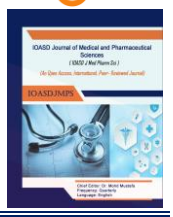
OPEN ACCESS

IOASD Journal of Medical and Pharmaceutical Sciences

IOASD J Med Pharm Sci, Vol-3, Iss-3, Jul-Sept., 2026
Frequency: Quarterly
ISSN: 3049-0294 (Online)
ISSN: 3049-3773 (Print)
Homepage: https://ioasdpublisher.com/ioasdjmps



Ebola Virus Disease: Hematologic Insights and Public Health Innovations- A Narrative Review

Emmanuel Ifeanyi Obeagu[1*] and Okwudili B. Nwankwo[2]

[1]Division of Haematology, Department of Biomedical and Laboratory Science, Africa University, Zimbabwe
[2]Department of Haematology, Chukwuemeka Odumegwu Ojukwu University, Awka, Anambra State, Nigeria

Corresponding Author: Emmanuel Ifeanyi Obeagu
DOI: 10.67224/ioasdjmps.2026.v03i03.011
Division of Haematology, Department of Biomedical and Laboratory Science, Africa University, Zimbabwe | Email: obeague@africau.edu

ABSTRACT

Ebola virus disease remains a formidable zoonotic infection marked by severe hematologic disturbances and high case fatality. Beyond its well-known hemorrhagic manifestations, EVD is characterized by complex coagulopathy, platelet dysfunction, endothelial injury, and immune dysregulation, which together drive disease severity and poor outcomes. This narrative review highlights the hematologic mechanisms underlying EVD pathogenesis, including disseminated intravascular coagulation, cytokine-driven vascular leakage, and bone marrow suppression, while discussing their clinical and diagnostic implications. In parallel, we examine recent public health innovations—from rapid diagnostics and monoclonal antibody therapies to ring vaccination and AI-assisted surveillance—that have transformed outbreak preparedness and response. By integrating hematologic insights with advances in public health interventions, this review underscores the critical need for multidisciplinary strategies to reduce mortality, improve patient management, and prevent future Ebola outbreaks.

Keywords: Ebola Virus Disease, hematologic changes, coagulopathy, thrombocytopenia, anemia.

Review Article

Article History
Received: 16-06-2026
Accepted: 04-08-2026
Published: 17-08-2026

INTRODUCTION

Ebola Virus Disease (EVD) is a severe and often fatal illness caused by the Ebola virus, a member of the Filoviridae family [1]. First identified in 1976 during simultaneous outbreaks in Sudan and the Democratic Republic of Congo, EVD has since become synonymous with high mortality rates and severe clinical manifestations [2]. The largest and most devastating outbreak occurred in West Africa from 2014 to 2016, underscoring the global health threat posed by this virus [3]. EVD is characterized by a sudden onset of symptoms, including fever, muscle pain, headache, and sore throat, which can rapidly progress to more severe symptoms such as vomiting, diarrhea, rash, and both internal and external bleeding [4]. One of the most critical and challenging aspects of EVD is its impact on the hematologic system. Hematologic abnormalities are a hallmark of EVD and significantly contribute to the disease's high mortality rate [5]. These abnormalities include coagulopathy, thrombocytopenia, and anemia, each of which complicates the clinical management of the disease. Coagulopathy in EVD patients often manifests as disseminated intravascular coagulation (DIC), a condition characterized by widespread clotting in the blood vessels, which can lead to severe bleeding and organ damage [6]. Thrombocytopenia, a reduction in platelet count, further exacerbates bleeding tendencies and complicates the management of the disease. Anemia, characterized by a decrease in red blood cells, results from both the direct effects of the virus and the body's immune response.

The Ebola virus directly infects and damages endothelial cells, hepatocytes, and immune cells, disrupting normal blood coagulation processes and leading to coagulopathy [7]. Additionally, the host's immune response to the virus can trigger a cascade of events that result in DIC. Thrombocytopenia in EVD patients is often due to bone marrow suppression, immune-mediated platelet destruction, and direct viral effects on platelet production. Anemia results from hemolysis, blood loss due to severe bleeding, and bone marrow suppression. The public health challenges associated with these hematologic changes are significant, particularly in resource-limited settings where most EVD outbreaks occur [8]. Accurate diagnosis and continuous monitoring of hematologic parameters are essential for effective clinical

management but are often hindered by inadequate laboratory infrastructure and limited medical supplies. Effective treatment of hematologic complications requires a multidisciplinary approach, including supportive care, blood product transfusions, and potentially the use of anticoagulants. However, resource constraints in outbreak regions make comprehensive care challenging. Infection control is another critical public health challenge in managing EVD [9]. The virus is highly contagious and spreads through direct contact with infected bodily fluids. Hematologic changes, such as severe bleeding, increase the risk of virus transmission, necessitating stringent infection control measures. These measures include the use of personal protective equipment (PPE), proper handling and disposal of medical waste, and isolation of infected patients. Implementing these measures consistently in resource-limited settings is often difficult due to lack of supplies, training, and infrastructure.

