

Brief Report

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The Need to Establish and Sustain Public Health Emergency Operation Centers for Managing Infectious Disease Outbreaks: Lesson From Response to Louse-Borne Relapsing Fever Outbreak in Jimma, Ethiopia

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Abstract

The coronavirus disease 2019 (COVID-19) pandemic has provided a great lesson for the globe about the necessity and significance of pandemics-related preparedness in all settings. Public health emergency operation centers play critical roles in preparing for and responding to public health events and emergencies by coordinating and pooling resources. In this article, we aimed to share lessons learnt from the public health response to the louse-borne relapsing fever (LBRF) outbreak coordinated by the emergency operation center established to respond to the COVID-19 pandemic in Jimma, Ethiopia.

After the major waves of COVID-19 outbreaks in Ethiopia were over, Jimma University Medical Center (JUMC) reported clusters of louse-borne relapsing fever cases from Jimma Main Prison. Accordingly, Jimma Emergency Operation Center (JEOP) established for the COVID-19 pandemic was immediately alerted and effectively coordinated the overall response.

As a result, the outbreak was contained within the prison without spreading to the community and the outbreak ended within a shorter period compared to previous LBRF outbreaks in Ethiopia. This indicates the necessity of establishing and sustaining public health emergency operation centers to prepare for and combat potential future public health emergencies.

Background

Emerging infectious diseases (EID) are rapidly increasing in incidence and geographic ranges accounting for at least 15% of all human pathogens.¹ When compared to other human diseases, EID may be unpredictable with the potential for outbreaks and spreading to the population level.² EIDs are significant burden to global economies and public health and outbreaks of emerging or re-emerging infectious diseases are happening more frequently than before as evidenced by Severe Acute Respiratory Syndrome (SARS) in 2003, Influenza A H1N5 (bird flu) in 2007, H1N1 (swine flu) in 2009, and MERS in 2012, as well as Ebola in 2014, and COVID-19 in 2019.^{1,3}

International Health Regulations (IHR 2005) has set the requirements for establishing public health emergency operation centers with designated physical locations that enable the member countries to develop, strengthen, coordinate operational information, and resources needed for strategic management of public health emergencies of all types.⁴ The locations also help the countries maintain their capacity towards public health emergencies of national or international concerns.⁵ The emergency preparedness involves specific activities, funding, partnerships, and political commitments to sustain and enable effective responses that end with lessons for future improvements to public health emergencies.⁶

United Nations has called the COVID-19 pandemic “the greatest test that we have faced since the formation of the United Nations.”⁷ The pandemic has strained health systems, as well as social safety and emergency management architecture, and has also brought an enormous economic and political burden globally.⁸ When health systems are overwhelmed, both direct mortality from an outbreak, indirect mortality from vaccine-preventable, and treatable conditions dramatically increase due to health service interruptions.

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Similarly, the COVID-19 pandemic and actions taken against it by most countries in Africa have led to the disruption of control measures against existing and common infectious diseases. For instance, Ethiopia faced difficulties in sustaining malaria control measures,⁹ and experienced pockets of cholera outbreaks,¹⁰ and a surge in the number of cases of relapsing fever since the onset of the pandemic despite the remarkable progress witnessed in controlling common infectious disease over the past few decades.¹¹

Relapsing fever (RF) is an old disease already eradicated from most part of the world with recently reported cases being limited mainly to East African countries.¹² It is a vector-borne disease, the control of which needs interventions aimed to improving environmental sanitation and vector control. Louse-borne relapsing fever (LBRF), in particular, is a classic epidemic-prone type of RF transmitted by body lice.¹² Its occurrence is associated with war, famine, refugees, and poverty, as well as overcrowding, and poor personal hygiene. Treatment of cases can reduce the case fatality rate from 40% to 5%. However, Jarisch–Herxheimer complications may happen in 18 – 80% of the patients and contributed to increased mortality.¹²

