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Dengue Virus and Blood Safety: A Mini-Review of Research Publications

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ABSTRACT

The growing demand for donated whole blood and blood products to save lives has both health benefits and health risks for blood recipients at the same time. Dengue virus, a re-emerging viral disease poses a threat to blood safety, and it has spread to over 128 countries in the world. Several studies have documented transfusion-transmitted (TT) dengue, with the first cases being reported in China in 2002 and Singapore in 2008. To understand the magnitude and broader picture of the dengue virus and blood safety, we conducted a mini-review of published literature from the Scopus database. The review focused on the number of publications related to the dengue virus among blood donors. Using keywords 'Dengue virus' AND 'Blood safety', 'Dengue virus' AND 'Blood donors' and 'Emerging infectious diseases' AND "Blood safety" were used to extract data from the Scopus database which was downloaded as a CSV Excel file covering a period 2004 to 2021. This was followed by a data-cleaning exercise and a descriptive analysis to generate the frequency of the number of publications. Most studies, as can be seen in the review, were concentrated in tropical regions of the world. Globally, South America and the Asian regions had the largest number of publications; while at the country level, Brazil and India had the highest number. More research output was witnessed during the years 2014 and 2018. The regions that experienced more frequent outbreaks of the disease, with the exception Africa, published most of the research work. Therefore, much more research work is needed to protect the safety of blood donors in Africa.

BACKGROUND INFORMATION

Emerging infectious diseases such as the dengue virus (DENV), chikungunya virus, and many others are believed to threaten blood safety and availability throughout the world.¹ Most of these threats arise from the rapid spreading and mutating of viral infections.² To address this challenge, the WHO regularly publishes epidemiological reports on emerging infectious diseases in blood safety through fact sheets to its member countries. Member countries can access these reports on an online Global Database on Blood Safety program created by the WHO and its partners.³ These reports assess data from different countries, highlight achievements, and address the challenges facing blood safety. It is worth noting that not all blood transfusion services have access to this database or follow the guidelines developed by the WHO.⁴ Screening blood donors for known and unknown transfusion-transmitted infectious diseases to ensure blood safety around the world is the sole responsibility of all blood transfusion services.⁵ It is therefore logical that these services do so much to protect blood recipients from emerging infectious diseases. Acquisition of infection by blood transfusion can be life-threatening and costly for various families struggling financially.

Dengue, a recurrent infection caused by DENV, poses

a threat to blood safety, and has spread to more than 128 countries around the world.⁶ It is estimated that half of the world's population is at a high risk of being infected with dengue virus.⁷ Dengue is a vector-borne disease spread by an *Aedes* mosquito species that are widely distributed in the tropical and subtropical regions of the world.⁸ An estimate of approximately 25,000 dengue-related deaths is reported annually from endemic regions of the world.⁹ However, there is evidence that DENV can also be spread through blood and tissue transplantation.¹⁰

Several studies have documented transfusion-transmitted (TT) dengue whereby the first case was reported in China in 2002 and a second case in Singapore in 2008. This mini-review was part of a large study that sought to understand the seroprevalence of the DENV among blood donors and its implications for blood safety.¹¹ To understand the magnitude and broader picture of the DENV and blood safety, we conducted a mini-review of existing literature from the Scopus database. The database was chosen purposefully because it contains STM journal articles and the references found in them are accessible enabling both forward- and backward-looking searches. The review focused on the number of publications related to the DENV among blood donors and their sources around

the world. This was to help us synthesize the current discussion on whether blood donors coming from dengue-endemic regions need to undergo testing. Using keywords 'Dengue virus' AND 'Blood safety', 'Dengue virus' AND 'Blood donors' and 'Emerging infectious diseases' AND 'Blood safety', data were extracted from the Scopus database, which was downloaded as a Ms. Excel CSV file. This was followed by a data-cleaning exercise and a descriptive analysis to generate the frequency of the number of publications. Ms. Excel was also used to present the global distribution of studies that focus on the DENV among potential blood donors from a global perspective.