Resource allocation during EVD outbreaks is a major public health concern. Outbreak regions often face shortages of medical supplies, trained healthcare workers, and healthcare infrastructure [10]. This scarcity complicates the delivery of necessary treatments, such as blood transfusions and advanced diagnostic tests, which are crucial for managing hematologic complications. Additionally, the high mortality rate and the rapid spread of the virus place a tremendous strain on healthcare systems, further exacerbating these challenges. Despite these challenges, significant progress has been made in understanding the hematologic aspects of EVD and developing public health strategies to address them. Strengthening diagnostic capabilities through enhanced laboratory infrastructure and training can improve the timely diagnosis and monitoring of hematologic changes in EVD patients [11]. Developing standardized treatment protocols for managing hematologic complications can improve patient outcomes and provide a framework for healthcare workers to follow during outbreaks. Improving infection control practices through better training, adequate supplies of PPE, and effective waste management is crucial for preventing nosocomial transmission. Enhancing public health infrastructure in vulnerable regions is essential for better outbreak preparedness and response. This includes building new healthcare facilities, ensuring a steady supply of medical essentials, and training healthcare workers. Strengthening healthcare systems can improve the overall response to EVD outbreaks and reduce their impact on affected populations. Research and development are also critical components of addressing the hematologic challenges of EVD. Continued investment in research to understand the pathophysiology of hematologic changes in EVD can lead to the development of new therapeutic approaches and vaccines [12]. Additionally, studying the efficacy of novel treatments and their application in clinical settings can provide valuable insights into managing EVD more effectively.

AIM

The aim of this comprehensive review is to examine the hematologic manifestations of EVD and to identify the associated public health challenges, solutions, recommendations, and strategies for effective management. By synthesizing existing literature and insights from public health experts, this review seeks to provide a holistic understanding of the hematologic complications of EVD and their impact on affected populations. Furthermore, this review aims to contribute to the body of knowledge on EVD management by offering evidence-based recommendations for enhancing diagnostic capabilities, treatment protocols, infection control measures, healthcare infrastructure, training and capacity building, community engagement, coordination of response efforts, and research and development initiatives. Ultimately, the aim is to inform policy-makers, healthcare providers, and public health authorities on best practices for mitigating the burden of EVD and improving outcomes for individuals and communities affected by this devastating disease.

Rationale

EVD is a severe and often fatal illness that poses significant public health challenges, particularly in regions with limited resources and healthcare infrastructure. Hematologic manifestations, including coagulopathy, thrombocytopenia, and anemia, are among the most critical complications of EVD, contributing to its high mortality rate. Understanding these hematologic changes and their impact on patient outcomes is essential for guiding effective management strategies. This review addresses the need for a comprehensive understanding of the hematologic aspects of EVD and their implications for public health. By examining the pathophysiology of hematologic complications, identifying associated challenges, and proposing evidence-based solutions, this review aims to inform policy-makers, healthcare providers, and public health authorities on strategies for improving EVD management and reducing its burden on affected populations. Furthermore, by synthesizing existing literature and expert insights, this review contributes to the ongoing discourse on EVD management and provides a foundation for future research and development efforts. By elucidating the rationale behind recommended interventions and strategies, this review seeks to empower stakeholders to implement effective measures for mitigating the impact of EVD outbreaks and safeguarding public health. Ultimately, the goal is to advance our collective understanding of EVD and improve outcomes for individuals and communities affected by this devastating disease.

METHODS

This narrative review was conducted to synthesize current evidence on the hematologic mechanisms of EVD and to examine emerging public health innovations relevant to its management and prevention. A structured but non-systematic search

strategy was employed to capture a comprehensive range of peer-reviewed and authoritative sources.

Literature Search Strategy

Between June and September 2025, electronic databases including PubMed/MEDLINE, Scopus, Web of Science, and Google Scholar were searched for articles published from January 2000 to September 2025. Key search terms and Boolean operators included combinations of: *"Ebola virus disease"*, *"EVD"*, *"hematology"*, *"coagulopathy"*, *"thrombocytopenia"*, *"endothelial dysfunction"*, *"immunopathology"*, *"public health response"*, *"diagnostics"*, *"vaccines"*, and *"therapeutics"*. Reference lists of relevant primary studies and review articles were also screened to identify additional sources.