The biggest and most recent LBRF outbreak in Ethiopia was recorded in Asella in 1991 after the Ethiopian civil war in the northern part when 389 people were infected and treated at Assela Hospital.¹³ This outbreak spreads to different members of the community and eventually to the schools following school opening after summer vacations. As a result, 109 (28%) school children were infected and admitted to Asella Hospital. This outbreak has ended with 3.6 % inpatient case fatality rate, 43% developed JHR, and 1.8% of the patients relapsed after completing treatments.¹³

In the last 2 decades, small-scale and sporadic outbreaks of LBRF have been reported from different parts of the country.^{13–17} However, the number of reported cases significantly declined in the past 10 years,¹⁸ probably due to the increased public health intervention, and community awareness about the disease. Hence, it is possible to assume that disruption of public health interventions against LBRF due to COVID-19 might have contributed to the emergence of the current LBRF outbreak.

Although measures taken to contain COVID-19 in most African countries have overstretched the already scarce health system resource, it has also forced countries to increase their level of preparedness, alertness, and response for re-emerging and emerging infectious diseases. Besides, a valuable lesson to prepare for a future pandemic and outbreak-prone diseases have been learned. In this paper, we present how the establishment of emergency operation centers (EOC) due to COVID-19 had helped to impede LBRF outbreaks. We tried to present the lesson learnt and describe the need to engage institutions to invest in establishing and sustaining public health emergency operation centers and enhancing all hazard approach capacity building.

Activation and Establishment of COVID-19 EOCs in Ethiopia

Following the global spread of COVID-19 and the declaration of the pandemic as a public health emergency of global concern, the Ethiopian government took prompt and numerous actions to mitigate the propagation of the pandemic and its economic impacts.¹⁹ At the top level, a 3- layered coordination platform was established and down-cascaded to all regional and city administrations. The Public Health Emergency Operation Center (PHEOC) was activated on January 27, 2020. It was aimed to

coordinate the preparedness and response efforts for the novel coronavirus (2019-nCov) using an Incident Management System (IMS). During the first 3 months of COVID-19 (March 15 to June 30, 2020), Ethiopia had limited capacity for managing COVID-19 cases; this included a lack of molecular diagnostic capacity at the local level. The country collaborated with universities and other stakeholders to expand the national PHEOC with laboratory diagnosis capacity to the regional institutions, sub-national, and private laboratories.¹⁹ A multi-sectoral level coordination was established and led by the National Disaster and Risk Management Committee (NDRMC) while the technical levels were led by PHEOC at Ethiopian Public Health Institute (EPHI).¹⁹ These collaborative actions with public and private universities for COVID-19 case detection and management, as well as conducting public health interventions, have helped the country to enhance local capacities to deal with the COVID-19 pandemic.

However, managing dual delivery of care, for both COVID-19 and non-COVID-19 patients, has been a key challenge for healthcare systems across the world particularly for resource-limited settings like Ethiopia. Disruption of essential health services due to the COVID-19 pandemic was documented in more than 94% of the countries surveyed by World Health Organization (WHO) between January and March, 2021.²

The disruption of routine and essential health services in Ethiopia has impacted access to health care services. As a result, in-patient and outpatient visits to health facilities significantly declined during the pandemic. Essential services (including PHC and preventive, promotive and curative care) were interrupted in most health facilities. In addition, service demand and uptake by the community fell sharply at all levels of the health system.^{20,21} This indicated the lack of proactive emergency response strategies which can support containment of public health emergencies while maintaining essential and primary health care (PHC) services.

Establishment of Jimma Emergency Operation Center (JEOC) and its Major Achievements

JEOC was established as part of expansion of the national PHEOC to regional institutions to respond for COVID-19 pandemic on March 13, 2020. JEOC was integrated with Jimma University Medical Center, a university hospital located in Jimma University's main campus, Jimma Town, Southwest Ethiopia. Initially, it was established as COVID-19 taskforce. Voluntary based recruitment of members and task sharing was accomplished during the initial phase of its establishment. The center is composed of management and operation sections. While the management team included scientific advisory council, the operation section consisted of 6 sub teams. The sub teams of the operation section were: (1) Isolation & case management, (2) Surveillance, (3) Risk communication & community engagement (RCCE), (4) Water, Sanitation, & Hygiene (WASH), and Infection Prevention Control (IPC) team, (5) Research, innovation, and diagnostics, and (6) Administration, data management and finance team.

