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Ebola in Africa: From Recurrent Outbreaks to a New Era of Cross-Border Transmission and Pandemic Preparedness

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ABSTRACT

Ebola virus disease (EVD) continues to pose a significant challenge as an emerging infectious disease in Africa, presenting with difficulty in urgency, high fatality rates and transmission through health systems. Even though improvements have been introduced across various aspects in the medical field, such advancements have not been able to eliminate existing challenges. In 2026, the Democratic Republic of the Congo (DRC) and Uganda suffered outbreaks of the Bundibugyo virus, showing a certain level of chance for potential spread of the disease. The outbreak in the DRC, however, continued across provinces and resulted in the largest outbreak in the history of EVD noted in the country. The key reason of the widening of the outbreak was the absence of the vaccine against Bundibugyo virus as well as antiviral therapy. This paper assesses the development of the Ebola crisis in Africa, looking at epidemic transmission, clinical characteristics, problems with diagnosis, differences in the virus, and improvements in treatment and vaccination. Special emphasis has been placed on the Bundibugyo outbreak that took place in 2026. The paper contends that effective control of the Ebola epidemics requires an integrated system that combines quick diagnostics, genomic surveillance, and adaptable methods of medical treatment and engagement of the community.

Keywords: Ebola Virus Infection; Bundibugyo Virus; Continent of Africa; Newly Emerging Infectious Diseases; The Category of Viral Hemorrhagic Fever; Preparedness for Disease Outbreak; Vaccinations and use of Monoclonal Antibodies

Introduction

Ebola virus disease is one of the prominent infectious-disease risks of epidemic emergence within Africa. Its initial discovery occurred in 1976 in the midst of concurrent outbreaks happening in today's Democratic Republic of the Congo and South Sudan. Ebola has since appeared numerous times in the Central and West African region with some outbreaks being quite localized and confined while others turning into large-scale epidemics and involving thousands of cases. The 2013-2016 epidemic in West Africa significantly altered global perception of Ebola as it proved that the disease that was in the past associated with remote rural outbreaks could spread through densely populated cities, cross borders, overburden health systems of various countries and result in cases appearing outside African continent [1,2]. It resulted in more than 28000 reported cases and more than 11000 deaths and triggered landmark investments in Ebola vaccines, treatments and diagnostics [3]. The epidemiological profile of Ebola has been changing since the West Africa outbreak. The DRC has seen multiple outbreaks and had a major outbreak between 2018-2020 in North Kivu and Ituri. Uganda has had outbreaks resulting from both Sudan and Bundibugyo viruses. All this indicates that Ebola should not be viewed as just a zoonotic disease with intermittent human infections and that the expansion of outbreaks results from the interactions of viral properties and humans' activities [1,3].

This complexity is most evident in the ongoing outbreak of 2026. In May 2026, the outbreak of Bundibugyo was reported in both Uganda and the Democratic Republic of the Congo. The World Health Organization declared the 17th of May 2026 as a Public Health Emergency of International Concern which is a case of great severity and highly contagious nature [4]. The outbreak spread just as much in the DRC too. According to the reports from the WHO, by 12 August

2026, February 6 had 4,665 confirmed cases and 2,184 deaths in DRC which has been reported across 54 health regions spread across six provinces. Reports from WHO on the African Region during August suggested that the number of cases had crossed the 5,200 mark and transmission was still going on [4]. The latest outbreak holds great significance as it brings into question the previously developed beliefs regarding the efficacy of modern Ebola countermeasures. Unlike Zaire ebolavirus, for which there have been created licensed vaccines as well as monoclonal antibody-based therapies, Bundibugyo virus remains without a specific vaccine and cure approved by authorities (Talking About the Ebola Virus Outbreaks, 2026) [5]. Consequently, the occurrence opens up significant opportunities for the evaluation of the Ebola virus as a pathogen and a danger from the perspective of the systems approach. To understand all the consequences of the Ebola virus, the use of virology, pathogenesis, epidemiology, diagnostics, therapeutics, vaccination, society's involvement, and health care system of the region is necessary.