Eligibility Criteria

Eligible materials included original research articles, clinical trials, outbreak reports, narrative and systematic reviews, World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) guidelines, and policy documents that addressed:

1. Hematologic pathophysiology, clinical manifestations, or laboratory findings in EVD;
2. Diagnostic innovations, therapeutic interventions, or preventive measures with hematologic or public health relevance; and
3. Lessons learned from outbreak preparedness and response.

Only articles published in English were included. Preprints and unpublished data were excluded unless they were cited in official WHO or CDC communications.

Data Extraction and Synthesis

Relevant information was extracted on (i) hematologic mechanisms and clinical correlations of EVD, (ii) diagnostic biomarkers and laboratory findings, (iii) therapeutic approaches including supportive hematologic care and antiviral interventions, and (iv) public health innovations such as vaccination strategies, outbreak surveillance systems, and community-based interventions. Findings were narratively synthesized, with emphasis on integrating hematologic insights with evolving public health strategies.

Quality Considerations

Although this review did not apply formal quality appraisal tools due to its narrative design, priority was given to peer-reviewed studies, multicenter outbreak reports, and evidence supported by international health agencies to ensure reliability and scientific rigor. This approach enabled a balanced and comprehensive overview of the interplay between Ebola's hematologic pathogenesis and the innovative public health responses shaping contemporary outbreak management.

Ethical Approval

Not applicable

Hematologic Manifestations of EVD

EVD exerts profound effects on the hematologic system, leading to a range of abnormalities that complicate clinical management and contribute significantly to the disease's high mortality rate [13]. The primary hematologic manifestations of EVD include coagulopathy, thrombocytopenia, and anemia.14 Each of these conditions stems from complex interactions between the virus and the host's immune response, resulting in severe clinical outcomes. Coagulopathy is one of the most critical and life-threatening hematologic complications of EVD [15]. It involves a disruption in the normal blood coagulation processes, leading to excessive bleeding and clotting abnormalities. The Ebola virus directly infects endothelial cells lining the blood vessels, as well as hepatocytes in the liver, which play a crucial role in synthesizing clotting factors. The damage to these cells disrupts normal coagulation. The body's immune response to the virus can trigger a cascade of events leading to disseminated intravascular coagulation (DIC). This condition is characterized by widespread clotting in small blood vessels throughout the body, consuming clotting factors and platelets, and subsequently leading to severe bleeding due to the depletion of these essential components.

Thrombocytopenia, a condition marked by a low platelet count, is another significant hematologic manifestation of EVD [16]. Platelets are essential for blood clotting, and their reduction exacerbates the risk of bleeding. The Ebola virus can suppress the function of the bone marrow, where platelets are produced [17]. This suppression may result from direct viral infection of bone marrow cells or the body's immune response affecting bone marrow function. In addition to reduced production, there is also an increased destruction of platelets. This destruction can be immune-mediated, where the body's immune system mistakenly targets platelets, or it can result from direct viral effects. Anemia, characterized by a reduced number of red blood cells, is frequently observed in EVD patients and contributes to the disease's severity by impairing oxygen delivery to tissues. The destruction of red blood cells, or hemolysis, can occur due to direct viral action or immune-mediated processes. Severe bleeding associated with coagulopathy leads to significant red blood cell loss, exacerbating anemia. Similar to its effect on platelets, the Ebola virus can impair the bone marrow's ability to produce red blood cells, leading to decreased levels in the bloodstream.

The hematologic abnormalities in EVD patients complicate the clinical management of the disease [18]. Severe bleeding due to coagulopathy and thrombocytopenia can lead to shock, multi-organ failure, and death if not managed promptly and effectively. Anemia further complicates the clinical picture by

reducing the oxygen-carrying capacity of the blood, leading to hypoxia and additional strain on vital organs. Accurate and timely diagnosis of these hematologic changes is essential for effective management. Laboratory tests to monitor platelet counts, coagulation profiles, and red blood cell levels are crucial. However, in many outbreak regions, the lack of adequate laboratory infrastructure and resources hampers proper monitoring and diagnosis. Platelet transfusions can help address thrombocytopenia, while fresh frozen plasma and clotting factor concentrates can aid in managing coagulopathy. In some cases, anticoagulants might be used to prevent the excessive clotting seen in DIC, though their use must be carefully balanced against the risk of bleeding. The hematologic changes in EVD pose significant public health challenges, particularly in resource-limited settings [19]. Effective management requires not only clinical interventions but also robust public health strategies, including strengthening healthcare infrastructure, improving diagnostic capabilities, and ensuring the availability of essential medical supplies.

