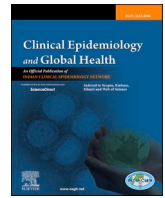




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Commentary

COVID-19, measles, and yellow fever: The need to reinforce vaccination in the Democratic Republic of Congo

ARTICLE INFO

Keywords

COVID-19
Measles
Yellow fever
Democratic Republic of Congo

ABSTRACT

The immunization programs have been jeopardized all over the world due to the stay-at-home constraints imposed, to mitigate the ongoing COVID-19 pandemic. This has directly or indirectly placed the global health care system in peril, resulting in an overlapping public health crisis. With this commentary, we aim to accentuate the need to reinforce vaccination in the Democratic Republic of Congo, in lieu of the intersecting COVID-19, measles, and yellow fever outbreak, besides, providing recommendations so as to help alleviate the situation.

1. Introduction

The ongoing COVID-19 pandemic caused by SARS-CoV-2 and its variants, is a public health emergency. As it continues to ravage across the globe, it has brought many nations to their knees by adversely impacting their healthcare system and thereby making them more vulnerable to an increase in burden of other infectious diseases.¹ In the Democratic Republic of Congo (DRC) the situation is no different and the COVID-19 outbreak poses multiple precarious challenges to the country's already fragile healthcare system.²

The first case of COVID-19 in the DRC was confirmed on March 10, 2020, following which the government declared a state of emergency on March 24, 2020.³ The basic preventive measures like hand washing and social distancing were difficult to implement in the region due to overcrowding and deprivation of necessities as a result of widespread poverty among the DRC population. The high prevalence of comorbidities and chronic diseases have further added to the COVID-19 mortality risk. As of December 7, 2021, a total of 58,768 COVID-19 cases and 1113 COVID-19 associated deaths have been reported from the DRC.^{2,4}

Additionally, in recent years DRC has been burdened with recurrent measles outbreaks with 133,802 cases in 2011, 88,381 cases in 2013, and 311,471 cases in 2019.⁵ Measles, caused by the Morbillivirus, is a leading cause of vaccine-preventable childhood mortality. The measles outbreak in the DRC in 2019 has been regarded as one of the largest and most fatal outbreaks across the world.⁶

In addition, the overall public health risk at the national level is at a high due to the concurrent threat of a yellow fever case in a densely populated urban city of Pointe-Noire with an estimated 1.2 million inhabitants, coupled with suboptimal immunization coverage in the affected community and the potential risk of spread within the DRC.⁷ Yellow fever, which has an acute viral hemorrhagic disease presentation, is another vaccine-preventable illness. Entomological surveys in the affected area revealed high densities of *Aedes aegypti*, vector responsible for urban transmission of yellow fever, indicating potential for rapid amplification. Rainy season further increases the risk of transmission. Children are vaccinated in the DRC from nine months of age. Suspension of the vaccination program for measles in April 2020,

and interruption of yellow fever vaccination efforts due to the COVID-19 pandemic, has further amplified the risk of a measles and yellow fever syndemic.⁸

The COVID-19 crisis has affected vaccination campaigns around the world, and this could affect the number of new cases arising from vaccine preventable illnesses in the near future. The ongoing pandemic continues to present new challenges to the recent efforts to improve immunization coverage in DRC. Health workers are often without access to adequate personal protective equipment (PPE) to conduct immunization sessions; parents are reluctant to bring their children to vaccination sessions due to fear of transmission; spread of misinformation and rumors about the virus, continue to act as barriers in the successful and widespread implementation of routine immunization.

2. Past and ongoing vaccination outreach

As of November 30, 2021, a mere total of 193,416 COVID-19 vaccine doses have been administered in the DRC making it one of the least vaccinated countries against COVID-19 across the world.^{9,10,11} However, The African Vaccine Acquisition Task Team of the African Union and the World Health Organization (WHO) led COVID-19 Vaccines Global Access initiative (COVAX) consortium, together with its global partners are striving to secure 720 million doses of COVID-19 vaccines which are estimated to reach about 60% coverage in Africa by June 2022. As of March 4, 2021, 11 countries across Africa have initiated vaccination programs and among them, Ghana, Nigeria, Kenya, Angola, Côte d'Ivoire, and the DRC have received doses through the COVAX initiative.⁹

The transmissibility of an infectious disease is usually defined using the 'Reproduction number' or also known as R_0 . R_0 is the average number of secondary cases produced by a single primary case during its entire period of infectiousness in a fully susceptible population.^{12,13}

A perturbing matter of concern is that a large proportion of the DRC population are yet to receive their first dose of COVID-19 vaccine while the R_0 for COVID-19 is expected to be between 2 and 3.¹³ However, new resorts are being made by several organizations to help alleviate the situation.