The mandate given to JEOC was to ensure the establishment of systems at all levels for preparedness and immediate emergency response to core rapid response teams for all public health emergencies including the COVID-19 outbreak in southwest Ethiopia. The center also developed an organizational structure supported by Terms of Reference (TOR) which were then endorsed by the steering committees. The TOR helped to unify the activities and reporting system under JEOC. Furthermore, the establishment of JEOC has enabled networking with regional and national

partners and stakeholders to facilitate capacity-building activities on building public health emergency management.

Public health measures undertaken by JEOC during the pandemic were: (1) active case detection through a surveillance system, (2) contact tracing and quarantine, (3) risk communication and community engagement in the response using youth volunteers and media, (4) identifications of vulnerable populations and spot area mapping, (5) screening high-risk groups and fumigation of the anticipated threats of the pandemic, (6) information communication and regular update to all stakeholders, and (7) management of myths and misinformation about the pandemic and facilitating the development of local supplies for Non-pharmacologic interventions (NPIs) such as hand-sanitizers, face masks, and detergents.

For any public health emergencies, be it a disease outbreak, natural or manmade, JEOC has been working as a point of contact to coordinate the public health interventions.

Louse-Borne Relapsing Fever Outbreak in Jimma Main Prison and Public Health Response by JEOC

After major waves of COVID-19 outbreaks in Ethiopia were over, most public health emergency operation centers established to deal with COVID-19 were de-commissioned. Only a few PHEOCs including JEOC, were kept active with the capacity of rapid activation in case of public health emergencies. While JEOC was operating in watch mode with proactive surveillance for signs of public health emergencies from different sources, it received a report about a cluster of patients with signs and symptoms of relapsing fever from Jimma Main Prison in May 2022. After clinical and laboratory investigations, the cases were found to be LBRF outbreak. While the clinical intervention was being provided in JUMC, JEOC was tasked to coordinate the public health emergency response.

On May 7, 2022, the JUMC Emergency Department (ED) received 11 young men from Jimma Main Prison who presented with high-grade fever, headache, and myalgia. Among them, 3 presented with acute-onset massive epistaxis and blood-tingled vomiting, and other 2 cases with a petechial rash on the torso and lower extremities. Giemsa-stained blood film revealed *Borrelia recurrentis* in 4 of the patients. Other blood work-ups showed thrombocytopenia and elevated aspartate aminotransferase levels.¹¹

Presentation of this cluster of cases alerted the ED to review the reasons for the visit to the ED in the previous 10 days. This retrospective action led to the identification of 1 patient who presented from Jimma Main Prison to the ED with 5 days history of acute febrile illness (AFI). He was treated with in-patient antibiotics as blood film confirmed case of LBRF and discharged with improvement. However, the treating team did not alert the hospital about this case. Based on this evidence, the ED reported this to the hospital leadership which in turn led to the activation of JEOC.

The number of cases gradually increased to 36, with all patients having similar signs and symptoms. However, *Borrelia Spp.* was identified in only 14 (38.9%) of the patients. Nevertheless, all the 36 patients were promptly treated as cases of LBRF. Their management included oral doxycycline, paracetamol, and intravenous fluid. All patients were discharged with improvement after a mean length of hospital stay of 4.25 days (SD = 0.77), range of 2 – 6 days. There were no fever recrudescence, the occurrence of shock, JHR, or other complications.¹¹

The coordination and communication platform established due to COVID-19 has played a crucial role for the public health measures undertaken during the current LBRF outbreak. Treatment was given to the index cases and their close contacts. Public health measures that were undertaken during the LBRF outbreak involved case management, contact tracing, risk communication, and community engagements, as well as delousing campaigns which included shaving and washing the clothes of all patients and their contacts using hot water, and chemical sprays both in the prison and treatment center. Two days' sensitization training was also given to health professionals working at 6 nearby health facilities (2 hospitals, 4 health centers [including the Jimma Main prison's health clinic], and 1 health post) with financial support from Oromia Health Bureau (OHB).

