Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Correspondence

Malaria and COVID-19: A double battle for Burundi

ARTICLE INFO

Keywords
Malaria
COVID-19
Public health
Pandemic
Burundi

ABSTRACT

Malaria has become a serious public health concern in Burundi. An outbreak that has the potential to evolve into an epidemic has eradicated nearly as many individuals as the Ebola crisis within the adjacent Democratic Republic of the Congo. The government’s delay to announce a national crisis, increased breeding sites as a result of flooding, and the presence of multi-drug resistant malaria have exacerbated the burden. With a concurrent COVID-19 pandemic, economic complications, and overlap of symptoms between both diseases, these challenges are complex, but not unfamiliar. Organizations such as Médecins Sans Frontières have carried out spraying campaigns, and the government is actively mitigating efforts to handle the pandemic. That being said, there is still a need to enhance preventive measures such as increasing technological capacity and epidemiological surveillance to better withstand challenges.

African relevance

- Most of the Malaria cases and passings happen in sub-Saharan Africa.
- Malaria could be a major danger to public health and financial advancements in Africa.
- Malaria is one of the vital causes of child mortality around the globe, which yearly kills >1 million children in Africa.
- Malaria can reduce productivity at work school, attendance and can also impair intellectual development.

Malaria, an infectious disease caused by Plasmodium is transmitted through bites of contaminated female Anopheles mosquitoes. There are 5 species, and 2 are most dangerous—Plasmodium falciparum and Plasmodium vivax [1]. It is a primary cause of death in Africa with more than 90% of 400,000 deaths of malaria reported for each year from this region [2]. Particularly, Burundi, a small country in East Africa, is greatly impacted with an incidence of over 85% for Plasmodium Falciparum and the presence of multi-drug resistant form in all malaria regions of the country and high risk during all months of the year [3].

Burundi, with a population of 12 million people reported 8,571,897 malaria cases including 3170 deaths (CFR 0.04%) in early January of 2020, a 93% increase from 2018 in both cases and deaths, as well as has surpassed the epidemic in 2017 [4]. Whereas malaria is widespread in April to May and from November to December, a usual decrease was not observed following May 2019, posing an unusual threat to the healthcare system [4]. From 1 January to 20 October 2019, 7,233,138 malaria cases with 2691 deaths were reported. In week ending 22 December 2019, 152,960 cases counting 63 deaths have been detailed [5]. Although over 6 million people were infected with malaria in 2019, its death toll equating Ebola and there was a delay in declaring national emergency due to upcoming elections [6,7]. As of 22nd March 2020, there were additional 1.2 million cases of malaria reported [8]. The association between flooding and vector borne diseases is due to an increase in breeding sites, and rate of survival, reproduction and juvenile development [9]. The United Nations office for the Coordination of Humanitarian Affairs and other specialists have identified that decreased competence of preventive measures and a vulnerable population with low levels of resistance and poor nutrition contributes to this [10].

With the entry of coronavirus disease 2019 (COVID-19) in 2020, attention to malaria became secondary. Nevertheless, the similarities of symptoms between malaria and COVID-19, which include fever, chills, headache, sweats, vomiting, and body throbs. This becomes a source of concern for health care workers trying to establish the disease in patients who exhibit these set of symptoms [6,11]. The World Health Organization states that the matter for concern is the infection rate of COVID-19 in the younger population and a symptomatic rate of over 80% in Sub-Saharan Africa, causing further challenges to the health care system [12]. Besides, the notable increase in workload, understaffing in intensive Care Units, lack of resources further complicates the situation in many African countries battling COVID-19, particularly Burundi which is simultaneously handling a malaria epidemic [12]. This scarcity in both staff and resources create a favourable environment for the spread of COVID-19. Thus, COVID-19 negatively influences the management of epidemic vector-borne and other infectious diseases which has also been demonstrated in other parts of the world [13–16].

In addition, Burundi fell into a recession in 2020 with a decline of 3.3% in gross domestic product due to COVID-19 which impacted mostly industry level by suffering a 4.5% decline in output, and services. The investments also declined around 3%. The decrease in agricultural production and expense of imported products resulted in a sharp rise in prices. These events further led to inflation increase by 8.5 points to 7.6% in 2020 [17]. These economic implications fuel more problems for the country’s healthcare system which already receives limited funding [11].

Abbreviations: COVID-19, Coronavirus disease 2019; CFR, Case fatality rate; UNDP, United Nations Development Programme.
However, efforts have been made to contain the malaria epidemic through humanitarian and governmental action. Spraying is the best technique to reduce malaria cases as a significant 80% drop was seen with this in previous years [2]. Teams from Médecins Sans Frontières are carrying malaria prevention campaigns in hills of Kinyinya by bicycling and spraying individual homes to contain spread. Collaboration with local authorities, and community members as well as education have helped with making this technique viable. Moreover, 6.8 million nets have been distributed with help from the government of Burundi, United Nations Development Programme (UNDP), and the Global Fund [11].

The national health crisis centre now has 200 smartphones and laptops and has become a base for the country’s COVID-19 response [11]. Additionally, UNDP is also supporting the development of an app for tracking COVID-19 cases and is working with the Global Fund to increase testing capacity of COVID-19 which is at 200 daily [11].