Public Health Challenges

Despite remarkable progress in EVD prevention and control, significant public health challenges continue to complicate outbreak preparedness, response, and long-term management. One of the foremost obstacles is the fragility of health systems in many affected regions. Limited laboratory capacity, shortages of trained healthcare personnel, and inadequate infection prevention and control measures hinder timely detection, isolation, and treatment of cases. In rural and remote areas, the lack of functional healthcare infrastructure often delays diagnosis and care, allowing community transmission to escalate before response measures can be implemented [20-21]. Community engagement and trust-building remain critical yet complex. Historical mistrust of government and international health agencies, combined with cultural practices such as traditional burial rituals and home-based caregiving, can fuel resistance to public health interventions. Miscommunication or misinformation—particularly during the early stages of outbreaks—may lead to fear, stigma, and even hostility toward healthcare workers, undermining efforts to enforce safe practices such as ring vaccination, contact tracing, and safe burials [22].

The logistical demands of outbreak response present additional challenges. Deploying rapid diagnostic tools, vaccines, and therapeutic agents to remote or conflict-affected areas is often hampered by poor road networks, political instability, and limited cold-chain capacity. These barriers complicate vaccine delivery and the distribution of life-saving treatments such as monoclonal antibodies, especially when outbreaks occur in insecure or inaccessible regions [23]. Another persistent challenge is the emergence of viral persistence and re-emergence. Evidence that Ebola virus can remain in immune-privileged sites, such as the testes or ocular fluid, raises concerns about sexual transmission and delayed flare-ups even after an outbreak is declared over. This necessitates long-term survivor monitoring and reinforces the need for sustained surveillance systems well beyond the acute phase of an epidemic [24].

At the global level, funding sustainability and political commitment remain inconsistent. Outbreaks typically trigger rapid mobilization of international resources, but support often wanes once transmission declines. This cyclical pattern jeopardizes ongoing research, vaccine production, and the development of resilient surveillance systems, leaving communities vulnerable to future epidemics [25]. The psychosocial and economic impacts of EVD extend well beyond the immediate health crisis. Survivors frequently experience stigma, chronic health complications, and economic hardship, while affected communities face disrupted livelihoods and prolonged economic instability. Addressing these broader consequences requires an integrated approach that combines medical care, mental health support, and economic recovery programs [26].

Community Engagement and Public Awareness

Community engagement and public awareness are central to the successful control of EVD, shaping both the immediate outbreak response and long-term preparedness. Experience from multiple outbreaks has demonstrated that biomedical interventions—no matter how advanced—cannot achieve their full impact without the trust and active participation of the affected populations. In many endemic regions, initial resistance to health authorities often stems from a legacy of marginalization, past political instability, and deep-seated mistrust of governmental and international agencies. Overcoming these barriers requires a deliberate, culturally sensitive approach that places communities at the heart of the response [27]. Effective engagement begins with transparent communication. Providing accurate, timely, and accessible information about Ebola transmission, symptoms, and prevention reduces fear and counters misinformation that can spread rapidly through social networks and local media. Messaging must be delivered in local languages and adapted to the cultural norms of each community, using trusted channels such as community leaders, religious figures, traditional healers, and respected local organizations. During recent outbreaks, partnerships with these local stakeholders proved essential in encouraging behaviors such as early reporting of symptoms, compliance with quarantine measures, and acceptance of vaccination campaigns [28].

Cultural sensitivity in intervention design is equally critical. Practices such as traditional burial rites, caregiving customs, and food preparation methods can inadvertently promote viral transmission if not addressed respectfully. Successful strategies have involved collaborating with families and community elders to

adapt burial practices, allowing safe but culturally meaningful ceremonies. Similarly, engaging survivors as peer educators and advocates has helped demystify Ebola, reduce stigma, and promote trust in medical interventions [29]. Public awareness campaigns must also focus on reducing stigma and supporting survivors. Fear of infection often leads to discrimination against Ebola survivors and their families, discouraging individuals from seeking testing or care. Education programs that highlight the non-infectious nature of recovered patients and share stories of survival play a key role in reintegration and mental health recovery [27].

Modern technologies have enhanced these efforts, with mobile platforms and social media enabling rapid dissemination of health messages and two-way communication between communities and health authorities. Interactive radio programs, SMS alerts, and AI-driven rumor tracking systems have been successfully deployed to monitor public sentiment and tailor messaging in real time.28 Community engagement and public awareness are not one-time interventions but continuous processes that extend beyond the acute phase of an outbreak. Building trust during inter-epidemic periods—through investment in primary healthcare, consistent health education, and survivor support networks—strengthens resilience and ensures quicker acceptance of control measures when new cases emerge. By prioritizing respectful dialogue, culturally aligned interventions, and long-term partnerships, public health authorities can transform communities from passive recipients of information into empowered partners in the fight against Ebola virus disease [29].

