson Chi-Square test, SPSS v.26, was used, where values of $p < 0.05$ were considered statistically significant.

Results:

The seroprevalence of hepatitis E in voluntary blood donors was 0.6%, Parvovirus B19 35%, and WNV 1%, in absolute value 2:300, 107:300, and 3:300, respectively. The seroprevalence of these infections in patients was 1.6% and 55%, respectively, whilst no WNV cases were found in patients.

The prevalence of HEV and Parvovirus infections is higher in patients than in donors, but the difference was statistically significant only for Parvovirus infection ($p = 0.0055$).

No positive NAT cases were found in blood donors for any of the infections in question, while we had one WNV IgM case in blood donors and one in patients.

The age group with the highest prevalence for all three infections in blood donors was over 50, where the prevalence for HEV IgG was 8.3%, Parvo IgG 50%, and WNV IgG 8.3% vs. the age group 18-34, with a prevalence of 0.4%, 34.6%, and 0.8%, respectively.

The age group over 50 years has a higher prevalence of all three infections, a prevalence that is significantly higher than the 18-35 age group ($p=0.04$) and the donor population in general ($p=0.035$).

No significant difference was observed in the prevalence of infections by gender. However, the seroprevalence of parvovirus in patients aged 18-35 was higher than that in donors of the same age group (57% vs. 34.6%), and this difference was significant ($p=0.0007$).

Discussion:

This study demonstrated a low seroprevalence of WNV in voluntary blood donors in our country. The reported seroprevalence of WNV in blood donors varies from 0.5 to 74% [15]. Since the first case of WNV transmitted by blood transfusion in the USA in 2002 [16], this infection has received special attention in the transfusion field. In addition to the risk of local transmission, there is a high risk of infected donations due to travel to risk areas.

To mitigate the risk of transfusion-transmitted WNV, applying strict selection criteria for donors returning from affected areas is essential. Following EU directives, this risk can be avoided through either donor deferral or nucleic acid testing (NAT). [17]

Our study also revealed a low seroprevalence of Hepatitis E, with the global seroprevalence of HEV in blood donors ranging from 2.0% to 37.5% [18]. Notably, this rate is reportedly lower in females than in males.

We didn't find a significant difference in the prevalence of all three infections between males and females.

The prevalence of most transfusion-transmitted infections tends to increase with age, a trend that is corroborated by our findings. Our findings reveal a significantly higher prevalence of all three infections among donors over 50 years old compared to those aged 18-35.

Our literature review revealed studies reporting that HEV infection mainly affects young adults aged 15-35. [19, 20] This is an important finding related to blood safety that should not be neglected, as most of the donor population (83% in our study) belongs to this age group.

Therefore, further investigation with NAT confirmation would be the gold standard in the study of HEV infection in blood donors, as many seroprevalence studies report discrepant data related to the immunoassay used for testing. [21, 22, 23]

The majority of voluntary blood donors in our country are young. As mentioned above, this might be one of the reasons for the low prevalence observed in voluntary blood donors. A complete picture of the distribution of these infections in blood donors will be obtained using larger donor populations, including family replacement blood donors and donors from affected areas regarding WNV infection. These data confirm that voluntary non, non-remunerated blood donors are the basis for safety and quality in blood transfusion.

We found that Parvovirus B19 has a moderately high prevalence among voluntary blood donors (35%) and an even higher prevalence among patients (55%). This higher prevalence in patients also suggests that they may have acquired some level of protection, as the primary infection in immunosuppressed individuals typically causes severe clinical manifestations.

The statistically significant higher prevalence of parvovirus in multi-transfuse

The statistically significant higher prevalence of parvovirus in multi-transfused patients aged 18-35 compared to donors of the same age group confirms the role of blood transfusion in transmitting this infection. Worldwide reported seroprevalence of Parvovirus B19 infection in blood donors ranges from 6% to 79.1% [24, 25].

The extent of this disease remains unclear due to transfusion transmission; therefore, the benefits of (universal) B19V-blood donor screening may be minimal and, at the moment, not justified, especially in countries with low endemicity [26].

On the other hand, in countries with a high prevalence of this infection, donors with persistent IgG anti-B19V might be considered "B19V-safe" for single-donor blood components [27]. All these might be considered when hemopoietic bone marrow transplantation is applicable in our country.

This study provides an overview of the three infections in voluntary blood donors. The data suggest that a further and broader study is needed focused on family replacement blood donors, who constitute 70% of our donations at the national level. The data also suggest that for a clear picture of the safety of blood and components related to WNV and HEV, more exhaustive NAT studies are needed, including voluntary non-remunerated and family replacement donors.

A thorough comprehension of these infections within the donor population will provide the requisite evidence to guide our testing policies, especially given the country's burgeoning transplant activity, which encompasses solid organs and stem cells.

Conclusions:

The study demonstrated a low seroprevalence of HEV and WNV in voluntary blood donors in our country. Most voluntary blood donors in our country are young, which may be one reason for the low prevalence observed in voluntary blood donors. In the donor population included in our study, 83% of donors are 18-35 years old. A more complete picture of the distribution of these infections in blood donors will be obtained using larger donor populations, including family blood donors. These data confirm that voluntary non, non-remunerated blood donors are the basis for safety and quality in blood transfusion.

Parvovirus B19 is found to have a moderately high prevalence in voluntary blood donors (35%) and higher in patients (55%). The higher prevalence in patients also suggests their protection since the primary infection in the immunosuppression situation is the one that causes the severe clinic. The statistically significant higher prevalence of parvovirus in multi-transfused patients aged 18-35 compared to donors of the same age group confirms the role of blood transfusion in transmitting this infection.

This study provides an overview of the three infections in voluntary blood donors. The data suggest that a further and broader study is needed focused on family replacement blood donors, who constitute 70% of our donations at the national level. The data also suggest that for a clear picture of the safety of blood and components related to WNV and HEV, more exhaustive NAT studies are needed, including voluntary non-remunerated and family replacement donors.

A thorough comprehension of these infections within the donor population is essential for informing the development of our testing policies, especially given the country's increasing transplant activity, which includes both solid organs and stem cells.

COI Statement: This paper has yet to be submitted in parallel, presented fully or partially at a meeting, podium, or congress, published, or submitted for consideration beforehand.

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Patient consent: The patient's consent was obtained for the publication of the case.

Abbreviation

NAT - Nucleic Acid Testing; HBV - Hepatitis B virus; HCV - Hepatitis C virus HIV - Human immunodeficiency virus; NBTC - National Blood Transfusion Center; B19V - Human parvovirus B19; WNV - West Nile Virus; HEV - Hepatitis E Virus; ELISA - Enzyme Immunoassay;

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