<https://doi.org/10.1016/j.cegh.2021.100956>

Received 20 August 2021; Received in revised form 17 December 2021; Accepted 30 December 2021

Available online 5 January 2022

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Medair, an overseas emergency relief organization supported and funded by the European commission are aiding the DRC government by partnering with the Ministry of health as well as several other humanitarian agencies in launching an extensive COVID-19 vaccination campaign with an aim to vaccinate at least 80,000 people in 7 months, focusing first and foremost on the most vulnerable population including frontline workers, elderly as well as individuals with co-morbidities.¹⁴ Taking advantage of accessible technology an SMS (Short Message Service) pre-registration system has also been initiated by United Nations Children's Fund (UNICEF) and partners to support the COVID-19 vaccination campaign by connecting people with available vaccines in the DRC.¹⁵ Furthermore, organizations such as Promotion for the Defence of the Rights and Interests of Young People (PRODDIJE), have been employing novel strategies at the grass-root level to prevent the spread of COVID-19 vaccine misinformation by reaching out to the country's youth and encouraging them to get vaccinated.¹⁶

The national routine immunization program against yellow fever with R_0 of 4.1 was introduced in DRC, in the year 2003.¹⁷ However, the coverage remains to be around only 56% which is well below the recommended minimum of 80%. Low coverage has led to a resurgence of the disease in the country, with six outbreaks erupting between 2010 and 2019.¹⁸ Measles has one of the highest R_0 value lying between 12 and 18, making it essential to administer timely vaccination to prevent rapid spread, morbidity as well as mortality.¹ Since January 2019, more than 288,000 people in the DRC have contracted measles. There were 5700 recorded deaths due to measles in this period, making it the largest measles epidemic in the world, as per data from the WHO. The measles epidemic continues to tear through DRC, and in just two years more than 460,000 children contracted the disease with nearly 8000 dying from it, with three-quarters of them being under five. In 2020, DRC vaccinated more than 260,000 children against measles, which has decreased fivefold as compared to 2019 where 816,000 children were vaccinated against measles.¹⁰ On April 27, 2021, the DRC launched a preventive yellow fever vaccination campaign targeting more than 16.3 million people which got delayed by a year due to the pandemic.¹⁸

3. Limitations for effective vaccination

Shift in attention and re-allocation of resources to aid in the mitigation of the COVID-19 pandemic in the DRC has led to interruption in basic health care services, most notably routine immunisation.¹⁹

Moreover, issues faced by the DRC for effective vaccination include limitations in reach as a result of large number of remote and virtually inaccessible communities spread throughout the country.²⁰ Unavailability of robust and effective vaccine supply chain alongside dearth in actual number of vaccine doses and immunization related consumables is another major challenge. Another factor that plays a decisive role in the successful control of any vaccine preventable illness is vaccine acceptance among public and healthcare workers, which has been substandard in the DRC due to pervasiveness of misguided assumptions and misinformation about vaccination at large.

Misinformation on social media about COVID-19 vaccine's safety and efficacy, the lack of trust in the system and government coupled with the undermining of the threat posed by the pandemic have adversely impacted vaccination against COVID-19. Furthermore, concerns over the potential link to rare blood clots in Europe, delayed the vaccine rollout in the African countries accentuating the poor vaccination rates.

As of June 2021, only 2609 people were fully vaccinated against COVID-19, out of a population of nearly 90 million in the DRC. Hence, out of 1.7 million doses received in early March through COVAX, 1.3 million AstraZeneca doses had to be redistributed to other African countries for use before they expire by the end of June.²¹

Repeated occurrences of outbreaks of measles and inadequate vaccine effectiveness suggests the need to further evaluate measles vaccine efficacy and improve vaccine delivery strategies in DRC.²² Although

reactive campaigns were conducted in response to the epidemic, strategies to ensure that children are vaccinated in the routine system remains the foundation of measles control to prevent large and repeated outbreaks of measles in DRC.

The DRC's national health budget represented only 3.5% of total gross domestic product in the year 2013, equivalent to about US\$70 million—among the smallest in the world, leaving basic health services inaccessible for most and contributing to poor health.²³ Disbursement delays also often affected the coverage, consistency, and quality of health services.^{20,24}

Vaccine quantification is extremely difficult given the large number of remote communities situated in several rural areas across the DRC. The country in addition also lacks a robust monitoring and data system, which further confounds the actual vaccination needs. Hence, the requests shared for vaccine procurement with UNICEF and Gavi are usually underestimated. Even though allocation of expenditures and funds for routine immunisation has grown in the last couple of years, the increase is still inadequate in comparison with total system and operating costs leading to inequitable distribution of vaccines.²⁰

At present, there are only six manufacturers of vaccines, who supply vaccines to tackle yellow fever. They collectively produce approximately 50 million to 100 million doses each year. These numbers represent the worldwide production and thus highlight the need to increase the overall vaccine supply for yellow fever.²⁵ Sufficient vaccine availability will counter difficulties arising from the vaccine shortage and thereby assist in tackling this major public health crisis.