Solutions and Strategies

Addressing the persistent threat of EVD requires a multi-layered approach that integrates clinical care, hematologic insights, and public health innovations. The most effective strategies combine immediate outbreak control measures with long-term investments in health system strengthening and community resilience, ensuring that interventions are both scientifically sound and socially acceptable [30]. At the clinical level, early detection and rapid isolation remain the cornerstone of outbreak containment. Expanding access to point-of-care diagnostics, including portable molecular testing platforms and rapid antigen assays, allows healthcare workers to identify cases within hours rather than days, thereby interrupting chains of transmission. In parallel, training frontline healthcare providers in strict infection prevention and control (IPC) practices—such as appropriate use of personal protective equipment (PPE), safe specimen handling, and standardized triage protocols—protects both staff and patients while preserving trust in health facilities [31-32].

Supportive hematologic care is equally critical. Aggressive fluid management, blood product transfusion, and correction of coagulation abnormalities help mitigate the profound vascular leakage and disseminated intravascular coagulation that drive EVD mortality. The integration of monoclonal antibody therapies such as REGN-EB3 (Inmazeb) and mAb114 (Ebanga) into treatment protocols has further improved survival, particularly when administered early. Continued research to refine dosing, identify potential antiviral combinations, and improve access in low-resource settings remains an urgent priority [33-34]. On the preventive front, vaccination strategies have transformed the landscape of Ebola control. The rVSV-ZEBOV (Ervebo) vaccine, deployed through ring vaccination campaigns, has demonstrated high efficacy in protecting contacts and healthcare workers. Strengthening cold-chain logistics, expanding stockpiles, and supporting the development of next-generation multivalent vaccines are essential to maintaining readiness against future outbreaks and emerging *Ebolavirus* species [35].

Beyond the clinical domain, robust surveillance and rapid response systems are indispensable. Investments in genomic sequencing, geospatial mapping, and artificial intelligence–assisted prediction models allow for earlier detection of outbreaks and more precise targeting of interventions. Mobile laboratories, drone-supported supply chains, and cross-border information sharing have proven particularly valuable in remote or conflict-affected regions, where delayed reporting can have catastrophic consequences.36 Community engagement and risk communication remain foundational to the success of these strategies. Sustained dialogue with community leaders, faith-based organizations, and survivors fosters trust, counters misinformation, and encourages participation in vaccination and contact-tracing initiatives. Incorporating local cultural practices into safe burial procedures and caregiving protocols ensures that interventions are not only effective but also respectful and sustainable [37]. Long-term capacity building is essential to break the cycle of panic and neglect that often follows major outbreaks. Strengthening primary healthcare infrastructure, training local laboratory personnel, supporting survivor follow-up programs, and establishing regional research networks create a resilient framework that can respond to Ebola and other emerging pathogens. International collaboration, consistent funding, and political commitment are critical to sustaining these gains and preventing future crises [38].

Recommendations

The successful control and long-term management of EVD depend on a set of coordinated actions that bridge clinical care, hematologic understanding, and public health policy. Based on the evidence reviewed, several key recommendations emerge to strengthen outbreak preparedness and improve patient outcomes. First, early detection and rapid intervention must remain the highest priority. Governments and international health partners should invest in decentralized diagnostic capacity, ensuring that

portable molecular and antigen-based tests are available at primary healthcare facilities and border entry points. Rapid identification of cases not only accelerates treatment but also limits community transmission, particularly in rural or high-mobility settings.

Second, integration of hematologic monitoring into routine EVD care is critical. Given the central role of coagulopathy, thrombocytopenia, and endothelial dysfunction in disease progression, treatment centers should adopt standardized protocols for coagulation testing and platelet monitoring, even in resource-limited settings. Early recognition of hematologic complications allows timely transfusion support, anticoagulation management where appropriate, and more accurate prognostic assessment.

Third, expansion of vaccine coverage and therapeutic accessibility is essential for sustained control. The rVSV-ZEBOV (Ervebo) vaccine has proven highly effective, but its impact depends on reliable cold-chain infrastructure, community acceptance, and sufficient stockpiles. Ring vaccination strategies should be complemented by ongoing development of multivalent vaccines to protect against diverse *Ebolavirus* species. At the same time, monoclonal antibody therapies should be incorporated into national treatment guidelines, with international partnerships ensuring affordable and equitable supply during outbreaks.