Blood Transfusion as A Route For Dengue Virus

The burden and implication of the DENV on blood safety in some tropical and subtropical regions where the virus is endemic are currently unknown. Therefore, there is quite limited information on DENV transfusion-transmitted cases to help countries improve their disease surveillance systems within blood transfusion services.^{12,13} The current review provides a snapshot of what is happening globally and helps fill this gap. Blood transfusion services around the world, as recommended by the WHO, are required to analyse transfusion risks and determine whether emerging infectious diseases are threats to blood safety in their country.¹⁴ However, most of these countries lack the capacity to implement these recommendations.¹⁵ The dependence on the WHO and other international organizations for epidemiological data before acting is a limitation that requires immediate intervention from countries in low-middle income countries (LMIC). Most African countries fall into this category and have limited human and financial resources. A robust surveillance system for the DENV not only provides the information required to maintain a blood supply but also helps and supports a safe blood supply.¹⁶

There is evidence that all patients who received donated blood from asymptomatic blood donors develop dengue-related symptoms after a few days.¹⁷ Studies in Brazil, India, and Singapore have shown a 0.5% rate of dengue viremia among asymptomatic blood donors during DENV outbreaks.^{18,19} Another study among healthy blood donors in Saudi Arabia has shown a seroprevalence between 1-7% for the DENV-NS1 antigen, the anti-DENV IgM antibody, and the anti-DENV IgG antibody.⁹ Similarly, a study conducted in the northeast part of Mexico among blood donors using the enzyme-linked immunosorbent assay (ELISA) technique found 59% and 2% for IgG and IgM, respectively.²⁰ In India, a country that is the most affected by the DENV, a study conducted in the Pune region of western India showed seropositivity of 0.64% and 6.4% for NS1 and IgM respectively in 2017.²¹ Despite all this evidence, very little is being done to implement mandatory screening for the DENV among blood donors to ensure blood safety.²²

In the Sub-Saharan region, very little is known about the prevalence of DENV among blood donors, and the likelihood that transfusion-transmitted Dengue fever has never been reported.²³ Limited studies conducted in a few countries (Figure 1) have shown evidence of dengue seromarkers in asymptomatic blood donors. For example, a study conducted among Cameroonian blood donors

showed a seropositivity rate of 5% for all serological markers using a simple immunochromatographic (IM) diagnostic kit.²⁴ In Tanzania, a similar study finding showed a seroprevalence of 50.6% DENV IgG among blood donors in Zanzibar.²⁵ Thousands of efforts and investments are required to conduct research studies on emerging infectious diseases and blood safety in Africa.²⁶

Blood transfusion services (BTS) in most developing countries are faced with numerous challenges that hinder their ability to provide safe blood to their blood recipients. One of the challenges is the lack of financial support from their national government to enable them to perform their functions.²⁷ Consequently, there is an inadequate supply of blood products, and much worse infection-contaminated blood supplies. This situation, hinders the performance and delivery of BTS services as a state organ with the mandate to supply safer blood to its citizens. Providing quality blood products to patients who urgently need blood transfusion is a fundamentally essential element of a functional blood transfusion service for any country.²⁸ Therefore, this mini-review aimed to analyse the available literature and draw a conclusion on whether it was necessary to include DENV as a mandatory test in all countries with the presence of the disease.

Current Evidence of Post-Transfusion Dengue Fever

It is an accepted principle that population growth and the increasing incidence of diseases raise the probability that blood products from viraemic individuals could be provided to vulnerable blood recipients.^{29,30} Previous studies in Hong Kong and Singapore have documented dengue transmitted by transfusions through blood derived from asymptomatic individuals.^{31,32} In regions with frequent outbreaks of the DENV, blood services would be required to assess whether urgent steps are needed to ensure blood availability.

In a population where dengue is widespread, the possibility of receiving blood from asymptomatic viral donors is also not resolved by symptom-based exclusion.³³ To date, studies show that there is at least a duration of infectivity of 1-2 days before symptoms develop and therefore a donor donating his/her blood during this period could pose a threat to people who would receive the blood.³⁴ During the dengue outbreak, the occurrence of viremia among asymptomatic people, including blood donors, is unknown.³⁵ For example, in a study in Hong Kong and Singapore, four recipients who acquired the virus by blood transfusion endured a relatively mild course of the disease and eventually recovered with very minimal sequelae.³⁶ More details are still needed to establish a concrete conclusion on whether blood transfusion could be an alternative route of viral transmission. However, fear always comes from the loss of a potential blood donor pool due to deferral.