Ebola Virus and its Changing Epidemiological Landscape

Belonging to the family Filoviridae, Ebola viruses are negative-stranded RNA viruses that are filamentous and have a protective envelope. Human disease has been caused by a few Ortho ebolavirus species, which vary in their clinical and epidemiological characteristics [1]. While the Zaire ebolavirus has accounted for most diagnosed infections in humans and enjoys the reputation of causing the biggest outbreaks, the Sudan virus and the Bundibugyo virus have also had their share of outbreaks. Uganda was the site of the first Bundibugyo virus outbreak in the years 2007-2008, helping to establish this virus as a separate cause of hemorrhagic fever in humans, while also demonstrating the possibility of the occurrence of Ebola outbreaks caused by different strains of the virus [5]. Ebola's ecological origin is not fully known. Fruit bats appear to be a plausible reservoir of the Ebola virus based on ecological studies, but the ecology of the reservoir and the spillover mechanisms have yet to be identified [2,6]. Humans get infected after being exposed to infected animals or other contaminated sources, and after that, transmission mainly occurs between humans. This is relevant from an epidemiological perspective because the initial zoonotic spillover is different from the mechanism of subsequent human-to-human transmission. Once human transmission is initiated; the spread of Ebola relies on the healthcare infrastructure and social networks involved. Transmission occurs readily when symptomatic patients receive treatment in the absence of infection prevention measures, health staff are exposed, corpses are handled improperly, and patients travel from one community to another. The West African epidemic is an example of how living in a very dense population and moving freely makes it possible for Ebola to spread from rural villages where Ebola outbreaks used to occur [3].

Clinical Disease and Pathogenesis

Ebola disease occurs after an incubation phase of up to 21 days and can be recognized through its first non-specific symptoms of fever, weakness, fatigue, headache, body aches, and general malaise. After that, gastrointestinal signs such as diarrhea and vomiting may occur, and in severe cases, dehydration, disturbances in electrolytes, shock, and organs' failure can appear with time [1,2]. Ebola is frequently referred to as viral hemorrhagic fever, but not all patients exhibit bleeding in their illnesses and bleeding is not a requirement for the experience of a serious disease. In fact, clinical symptoms of Ebola are very similar to those demonstrated in patients with diseases causing febrile syndrome, such as malaria, bacterial sepsis, typhoid fever, and other viral infections. The development of severe Ebola disease is characterized by the extreme replication of the virus and a strong impairment of host immune and vascular systems. The Ebola virus attacks various immune cells including dendritic cells, macrophages, and monocytes, which leads to the disruption of innate antiviral immune processes. These disruptions create a problem in an early immune reaction, making the inflammatory processes excessive later on in the disease [1,7].

It is also worth noting that vascular dysfunction, blood coagulation problems, and inflammation can lead to shock and failure of several organ systems. Therefore, severe Ebola disease is the result of virus-related processes and the uncontrolled response of the host's immune system rather than a simple hemorrhage. The immune response plays a role in the outcome as well. Those individuals who survive experience powerful adaptive immune responses, while people who die tend to have deficient early immune responses. The studies of these mechanisms have been critical for vaccine and antibody therapy development [1].

Transmission, Healthcare Exposure, and the Human Dimension

When people get sick with Ebola, the illness spreads mainly from person to person because the infected person's body fluid is in contact with someone else's blood or body fluids, including the period when the infected person is showing the signs of the disease. This is due to the increasing viral load in the infected person's body fluids, the longer the disease has progressed. For this reason, health workers may be seriously endangered while treating seriously ill Ebola patients in the absence of proper protective gear, isolation wards, staff, or infection control materials [2]. The spread of Ebola through healthcare facilities was a significant factor in earlier outbreaks in Africa. The health facilities helped the spread of the disease during the recent outbreak in West Africa between 2013 and 2016, because many people avoided healthcare for fear of Ebola infection [3]. It led to indirect effects beyond Ebola, adversely affecting maternal health, child health and vaccinations, malaria treatment and other services. Ebola transmission has one more angle, which is the post-recovery period.