4. Implications

The poor healthcare access and negative health outcomes could be attributed to the aftermath of years of war, pre-existing low vaccination, frequent outbreaks of other diseases, malnutrition, and predominance of vulnerable populations. Among the above factors, provision of an effective immunization program would have mitigated substantial risk in the development of an outbreak. Being a highly populous nation with poor access to vaccines, epidemic flare ups will continue to occur, eventually leading to the risk of acute malnutrition in children which will make them susceptible to other infections, provoking a vicious endless cycle.²⁶ Plethora of sequelae stemming from these vaccine preventable diseases will also add to the country's morbidity and mortality burden.

Even a single confirmed case among the unvaccinated population could lead to an outbreak that in turn could further increase the disease burden and widen the socioeconomic gap. The spread of the outbreak beyond the nation's boundaries could also lead to a potentially serious public health threat at a global level.¹⁸ With multiple epidemics and vaccination shortages occurring simultaneously, DRC is far behind in the administration of COVID-19 and routine vaccines to its population and is currently playing catch up.

5. Recommendations

Emphasis on the relevance of vaccination in a severely deprived health care system like DRC must be stressed upon. It is imperative to immediately take steps to narrow healthcare gaps and address pre-existing challenges through strengthening vaccination efforts. Additionally, to address the aforementioned challenges and priorities, identification, isolation, treatment, and contact tracing of those affected must be undertaken at the earliest. Community outreach programs should also be organized to spread awareness and ensure that the guidelines on disease prevention and vaccine adherence are being followed. Prioritizing 'catch-up' vaccination, with a preference for measles vaccination in children and COVID-19 vaccine in adults owing to the limited vaccination resources as well as ensuring safety among vaccinators and those receiving the vaccination is of foremost importance.²⁷ One such important facet is the supply of proper personal protective

equipment (PPE) to minimize the transmission and hence ensuring adequate health workforce capability to carry out routine immunization drives. Implementation of the Strategic Response Plan included in WHO's Immunization Agenda 2030 will help assist with future outbreak prevention, preparedness, and response.^{28,29}

Long-term strategies to increase the accessibility of vaccines include promoting comprehensive vaccine preventable disease surveillance which must be supported by strong and reliable laboratory-based systems and epidemiological analysis. A prospect for simultaneous vaccination for different diseases at a single visit, may be reckoned. The securing of high-quality supply chains and effective vaccine management will facilitate equitable coverage. Establishment of an integrated delivery of 'touch-points' for public health interventions, will ensure timely, well-organized responses to any outbreak.

Speculation of devastating impact of measles on children post the COVID-19 pandemic is another pertinent matter of concern that is to be taken into consideration.³⁰ The COVID-19 pandemic has been implicated in creating a critical measles-immunity-gap, particularly in many vulnerable countries like that of the DRC, which demands immediate measures to abate an impending measles catastrophe. Disruption in vitamin A supplementation and poor nutritional status among impoverished children due to adverse impact on food supplies by the COVID-19 pandemic may result in a rise in measles-related mortality. The DRC must therefore prioritize extended "catch-up" vaccination campaigns whilst taking steps to ensure that children are provided with nutritious food as well as with vitamin A supplementation.

The African Union (AU) along with the African Centre of Disease Control (CDC) can help provide valuable leadership, management, and research training to healthcare personnel as well as other involved stakeholders to better strategic problem solving and political advocacy primarily through native and homegrown methods.³¹ Emphasis should also be laid on building and sustaining strong social, financial, and political commitment for immunization by strengthening administrative coordination at all levels¹⁸

6. Conclusion

Set against a background of hunger and poverty, overcrowding, sanitary insufficiency, and disease, the COVID-19 crisis has jolted the impoverished health system of the DRC, triggering with it an increased burden of vaccine preventable infections. If not controlled in time, the DRC could be starting at a multifaceted public health crisis that has the potential to threaten its population and the world at large. The call of the hour is to implement a proper action plan for vaccination outreach, involving a multidisciplinary team of stakeholders. This must comprise the government, the medical professionals, and the community healthcare workers. Simultaneously, to alleviate the pressure on the healthcare system, suitable measures must be formulated. Citizens too, should consider it an individual as well as a collective responsibility, to take the primordial steps of prevention by getting vaccinated, and adhering to the necessary protocols. It is important to understand that the causes of the outbreaks vary but failing to vaccinate people may be at the root of them all.

Funding

Not applicable.

Ethical approval and consent to participate

Not applicable.

Consent for publication

All authors agreed to the publication of this manuscript.

Declaration of competing interest

The authors declare that they have no competing interests.

Acknowledgements

Not applicable.

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