Global Distributions of Research Work Around the Dengue Virus among Blood Donors

Part of this review was to understand the distribution of research articles related to DENV among blood donors. As shown in Figure 1, most of the studies were concentrated in the tropical regions of the world. This shows a pattern similar to that seen in the distribution of the DENV in epidemiological studies.³⁷⁻⁴¹ South America and the Asian regions had the largest number of

publications; and at the country level, Brazil and India had the most publications. One of the explanations for this phenomenon is the increased number of dengue outbreaks in these regions in the recent past.⁴² Few countries in these regions have implemented additional tests for the DENV in their test algorithms.^{36,43-51} Thus, this raises the question as to why other regions do not implement dengue screening among blood donors, even with the predominant evidence. There are a number of reasons; first, several studies have documented the presence of viral markers (IgG, IgM, NS1, and RNA) among healthy donors in dengue-endemic regions.^{36,48,52} It is therefore a major challenge among transfusion experts in deciding whether to screen or not, given that viral markers can also be detected among healthy subjects in the endemic regions.⁵³⁻⁵⁵ Secondly, financial constraints and the cost of blood transfusion are some of the reasons in the literature to explain why there is a lack of predonation screening for the DENV.^{56,57}

As shown in this review, very minimal research activities were observed in the African region regardless of the presence of dengue on the continent. A similar observation has also been made in a limited number of epidemiological research activities on the continent.⁵⁸ For example, single studies have been conducted in Tanzania, Cameroon, Ghana, Nigeria, Egypt, Burkina Faso, and Sudan.^{24,59-62} Therefore, very little is known about the implications of the DENV among blood donors in tropical regions of Africa.⁶³ A simple intervention for Africa would be to implement a voluntary call system after a blood donation is made to the blood transfusion service about the appearance of clinical symptoms consistent with the infectious disease. This intervention is called a post-donation illness report (PDIR), which would be cheaper and more affordable in most poor countries. The passive approach of voluntary reporting does not require BTS to screen donors but requires the donors to report

post-donation illness. Studies to assess the effectiveness of PDIR as a mitigation for viral agents, such as DENV, would help improve blood safety.⁶⁴ In addition, there is an opportunity for African researchers to conduct studies with the aim to protect the safety of blood recipients.⁶⁵

Most of the investigations in the reviewed articles showed a high seroprevalence of dengue viral markers (IgM/IgG) among potential blood donors who were asymptomatic.⁶⁶⁻⁷⁴ Therefore, it is essential to practice meticulous preventive techniques to ensure the safety of blood transfusions and to prevent the spread of the DENV in an endemic area.⁷⁵

Distribution of Published Work on the Dengue Virus among Blood Donors Around the World

In recent years, the number (84) of publications related to the DENV among blood donors has increased drastically. As part of this mini-review and to understand research output, we purposed to establish the number of publications since the year 2004 to 2021. Between 5 and 12 research outputs were observed between 2014 and 2018 as shown in Figure 2. The main reason for this increase in production is probably related to the increased number of reported dengue outbreaks in endemic regions.⁷⁶ The impact of the COVID-19 pandemic on research output can also be seen in the decrease in the number of publications between 2019 and 2020. The reduction in the number of publications can be attributed to a change of focus to address the pandemic. However, a resumption of research output is also observed in 2021. This could have been due to understanding the current pandemic, which had an initial reaction full of uncertainties. This is a true reflection of what happens when there is a disease outbreak or a pandemic. The emergence of new viral infections can affect all aspects of our lives, including blood safety and availability.