Ebola virus RNA can be found even after the disappearance of an infection from the blood because it remains in immune-privileged sites. Survivors of the outbreak in West Africa have shown that viral RNA continued to be detected in the semen, with evidence of sexual

transmission in cases of survivors' prolonged viral presence in their bodies [8,9]. However, being a survivor in this case does not mean that people keep transmitting Ebola; it just shows the significance of proper follow-up, counseling, and reproductive-health advice of recovered patients. The role of the social aspect of the epidemic is also important. For example, responsible caring for sick relations, different customs associated with burials, fear of being isolated, misinformation, stigma towards the disease and authorities, distrust of the government, and previous experience with the healthcare system can affect whether a person will be able to receive medical treatment or not. Thus, a community reaching out is not just a method of communication but an intervention in epidemiology and it has been shown once again by the recent outbreak in the DRC [10].

The 2026 Bundibugyo Virus Outbreak: A New Warning for Africa

The outbreak of 2026 is particularly significant because it is caused by the Bundibugyo virus, an Ebola type for which the field of medical countermeasures is less developed than the one for Zaire ebolavirus. The outbreak has been declared in the DRC and Uganda in May 2026 and on May 17th, the WHO has stated that the event is now a Public Health Emergency of International Concern [4]. Initially, the outbreak started in Mongbwalu health zone located in Ituri Province and continues to spread to many areas. According to the World Health Organization, as many as 4,655 cases were reported in the Democratic Republic of Congo with 2,184 lives lost by August 12, 2026. This means that the number of people dying from the disease was roughly 46.8 % at this stage of the outbreak. There were cases ongoing across 54 health zones spread over 6 provinces, with at least 155 medical professionals being directly affected, comprising of 45 fatalities [5,10]. By August 24, the WHO reported that the epidemic crossed 5,200 cases in the continent of Africa [4]. It is alarming because it has already surpassed the case figures that were presented during the Ebola outbreak in DRC between 2018 and 2020. So, it can be stated that currently, the outbreak in question is the largest recorded outbreak in the country [4]. The rapid charge of the occurrence has taken place against the background of insecurity, displacement of the population, high mobility, and disturbances in health care [10].

Most of these cases are linked epidemiologically through travel from the DRC where secondary infections occurred amongst contacts and health care workers. Uganda declared the end of the outbreak on 28th July 2026 as they had met the required period without the emergence of a new locally transmitted confirmed case [11]. This case highlights the importance of early recognition, contact tracing, laboratory confirmation, provision of infection control measures and coordinated response between countries for preventing imported outbreaks establishing sustained community transmission. The difference between Iraq and Uganda illustrates the need for prior preparation prior to transmission becoming widespread. When the system for surveillance and contact tracing is overwhelmed, the ability to track cases becomes less effective [5]. As opposed to that, if cases are detected early on, it is possible to follow the contacts, thus containing a dangerous pathogen.

Diagnosis in the Era of Molecular Surveillance

A diagnosis remains key to controlling cases as the clinical features often mimic those from other diseases causing acute fever. A reverse-transcription polymerase chain reaction (RT-PCR) test is useful in identifying Ebola viral RNA while WHO's diagnostic guidelines underline the need to ensure appropriate laboratory tests are undertaken and maintain capacity during Ebola virus disease outbreaks [12]. Diagnostic challenges are not about individuals but about capacity during outbreaks. Laboratory capacity determines how rapidly we isolate, treat, link, and report back on suspected cases. We should expect an initial spike in case numbers with expanded testing as previously undetected infections become identified. However, the extent to which this occurs will depend upon our diagnostic capability. For example, during the 2026 DRC outbreak, the WHO stated "part of the increase seen was due to enhanced surveillance, testing and diagnostic capacities. Most of the increase has been related to true expansion of transmission" [10].

Genomic sequencing provides additional insights into outbreaks that may be useful during this particular case. Viral genomes can be used to establish whether cases are epidemiologically linked, differentiate between local spread and multiple introductions, and recognize clusters of viral transmissions. Combining genomic results with traditional epidemiologic investigations will provide critical clues for better understanding of patterns of viral transmission in these inter-connected populations and the movement of disease across both administrative and international boundaries.