Fourth, community engagement must be institutionalized as a core component of outbreak preparedness rather than a reactive measure. Health authorities should maintain continuous dialogue with community leaders, survivors, and local organizations to promote trust and encourage participation in preventive measures such as safe burial practices, vaccination, and early care-seeking. Educational campaigns should address stigma and misinformation, using culturally tailored messages delivered through trusted local networks. Fifth, strengthening health system resilience is vital for long-term preparedness. This includes training healthcare workers in infection prevention and control (IPC), upgrading laboratory networks, improving surveillance systems, and establishing cross-border communication platforms to facilitate rapid data sharing during outbreaks. Investments made during emergency response phases should be maintained during inter-epidemic periods to prevent the erosion of capacity. Sustained international collaboration and funding are imperative to avoid the cycle of crisis-driven response followed by neglect. Global health agencies, donor organizations, and national governments should prioritize continuous support for research, vaccine development, and survivor follow-up programs, ensuring that lessons from past outbreaks inform future policies (Table 1).

Table 1: Tabular Summary of Key Recommendations

Focus Area	Key Recommendation	Rationale/Expected Impact
Early Detection and Diagnosis	Expand decentralized access to rapid molecular and antigen-based tests at primary healthcare facilities and border points.	Enables early case identification, accelerates treatment, and limits community transmission.
Hematologic Monitoring	Integrate routine coagulation and platelet testing into EVD management protocols, even in resource-limited settings.	Facilitates timely detection and management of coagulopathy and thrombocytopenia, improving prognosis.
Vaccination	Strengthen ring vaccination campaigns and maintain sufficient rVSV-ZEBOV (Ervebo) stockpiles while supporting development of multivalent vaccines.	Provides high levels of protection, reduces outbreak size, and prepares for emerging *Ebolavirus* species.
Therapeutic Access	Incorporate monoclonal antibodies (e.g., REGN-EB3, mAb114) into national treatment guidelines and secure affordable supply chains.	Reduces mortality when administered early and enhances clinical outcomes.
Community Engagement	Institutionalize continuous dialogue with community leaders, survivors, and local organizations; deliver culturally tailored education campaigns.	Builds trust, counteracts misinformation, and promotes safe practices such as early care-seeking and safe burials.
Health System Strengthening	Train healthcare workers in infection prevention and control (IPC), upgrade laboratories, and establish cross-border surveillance networks.	Improves outbreak preparedness, enhances case management, and facilitates rapid data sharing.
Global Collaboration and Funding	Ensure sustained international partnerships and consistent financing for research, vaccines, and survivor programs.	Maintains readiness between outbreaks and prevents capacity loss after emergency phases.

CONCLUSION

Ebola virus disease remains a formidable global health challenge, characterized by profound hematologic disturbances, high mortality, and complex socio-cultural dynamics that influence outbreak control. The interplay of coagulopathy, thrombocytopenia, endothelial dysfunction, and immune dysregulation drives both the clinical severity and the diagnostic and therapeutic challenges of EVD. Significant advances in public health, including rapid diagnostic tools, monoclonal antibody therapies, vaccination campaigns, and AI-assisted surveillance, have transformed outbreak

preparedness and response. However, persistent challenges—ranging from fragile health systems and logistical barriers to community mistrust and stigma—underscore the necessity of integrated, multidisciplinary strategies. Community engagement, culturally sensitive communication, and sustained international collaboration are as critical as biomedical interventions in ensuring the success of these efforts.