FIGURE 1: Global Distributions of Research Work on Dengue Virus and Blood Safety

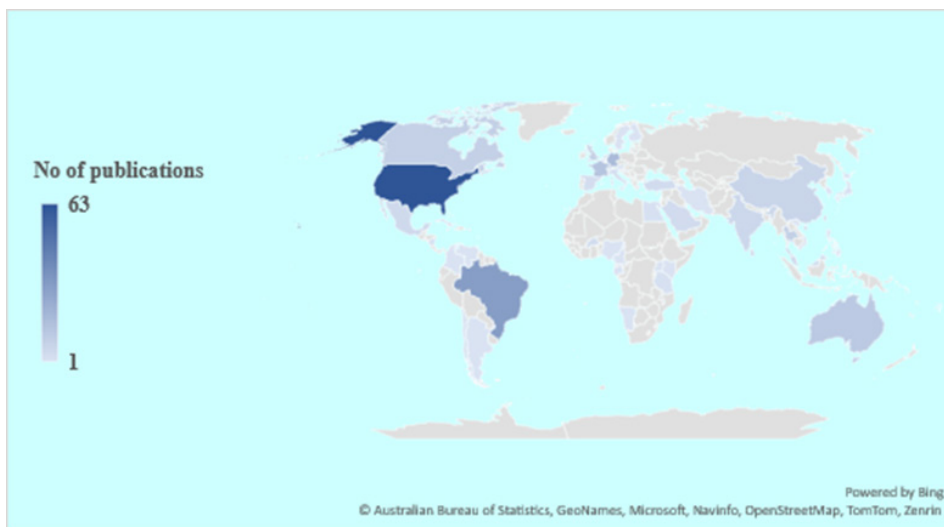
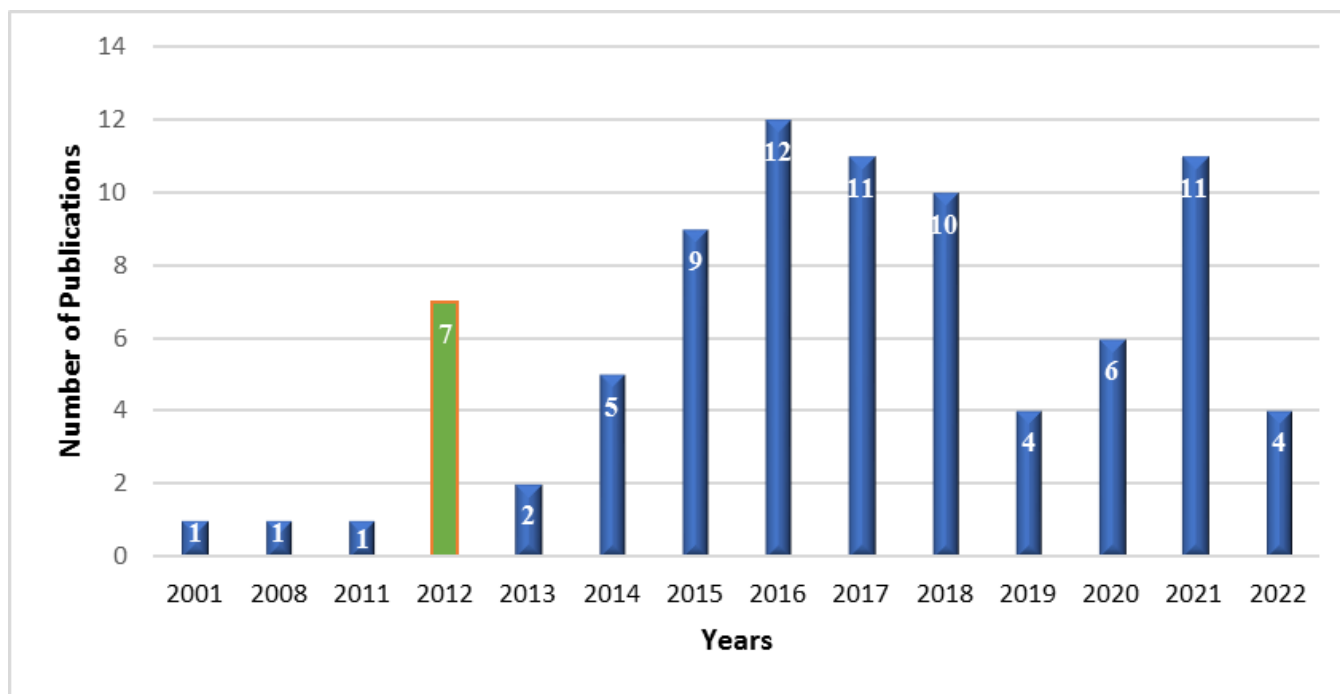