Therapeutic Progress and the Remaining Medical Countermeasure Gap

Management approaches have also evolved significantly from the experience with the West African outbreak. While intensive supportive care including management of fluids/electrolytes, oxygenation, nutrition, shock and managing complications continues to form the bedrock of support for patients infected with the virus, there has been progress on developing more targeted forms of therapy to further enhance outcomes. This was evidenced by results of the randomized clinical trials undertaken to evaluate efficacy of monoclonal antibody-based therapies for treatment of Zaire ebolavirus disease. Patients receiving the two monoclonal antibody therapies tested - REGN-EB3 and MAb114 - experienced much higher rates of survival in comparison to those who received other investigational therapies (e.g., ZMapp or Remdesivir) in the randomized PALM study performed during the DRC outbreak [13]. This success has driven their availability as options for people diagnosed with Zaire ebolavirus disease.

Despite these advancements, it is critical to note that this approach can't necessarily be extrapolated across all viral strains caus-

ing EVD. As reported by WHO [5], "the Bundibugyo virus that caused the 2026 outbreak doesn't have a licensed vaccine or specific treatment. Candidate vaccines and therapeutics against this strain are being investigated". It therefore highlights a key therapeutic gap which arises at times of larger epidemics.

A recent publication provides some hope, after a 2026 study found evidence of detectable, though much lower level, cross-reactive antibody responses to a Bundibugyo virus antigen post-vaccination using licensed Zaire ebolavirus platform antigens [14], which was recently published in NEJM. But we caution readers not to interpret these results as providing proof of clinical protection by currently licensed vaccines against Bundibugyo virus.

There is an important difference between the demonstration of immunological "cross-reactivity" against various species within the genus Ebolavirus and demonstrating actual clinical effectiveness in preventing infection. And indeed, this distinction underscores what it has been writing about since the beginning of the outbreak—the importance of having ready medical countermeasures against all filovirus species, not just those originally designed for Zaire ebolavirus.

Vaccination and the Lessons of Previous Outbreaks

The development of vaccines has been arguably one of the greatest triumphs in emerging infectious diseases research. A recombinant vesicular stomatitis virus vaccine expressing Zaire ebolavirus glycoprotein displayed high efficacy upon administration using ring-vaccination strategy during the West African epidemic in Guinea [15]. Therefore, this vaccine becomes an important element to consider in the control strategies employed for outbreaks related to Zaire ebolavirus disease. Currently, the World Health organization acknowledges that Ervebo which has been licensed and WHO pre-qualified remains the only vaccine currently available for use on the treatment of Ebolavirus Diseases brought about by Zaire ebolavirus [16] In particular, this platform is deployed in outbreak scenarios where targeted vaccinations are provided to contacts and contacts of contacts (WHO 2026g). As noted previously, a separate heterologous two-dose regimen based on Ad26.ZEBOV and MVA-BN-Filo was shown to have robust immunogenicity and had been integrated into strategies aimed at preventing Bundibugyo virus disease among those considered at-risk of such exposure [17].

Notably, vaccine effectiveness may be limited to specific species. A vaccine produced for targeting Zaire ebolavirus will not necessarily offer broad immunity towards other forms of ebolavirus such as Bundibugyo. During the 2026 outbreak, this species-specific nature of effective vaccines becomes quite pertinent given there exists no licensed candidate for the latter. Thus, researchers and public health authorities alike must now determine if these can offer some level of partial protection pending further investigations coupled with accelerated efforts towards developing and evaluating Bundibugyo-specific options. Taken together with these findings, there is an urgent need for future vaccine development efforts to focus on platform technologies capable of rapid adaptation to emergent filoviruses as well as clinical trial frameworks which can be promptly initiated during outbreak periods. Finally, while promising, current data are inadequate to demonstrate the efficacy of existing vaccines against Bundibugyo virus [14].

Ebola, Conflict, and Health-System Fragility

One of the biggest lessons learned from outbreaks of Ebola virus disease in Africa is that pathogen biology is no guarantee of how large an epidemic might become just as much if not more important are the health system's ability to respond, the political climate and general state of security and people's confidence in their governments and healthcare providers. The ongoing DRC outbreak is unfolding in the context of a humanitarian crisis, population displacement and insecurity combined with limitations to accessing healthcare services. Attacks on healthcare facilities have impeded both surveillance and response efforts while deterring individuals from seeking healthcare when they need it most [10]. These conditions could feed into each other in what may be referred to as "a positive feedback loop", whereby insecurity restricts healthcare access which slows down diagnoses but facilitates continued virus spread thereby worsening the impact on healthcare infrastructure. This was also the case during the recent 2018-2020 epidemic of Ebola in eastern DRC, when insecurity and mistrust hampered responses at critical points. Lessons we've drawn apply well beyond Ebola; emerging infectious diseases thrive amidst systemic health sector challenges. Strengthening laboratory capacity and infection prevention systems as well as investing in trained healthcare workers, emergency transport mechanisms, primary healthcare infrastructures, robust surveillance capabilities and building community-level trust should all feature prominently in strategies to prepare for pandemics.