REFERENCES

1. Moghadam, S. R., Omidi, N., Bayrami, S., Moghadam, S. J., & SeyedAlinaghi, S. (2015). Ebola viral disease: A review literature. *Asian Pacific Journal of Tropical Biomedicine, 5*(4), 260–267.
2. Weyer, J., Grobbelaar, A., & Blumberg, L. (2015). Ebola virus disease: History, epidemiology and outbreaks. *Current Infectious Disease Reports, 17*, 1–8.
3. Omoleke, S. A., Mohammed, I., & Saidu, Y. (2016). Ebola viral disease in West Africa: A threat to global health, economy and political stability. *Journal of Public Health in Africa, 7*(1).
4. Nicastri, E., Kobinger, G., Vairo, F., Montaldo, C., Mboera, L. E., Ansunama, R., Zumla, A., & Ippolito, G. (2019). Ebola virus disease: Epidemiology, clinical features, management, and prevention. *Infectious Disease Clinics of North America, 33*(4), 953–976.
5. Goeijenbier, M., Van Kampen, J. J. A., Reusken, C. B. E. M., Koopmans, M. P. G., & Van Gorp, E. C. M. (2014). Ebola virus disease: A review on epidemiology, symptoms, treatment and pathogenesis. *Netherlands Journal of Medicine, 72*(9), 442–448.
6. Chang, J. C. (2017). Viral hemorrhagic fevers due to endotheliopathy-associated disseminated intravascular microthrombosis and hepatic coagulopathy: Pathogenesis based on "two activation theory of the endothelium." *Clinical Microbiology and Infectious Diseases, 2*(2), 1–6.
7. Zampieri, C. A., Sullivan, N. J., & Nabel, G. J. (2007). Immunopathology of highly virulent pathogens: Insights from Ebola virus. *Nature Immunology, 8*(11), 1159–1164.
8. Nwabuko, O. C., Chikezie, J. A., & Nnaji, T. O. (2020). Ebola haemorrhagic disease: Sero-epidemiology and where haematology comes into play in the diagnosis. *International Journal of Medical Reviews and Case Reports, 4*(1), 4.
9. Ngatu, N. R., Kayembe, N. J., Phillips, E. K., Okech-Ojony, J., Patou-Musumari, M., Gaspard-Kibukusa, M., Madone-Mandina, N., Godefroid-Mayala, M., Mutaawe, L., Manzengo, C., & Roger-Wumba, D. (2017). Epidemiology of ebolavirus disease (EVD) and occupational EVD in health care workers in Sub-Saharan Africa: Need for strengthened public health preparedness. *Journal of Epidemiology, 27*(10), 455–461.
10. Wilkason, C., Lee, C., Sauer, L. M., Nuzzo, J., & McClelland, A. (2020). Assessing and reducing risk to healthcare workers in outbreaks. *Health Security, 18*(3), 205–211.
11. Raftery, P., Condell, O., Wasunna, C., Kpaka, J., Zwizwai, R., Nuha, M., Fallah, M., Freeman, M., Harris, V., Miller, M., & Baller, A. (2018). Establishing Ebola virus disease (EVD) diagnostics using GeneXpert technology at a mobile laboratory in Liberia: Impact on outbreak response, case management and laboratory systems strengthening. *PLoS Neglected Tropical Diseases, 12*(1), e0006135.
12. Dhama, K., Karthik, K., Khandia, R., Chakraborty, S., Munjal, A., Latheef, S. K., Kumar, D., Ramakrishnan, M. A., Malik, Y. S., Singh, R., & Malik, S. V. S. (2018). Advances in designing and developing vaccines, drugs, and therapies to counter Ebola virus. *Frontiers in Immunology, 9*, 1803.
13. Goeijenbier, M., Van Kampen, J. J. A., Reusken, C. B. E. M., Koopmans, M. P. G., & Van Gorp, E. C. M. (2014). Ebola virus disease: A review on epidemiology, symptoms, treatment and pathogenesis. *Netherlands Journal of Medicine, 72*(9), 442–448.
14. Liu, D. X., Pahar, B., Perry, D. L., Xu, H., Cooper, T. K., Huzella, L. M., Hart, R. J., Hischak, A. M., Bernbaum, J., Claire, M. S., Byrum, R., et al. (2023). Depletion of bone marrow hematopoietic cells in ebolavirus-infected rhesus macaques: A possible cause of hematologic abnormalities in ebolavirus disease. *The American Journal of Pathology, 193*(12), 2031–2046.
15. Tadevosyan, A., Navarro, J. C., Rasheed, I. Y., & Kumar, M. A. (2019). Hematological management of neurocritical care patients. In *Textbook of neuroanesthesia and neurocritical care: Volume II—Neurocritical care* (pp. 217–239).
16. van der Ven, A. J., Netea, M. G., van der Meer, J. W. M., & de Mast, Q. (2015). Ebola virus disease has features of hemophagocytic lymphohistiocytosis syndrome. *Frontiers in Medicine, 2*, 4.
17. Bray, M., & Geisbert, T. W. (2005). Ebola virus: The role of macrophages and dendritic cells in the pathogenesis of Ebola hemorrhagic fever. *The International Journal of Biochemistry & Cell Biology, 37*(8), 1560–1566.
18. Uyeki, T. M., Mehta, A. K., Davey, R. T., Jr., Liddell, A. M., Wolf, T., Vetter, P., Schmiedel, S., Grünewald, T., Jacobs, M., Arribas, J. R., Evans, L., et al. (2016). Clinical management of Ebola virus disease in the United States and Europe. *The New England Journal of Medicine, 374*(7), 636–646.
19. Sprecher, A., Van Herp, M., & Rollin, P. E. (2017). Clinical management of Ebola virus disease patients in low-resource settings. In *Marburg- and ebolaviruses: From ecosystems to molecules* (pp. 93–113).
20. Lo, M. K., Spengler, J. R., Erickson, B. R., & Spiropoulou, C. F. (2019). Developing therapeutics