FIGURE 2: Distribution of Published Work From 2001 to 2022



CONCLUSION

This mini-review has shown that there is evidence that asymptomatic blood donors can transmit the DENV to blood recipients. Most of the research work was conducted in regions that experience frequent outbreaks of diseases, except in regions on the African continent. Therefore, much work is needed to protect the safety of blood donors in Africa.

REFERENCES

1. Fiebig EW, Busch MP. Emerging infections in transfusion medicine. *Clin Lab Med.* 2004;24(3):797-823, viii.
2. Baker RE, Mahmud AS, Miller IF, et al. Infectious disease in an era of global change. *Nature Reviews Microbiology.* 2022;20(4):193-205.
3. Coté CJ, Grabowski EF, Stowell CP. Strategies for Blood Product Management, Reducing Transfusions, and Massive Blood Transfusion. In: *A Practice of Anesthesia for Infants and Children.* Elsevier; 2019:257-280.e213.
4. Global status report on blood safety and availability 2021. 2021.
5. Busch MP, Bloch EM, Kleinman S. Prevention of transfusion-transmitted infections. *Blood.* 2019;133(17):1854-1864.
6. Dunstan RA, Seed CR, Keller AJ. Emerging viral threats to the Australian blood supply. *Aust N Z J Public Health.* 2008;32(4):354-360.
7. Castillo JA, Giraldo DM, Smit JM, Rodenhuis-Zybert IA,

- Urcuqui-Inchima S. Vitamin D-induced IL-37 modulates innate immune responses of human primary macrophages during DENV-2 infection. *Pathog Dis.* 2022;80(1).
8. Zheng L, Ren H, Shi R, Lu L. Spatial Simulation and Prediction of Dengue Fever Transmission in Pearl River Delta. *J Geo-Inf Sci.* 2019;21(3):407-416.
9. Ashshi AM. Serodetection of Dengue virus and its antibodies among blood donors in the western region of Saudi Arabia: a preliminary study. *Blood Transfus.* 2015;13(1):135-138.
10. Hsu AY, Ho TC, Lai ML, et al. Identification and characterization of permissive cells to dengue virus infection in human hematopoietic stem and progenitor cells. *Transfusion.* 2019;59(9):2938-2951.
11. Mulakoli F, Gachara, G., Ndombi, E., & Khamadi, S. Molecular investigation of dengue virus among blood donors as a threat to blood safety in Mombasa and Nairobi city counties, Kenya. In: *Kenyatta university;* 2022.
12. Nyaruaba R, Mwaliko C, Mwau M, Mousa S, Wei H. Arboviruses in the East African Community partner states: a review of medically important mosquito-borne Arboviruses. *Pathog Global Health.* 2019;113(5):209-228.
13. Barro L, Drew VJ, Poda GG, et al. Blood transfusion in sub-Saharan Africa: understanding the missing gap and responding to present and future challenges. *Vox Sang.* 2018;113(8):726-736.