Social media and other communication methods/ platforms like Email, WhatsApp, Telegram, and Zoom meetings, as well face-to-face communications have been used to update each other and facilitate public health interventions. A 1-day stakeholder meeting with the leaders of correctional facilities in Jimma Town, Police departments of Jimma Zone and Jimma Town, Jimma Zone Health Bureau, and leadership of Jimma Medical Center, was also done. These communication platforms enhanced swift communication and targeted interventions to control the outbreak.

This contributed to the containment of the outbreak within 2 weeks of the outbreak and recovery of all patients with no death, relapse, occurrence of shock, or development of any complications associated with JHR/other LBRF outbreaks, as well as discharge within a short hospital stay and no spread to the community. In contrast, previous similar outbreaks of LBRF in Ethiopia showed active spread of the infections for 20 days and above,¹⁴ and significant case fatality rates ranged from 3.6% to 13%.¹³⁻¹⁷

Although sporadic cases were reported during the recent LBRF outbreak until July 2022, 31 of the cases were treated in the first 2 weeks of the outbreak. Moreover, most of the cases were contained within the prison except 1 case which was reported from the community who has been in a close contact with prisoners. Keeping JEOC active, having a dedicated treatment center, clinical, and public health capabilities for the outbreak management, as well as multi-sectoral collaboration, and the lesson learned during the COVID-19 pandemic had helped in impeding the LBRF outbreak. Such a prompt approach helped in early control of the outbreak and effective management of the cases with no spillover to the community and other vulnerable institutions like schools and universities.

Conclusion

The establishment of a dedicated Public Health Emergency Operation Center (PHEOC) and sustaining its operations despite the decline in the number of COVID-19 cases have helped to impede LBRF outbreaks in Ethiopia. Hence, in epidemic-prone, disease ridden/ vulnerable, and resource-limited settings like Ethiopia, establishing and maintaining public health emergency operation centers with the capabilities of responding to disease outbreaks can limit the public health burden due to outbreaks. These lessons can be used in the response and management of other outbreaks like measles, cholera, malaria, and yellow fever, as well as dengue fever. Multi-sectorial collaboration and coordination focusing on capacity building at all levels are also essential to prepare for and respond to public health emergencies of any type.

Data availability. This is a review of the response on LBRF by JEOC; the necessary data were indicated in this article. However, additional data could be accessed from the corresponding author upon request.

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Authors contribution. (1) Conception of idea: EKG, TKC, EG, DY; (2) Drafting and revising of the manuscript: TKC, KNT, EKG, DY, EG, EAY, FA, GH; and (3) Final approval for submission: TKC, EKG, KNT, DY, EG.

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Abbreviations. AFI, Acute Febrile Illness; COVID-19, Coronavirus Disease 2019; EPHI, ED, Emergency Department; EID, Emerging Infectious Diseases, Ethiopian Public Health Institute; EOC, Emergency Operation Center; IMS, Incident Management System; IPC, Infection Prevention and Control; IHR, International Health Regulations; JEOC, Jimma Emergency Operation Center; JUMC, Jimma University Medical Center; LBRF, Louse-borne relapsing fever; NDRMC, National Disaster and Risk Management Committee; OHB, Oromia Health Bureau; PHEOCs, Public Health Emergency Operations Centers; PHC, Primary Health Care; RCCE, Risk Communication And Community Engagement; TOR, Terms of Reference; MERS, Middle East, Respiratory Syndrome; SARS, Severe Acute Respiratory Syndrome; WHO, World Health Organization

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