for Ebola virus disease: A multifaceted approach. In *Neglected tropical diseases: Drug discovery and development* (pp. 49–91).
21. Ziai, W. C., & Lewin, J. J., III. (2008). Update in the diagnosis and management of central nervous system infections. *Neurologic Clinics, 26*(2), 427–468.
22. Effiom, B. E., Effiom, A. B., Uwa, N. N., Inyang, F. B., Eso, I. J., Elizabeth, G. A., & Alderline, B. B. (2025). Counselling on Healthcare Management: Imperative on the use of Modern, Technology in Saving Life in Esierebom Primary Health Centre, Calabar South Local Government Area, Cross River State, Nigeria. *IOASD Journal of Medical and Pharmaceutical Sciences, 2*(2), 100-102.
23. Muñoz-Fontela, C., & McElroy, A. K. (2017). Ebola virus disease in humans: Pathophysiology and immunity. In *Marburg- and ebolaviruses: From ecosystems to molecules* (pp. 141–169).
24. Patel, A., D'Alessandro, M. M., Ireland, K. J., Burel, W. G., Wencil, E. B., & Rasmussen, S. A. (2017). Personal protective equipment supply chain: Lessons learned from recent public health emergency responses. *Health Security, 15*(3), 244–252.
25. Vivalya, B. M., Ayodeji, O. A., Bafwa, Y. T., Muyisa, L. K., Piripiri, A. L., & Mbeva, J. B. (2021). Analysis of the management of the tenth Ebola virus disease outbreak in the Democratic Republic of Congo: Developing a multidisciplinary response model to strengthen the healthcare system during disease outbreaks. *Globalization and Health, 17*, 1–7.
26. McEntire, C. R., Song, K. W., McInnis, R. P., Rhee, J. Y., Young, M., Williams, E., Wibecan, L. L., Nolan, N., Nagy, A. M., Gluckstein, J., & Mukerji, S. S. (2021). Neurologic manifestations of the World Health Organization's list of pandemic and epidemic diseases. *Frontiers in Neurology, 12*, 634827.
27. Musa, E., Nasidi, A., Shuaib, F., Nguku, P. M., & Vaz, R. G. (2016). Nigeria's Ebola outbreak response: Lessons for future epidemic preparedness. *Archives of Medicine, 8*(6).
28. Jacob, S. T., Crozier, I., Fischer, W. A., II, Hewlett, A., Kraft, C. S., Vega, M. A., Soka, M. J., Wahl, V., Griffiths, A., Bollinger, L., & Kuhn, J. H. (2020). Ebola virus disease. *Nature Reviews Disease Primers, 6*(1), 13.
29. Gatiso, T. T., Ordaz-Németh, I., Grimes, T., Lormie, M., Tweh, C., Kühl, H. S., & Junker, J. (2018). The impact of the Ebola virus disease (EVD) epidemic on agricultural production and livelihoods in Liberia. *PLoS Neglected Tropical Diseases, 12*(8), e0006580.
30. Nicastri, E., Kobinger, G., Vairo, F., Montaldo, C., Mboera, L. E., Ansunama, R., Zumla, A., & Ippolito, G. (2019). Ebola virus disease: Epidemiology, clinical features, management, and prevention. *Infectious Disease Clinics of North America, 33*(4), 953–976.
31. Ziai, W. C., & Lewin, J. J., III. (2008). Update in the diagnosis and management of central nervous system infections. *Neurologic Clinics, 26*(2), 427–468.
32. Obeagu, E. I. (2026). Hematologic Fallout: A Review of Anemia in Communities Exposed to Gas Flaring and Petrochemical Pollution. *IOASD Journal of Medical and Pharmaceutical Sciences, 3*(2), 64-72.
33. Cummings, K. J., Choi, M. J., Esswein, E. J., de Perio, M. A., Harney, J. M., Chung, W. M., Lakey, D. L., Liddell, A. M., & Rollin, P. E. (2016). Addressing infection prevention and control in the first U.S. community hospital to care for patients with Ebola virus disease: Context for national recommendations and future strategies. *Annals of Internal Medicine, 165*(1), 41–49.
34. Kouadio, K., Okeibunor, J., Nsubuga, P., Mihigo, R., & Mkanda, P. (2016). Polio infrastructure strengthened disease outbreak preparedness and response in the WHO African Region. *Vaccine, 34*(43), 5175–5180.
35. World Health Organization. (2014). *Ebola virus disease preparedness strengthening team: Ethiopia country visit, 1–8 December 2014*. World Health Organization.
36. World Health Organization. (2018). *Managing epidemics: Key facts about major deadly diseases*. World Health Organization.
37. Chowell, G., & Nishiura, H. (2014). Transmission dynamics and control of Ebola virus disease (EVD): A review. *BMC Medicine, 12*, 196.
38. Calnan, M., Gadsby, E. W., Kondé, M. K., Diallo, A., & Rossman, J. S. (2018). The response to and impact of the Ebola epidemic: Towards an agenda for interdisciplinary research. *International Journal of Health Policy and Management, 7*(5), 402–411.