14. Freeman MC, Coyne CB, Green M, Williams JV, Silva LA. Emerging arboviruses and implications for pediatric transplantation: A review. *Pediatr Transplant*. 2019;23(1).
15. Organization WH. Global status report on blood safety and availability 2021. 2022.
16. Hamdan KR, Jaafar MH, Rahman AA, Fadhullah W. Assessment of Vector Surveillance and Meteorological Factors in Evaluating Dengue Outbreak Areas in South Seberang Perai District, Penang. *Malays J Med Health Sci*. 2021;17:101-107.
17. Tambyah PA, Koay ESC, Poon MLM, Lin RVTP, Ong BKC. Dengue hemorrhagic fever transmitted by blood transfusion. *N Engl J Med*. 2008;359(14):1526-1527.
18. Matos D, Tomashek KM, Perez-Padilla J, et al. Probable and possible transfusion-transmitted dengue associated with NS1 antigen-negative but RNA confirmed-positive red blood cells. *Transfusion*. 2016;56(1):215-222.
19. Sabino EC, Loureiro P, Lopes ME, et al. Transfusion-Transmitted Dengue and Associated Clinical Symptoms During the 2012 Epidemic in Brazil. *J Infect Dis*. 2016;213(5):694-702.
20. Rodríguez Rodríguez D, Garza Rodríguez M, Chavarria AM, et al. Dengue virus antibodies in blood donors from an endemic area. *Transfus Med*. 2009;19(3):125-131.
21. Kulkarni R, Tiraki D, Wani D, Mishra AC, Arankalle VA. Risk of transfusion-associated dengue: screening of blood donors from Pune, western India. *Transfusion*. 2019;59(2):458-462.
22. Li L, Li Y, Lu S, et al. Epidemiological survey and screening strategy for dengue virus in blood donors from Yunnan Province. *BMC Infectious Diseases*. 2021;21(1):104.
23. Amarasinghe A, Kuriitsk JN, Letson GW, Margolis HS. Dengue virus infection in Africa. *Emerg Infect Dis*. 2011;17(8):1349-1354.
24. Tchuandom SB, Lissom A, Ateba GHM, et al. Dengue virus serological markers among potential blood donors: an evidence of asymptomatic dengue virus transmission in Cameroon. *Pan Afr Med J*. 2020;36:185.
25. Vairo F, Nicastri E, Yussuf SM, et al. IgG against dengue virus in healthy blood donors, Zanzibar, Tanzania. *Emerg Infect Dis*. 2014;20(3):465-468.
26. Loua A, Nikiema JB, Sougou A, Kasilo OJM. Transfusion in the WHO African Region. *Transfus Clin Biol*. 2019;26(3):155-159.
27. Wakaria EN, Rombo CO, Oduor M, et al. Implementing SLMTA in the Kenya National Blood Transfusion Service: lessons learned. *Afr J Lab Med*. 2017;6(1):585.
28. Candotti D, Tagny-Tayou C, Laperche S. Challenges in transfusion-transmitted infection screening in Sub-Saharan Africa. *Transfus Clin Biol*. 2021;28(2):163-170.
29. Duong V, Lambrechts L, Paul RE, et al. Asymptomatic humans transmit dengue virus to mosquitoes. *Proc Natl Acad Sci U S A*. 2015;112.