Cross Border Transmission and Regional Preparedness

This 2026 case shows how critical regional preparedness can be for containing outbreaks beyond national borders. The DRC and Uganda share many connections including through trade, migration, family ties, healthcare seeking, and other forms of population movement. It also highlights that, despite geographical concentration in the original outbreak site, the spread of infection by movement of persons carrying Ebolavirus could lead to its introduction into neighboring countries. While Uganda successfully contained all cases of the imported Bundibugyo virus, with WHO documenting both the imported cases from the DRC as well as subsequent infections amongst their contacts and health care workers, no evidence of ongoing transmission was found prior to the declaration of the end of this outbreak [11]. Because there is limited overlap between geographical regions and national borders, a coordinated regional approach becomes especially relevant. In this regard, it should be noted that the actions may include the creation of a laboratory network, entry monitoring, transferring to appropriate institutions, and emergency response mechanisms.

From Ebola Response to Pandemic Preparedness

Ebola has provided many valuable lessons about the emergence of these types of infectious diseases. The West African Ebola epidemic taught us the importance of early detection and response capacities; subsequent outbreaks have emphasized the impact that advances such as vaccines, monoclonal antibodies, diagnostics, and outbreak coordination strategies can play in mitigating their effects.

More recently, the 2026 Bundibugyo outbreak showed how preparedness needs to factor in viral diversity. Even though the nation had learned much about responding to the previous Ebola outbreaks, having trained responders, treatment protocols, and access to a vaccine against this particular species did little good against another virus altogether. Future preparedness efforts must focus more on building adaptable platforms instead of specific preparedness measures targeting one specific pathogen. Diagnostics need to be able to identify various filoviruses, vaccine platforms will need to allow for quick adaptation to various species, and therapeutic development efforts need to explore common viral targets or develop broadly active antibodies. Genomic surveillance could even be integrated into routine outbreak intelligence gathering instead of being considered a research endeavor [1,3]. Enhancing the capacity of locals down the line will make sure that the African nations do not rely solely on international teams when the outbreak starts. Preparedness that can last means having local qualified personnel in the fields of epidemiology, laboratory work, medical treatment, infection prevention, community health workforce, and emergency response teams. It can also lead to better engagement with the local population, as leaders operate and reside in the area.

Conclusion

The historical evolution of our understanding of Ebola virus disease in Africa illustrates how scientific advances can transform the dynamics of an epidemic. however, even with the advent of vaccines, monoclonal antibodies, molecular diagnostics, genomic sequencing, and improvements in supportive care, the 2026 Bundibugyo virus outbreak demonstrated that effective medical countermeasures are still highly species specific, and insecurity, population movement, and healthcare disruptions continue to create opportunities for Ebola virus transmission. The DRC's current Ebola outbreak is now the biggest documentation in the country. By august 2026, more than 5,200 cases were reportedly diagnosed [4], and its spread into various provinces shows that Ebola continues to pose challenges to health systems as well as to virology. This article discusses the implications of these events for improving Ebola preparedness going forward. We argue that, as Ebola virus evolves, Ebola preparedness efforts must do likewise if we hope to bring this deadly pathogen under control. this means developing an integrated approach to Ebola control that includes rapidly available diagnostics, genomic surveillance, adaptable vaccines, therapeutics, resilient health systems, and coordinated action between nations affected by Ebola virus emergence. Finally, the 2026 Bundibugyo virus outbreak should be considered less just a continuing emergency but as a potential opportunity to enhance Africa's capabilities for detecting, investigating, and containing future emerging infectious diseases before they escalate to regional or international public health emergencies [18].

Ethical Approval

The author declares that he is committed to upholding the integrity of the scientific record and adhering to discipline-specific rules for acquiring, selecting, and processing data.

Conflict of Interests

The author did not reveal any conflicts of interest.

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