30. Thisyakorn U, Thisyakorn C. DENGUE: GLOBAL THREAT. *Southeast Asian J Trop Med Public Health*. 2015;46 Suppl 1:3-10.
31. Tambyah PA, Koay ES, Poon ML, Lin RV, Ong BK. Dengue hemorrhagic fever transmitted by blood transfusion. *N Engl J Med*. 2008;359.
32. Tang JW, Ng Y, Koay ES, et al. A febrile blood donor. *Clin Chem*. 2010;56(3):352-356.
33. Arellanos-Soto D, V BalC, Mendoza-Tavera N, et al. Constant risk of dengue virus infection by blood transfusion in an endemic area in Mexico. *Transfus Med*. 2015;25(2):122-124.
34. Sharma KK, Lim XX, Tantirimudalige SN, et al. Infectivity of Dengue Virus Serotypes 1 and 2 Is Correlated with E-Protein Intrinsic Dynamics but Not to Envelope Conformations. *Structure*. 2019;27(4):618-630 e614.
35. Linnen JM, Vinelli E, Sabino EC, et al. Dengue viremia in blood donors from Honduras, Brazil, and Australia. *Transfusion*. 2008;48(7):1355-1362.
36. Schmidt M, Geilenkeuser WJ, Sireis W, Seifried E, Hourfar K. Emerging pathogens - How safe is blood? *Transfus Med Hemotherapy*. 2014;41(1):10-17.
37. Brady OJ, Messina JP, Scott TW, Hay SI. Mapping the epidemiology of dengue. *CABI*; 2014.
38. Dehghani R, Kassiri H. A Review on Epidemiology of Dengue Viral Infection as an Emerging Disease. *Res J Pharm Technol*. 2021;14(4):2296-2301.
39. Guo C-c, Zhou Z, Wen Z-h, et al. Global Epidemiology of Dengue Outbreaks in 1990–2015: A Systematic Review and Meta-Analysis. 2017.
40. Guo C, Zhou Z, Wen Z, et al. Global Epidemiology of Dengue Outbreaks in 1990-2015: A Systematic Review and Meta-Analysis. *Front Cell Infect Microbiol*. 2017;7(JUL):317.
41. Murray NEA, Quam MB, Wilder-Smith A. Epidemiology of dengue: Past, present and future prospects. *Clin Epidemiol*. 2013;5(1):299-309.
42. Levi J. Arbovirus epidemics and blood safety in Brazil. 2017.
43. Mangwana S. Dengue viremia in blood donors in Northern India: Challenges of emerging dengue outbreaks to blood transfusion safety. *Asian J Transfus Sci*. 2015;9(2):177-180.
44. Bloch E, Simon M, Shaz B. Emerging Infections and Blood Safety in the 21st Century. 2016.
45. Levi JE. Emerging Infectious Agents and Blood Safety in Latin America. *Front Med (Lausanne)*. 2018;5(MAR):71.
46. Glynn SA, Busch MP, Dodd RY, et al. Emerging infectious agents and the nation's blood supply: Responding to potential threats in the 21st century. *Transfusion*. 2013;53(2):438-454.
47. Li L, Li Y, Lu S, et al. Epidemiological survey and screening strategy for dengue virus in blood donors from Yunnan Province. *BMC Infect Dis*. 2021;21(1).
48. Beau F, Lastère S, Mallet HP, Mauguin S, Brout J, Laperche S. Impact on blood safety of the last arboviruses outbreaks in French Polynesia (2012–2018). *Transfusion Clinique et Biologique*. 2020;27(1):4-9.

49. Faddy HM, Seed CR, Fryk JJ, et al. Implications of dengue outbreaks for blood supply, Australia. *Emerg Infect Dis.* 2013;19(5):787-789.
50. Marks PW, Epstein JS, Borio LL. Maintaining a Safe Blood Supply in an Era of Emerging Pathogens. *The Journal of infectious diseases.* 2016;213(11):1676-1677.
51. Machado AAV, Negrão FJ, Croda J, de Medeiros ES, Pires M. Safety and costs of blood transfusion practices in dengue cases in Brazil. *PLoS One.* 2019;14(7):e0219287.
52. Garraud O, Filho LA, Laperche S, Tayou-Tagny C, Pozzetto B. The infectious risks in blood transfusion as of today – A no black and white situation. *Presse Med.* 2016;45(7-8):e303-e311.
53. Cabral-Castro MJ, Cavalcanti MG, Peralta RHS, Peralta JM. Molecular and serological techniques to detect co-circulation of DENV, ZIKV and CHIKV in suspected dengue-like syndrome patients. *J Clin Virol.* 2016;82:108-111.
54. Hunsperger EA, Muñoz-Jordán J, Beltran M, et al. Performance of Dengue Diagnostic Tests in a Single-Specimen Diagnostic Algorithm. *J Infect Dis.* 2016;214(6):836-844.
55. Áñez G, Heisey D, Chancey C, et al. Distribution of Dengue Virus Types 1 and 4 in Blood Components from Infected Blood Donors from Puerto Rico. 2016.
56. Dosunmu AO, Akinbami AA, Ismail AK, Olaiya MA, Uche EI, Aile IK. The cost-effectiveness of predonation screening for transfusion transmissible infections using rapid test kits in a hospital-based blood transfusion centre. *Niger Postgrad Med J.* 2017;24(3):162-167.
57. Jacquot C, Delaney M. Pathogen inactivated blood products for pediatric patients: blood safety, patient safety, or both? 2018.
58. Gainer EM, Harris E, LaBeaud AD. Uncovering the Burden of Dengue in Africa: Considerations on Magnitude, Misdiagnosis, and Ancestry. *Viruses.* 2022;14(2).
59. Abd El-Wahab EW, Elfiky KSR, Ghanem MA, Shatat HZ. Assessment of dengue virus threat to blood safety and community health: A single center study in northern Egypt. *J Virus Erad.* 2022;8(2):T00077.
60. Shauri HS, Ngadaya E, Senkoro M, Buza JJ, Mfinanga S. Seroprevalence of Dengue and Chikungunya antibodies among blood donors in Dar es Salaam and Zanzibar, Tanzania: a cross-sectional study. *BMC Infectious Diseases.* 2021;21(1):911.
61. Narkwa PW, Mutocheluh M, Kwofie TB, et al. Dengue virus exposure among blood donors in Ghana. *Journal of Medical and Biomedical Sciences.* 2016;5(2):30-35.
62. Sawadogo S, Baguoya A, Yougbare F, et al. Seroprevalence and factors associated with IgG anti-DENV positivity in blood donors in Burkina Faso during the 2016 dengue outbreak and implications for blood supply. *Transfus Med.* 2020;30(1):37-45.
63. Lim JK, Carabali M, Lee JS, et al. Evaluating dengue burden in Africa in passive fever surveillance and seroprevalence studies: Protocol of field studies of the Dengue Vaccine Initiative. *BMJ Open.* 2018;8(1).
64. Bezerra RS, Peronni KC, Barros BDF, et al. Viral metagenomics in blood donors with post-donation diseases and negative tests for dengue and zika viruses rna detection during a major outbreak of arboviruses in Sao Paulo State in 2016. *Rev Inst Med Trop Sao Paulo.* 2020;62:1-4.
65. Barro L, Drew VJ, Poda GG, et al. Blood transfusion in sub-Saharan Africa: understanding the missing gap and responding to present and future challenges. *Vox Sanguinis.* 2018;113(8):726-736.
66. Zeng P, Liao Q, Gao Z, He M, Rong X. Sero-prevalence and viremia status of dengue virus among asymptomatic blood donors post epidemic outbreak in Chinese Guangzhou in 2015. *Transfus Med.* 2018;28(6):468-469.
67. Slavov S, Cilião-Alves DC, Gonzaga FAC, et al. Dengue seroprevalence among asymptomatic blood donors during an epidemic outbreak in Central-West Brazil. 2019.
68. Ashshi AM, Alghamdi S, El-Shemi AG, et al. Seroprevalence of Asymptomatic Dengue Virus Infection and Its Antibodies Among Healthy/Eligible Saudi Blood Donors: Findings From Holy Makkah City. *Virology (Auckl).* 2017;8:1-5.
69. Liao Q, Shan Z, Wang M, et al. An evaluation of asymptomatic Dengue infections among blood donors during the 2014 Dengue outbreak in Guangzhou, China. *J Med Virol.* 2017;89(11):2037-2040.
70. Slavov S, Hespanhol MR, Ferreira AR, Rodrigues E, Covas D, Kashima S. Silent dengue virus circulation among asymptomatic blood donors from a hyperendemic Brazilian region. 2018.
71. Tsai J, Lin P-C, Tsai C-Y, Wang Y-H, Liu L-T. Low frequency of asymptomatic dengue virus-infected donors in blood donor centers during the largest dengue outbreak in Taiwan. 2018.
72. Ashshi AM. The prevalence of dengue virus serotypes in asymptomatic blood donors reveals the emergence of serotype 4 in Saudi Arabia. *Viol J.* 2017;14(1):107.
73. Chien YW, Shu YC, Chuang KT, et al. High estimated prevalence of asymptomatic dengue viremia in blood donors during a dengue epidemic in southern Taiwan, 2015. *Transfusion.* 2017;57(11):2649-2656.
74. Tchuandom SB, Lissom A, Ateba G, et al. Dengue virus serological markers among potential blood donors: an evidence of asymptomatic dengue virus transmission in Cameroon. 2020.
75. Stramer SL, Dodd RY. *Transfusion-Transmitted Diseases.* In: Hematology. Elsevier Inc.; 2018:1803-1820.e1802.
76. Figueiredo L. Serious disease outbreaks caused by viruses transmitted by *Aedes aegypti* in Brazil. 2016.

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