The syndemic of COVID-19 and malaria poses a serious threat and requires urgent attention from healthcare professionals, policy makers and entire populace. The similarity in early COVID-19 symptoms and malaria symptoms where it is endemic such as Burundi may present difficulty in diagnosis, hence, necessitating laboratory tests. Furthermore, long-term implications of this include untreated and misdiagnosed malaria and COVID-19 cases contributing to higher mortality, and hence inflicting more on the fragile healthcare system and weak economy. Thus, this implies that healthcare professionals are recommended to ensure proper diagnostic laboratory tests are carried out and not infer solely on reason in the diagnosis of a patient. Double screening tests should be carried out for patients presenting with symptoms that suggest malaria and COVID-19. Secondly, understaffing, scarcity of resources and limited health care capacity can also exacerbate the mental health of frontline workers, and hence implications of burnout may impact patient care. Another major recommendation is the need for increased epidemiological surveillance in Burundi. Inter-communication within the national healthcare system should be enhanced to increase monitoring and recording of cases and increasing preparedness. Thus, policy makers are encouraged to strengthen mass campaign efforts on the need for social distancing and COVID-19 preventive measures, and on the need to enhance malaria preventive efforts by the populace with an additional emphasis on mental health services for frontline workers. Lastly, climate impacts are crucial in the development of malaria, hence better disaster preparedness and implementation of public health measures for those displaced is important.

Author contribution

Authors contributed as follow to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: PM, ZI, MMH contributed 20% each; OJA, ACDSC, ATA contributed 10% each; and SA and MYE contributed 5% each. All authors approved the version to be published and agree to be accountable for all aspects of the work.

Dissemination of results

The results from the research is most effectively disseminated using multiple vehicles such as sharing of facts and figure with colleagues, medical students and doctors ideally with face to face interaction or through an informal presentation. From these interactions we have acquired actionable messages and recommendations for the wider dissemination and the betterment of the research, including via traditional and novel methods. We have collaboratively explored how our research findings fit with current statistics and advancements and in what ways the proposed findings could inform improvements to curb the disease.

Declaration of competing interest

The authors declare no conflicts of interest.

Acknowledgements

None.

References

1. World Health Organization. Malaria. https://www.who.int/news-room/fact-sheets/detail/malaria; 2021 (accessed June 21, 2021).
2. ReliefWeb. Pumps, bicycles and satellites: fighting malaria in Burundi - Burundi, (n.d.). https://reliefweb.int/report/burundi/pumps-bicycles-and-satellites-fighting-malaria-burundi (accessed June 21, 2021).
3. IAMAT. Burundi: Malaria, (n.d.). https://www.iamat.org/country/burundi/risk/malaria; (accessed June 21, 2021).
4. Outbreak News Today. Burundi malaria epidemic reaches 8.5 million cases, Travel alert issued, (n.d.). http://outbreaknewstoday.com/burundi-malaria-epidemic-reaches-85-million-cases-travel-alert-issued-68540/ (accessed June 29, 2021).
5. ReliefWeb. Burundi: Malaria outbreak - May 2019, (2020). https://reliefweb.int/disaster/ep-2019-000060-bdi (accessed June 21, 2021).
6. CDC. Malaria in Burundi - watch level 1, practice usual precautions. https://www.cdc.gov/travel/notices/watch/malaria-burundi (accessed June 21, 2021).
7. Lok P, Dijk S. Malaria outbreak in Burundi reaches epidemic levels with 5.7 million infected this year. BMJ 2019;56651504. https://doi.org/10.1136/bmj.515.04.
8. ReliefWeb. UNICEF Burundi humanitarian situation report no. 2 - reporting period: 01 January to 30 June 2020 - Burundi, (n.d.). https://reliefweb.int/report/burundi/unicef-burundi-humanitarian-situation-report-no-2-reporting-period-01-january-30-june (accessed June 29, 2021).
9. Thomson MC, Muitoo AG, Cousin R, Shumake-Guilemôt J. Climate drivers of vector-borne diseases in Africa and their relevance to control programmes. Infect Dis Poverty 2018;7. https://doi.org/10.1186/s40249-018-0460-1.
10. Beaumont P. The Guardian. Burundi malaria outbreak at epidemic levels as half of population infected, https://www.theguardian.com/global-development/2019/au-g/08/burundi-malaria-outbreak-at-epidemic-levels-as-half-of-population-infected; 2019 (accessed June 21, 2021).
11. Philip M, Ooms G, Hargreaves S, Durrant A. Burundi: a population deprived of basic health care. Br J Gen Pract 2004;54:634–5.
12. BBC News. Coronavirus in Africa: five reasons why Covid-19 has been less deadly than elsewhere, (n.d.). https://www.bbc.com/news/world/africa-54418613 (accessed June 21, 2021).
13. Costa ACdos S, Hasan MM, Xenophontos E, Mohan A, Bassey EE, Hashim HT, Ahmad S, Essar MY. Measles returns to the Democratic Republic of Congo: a new predicament amid the COVID-19 crisis. J Med Virol 2021:jmv.27137. https://doi.org/10.1002/jmv.27137.
14. Cavarroglu S, Hasan MM, Mohan A, Xenophontos E, Costa ACdos S, Aboorde AT, Tkagkaris C, Outani O, Ahmad S, Essar MY. Measles returns to the Democratic Republic of Congo: a new predicament amid the COVID-19 crisis. J Med Virol 2021:jmv.27137. https://doi.org/10.1002/jmv.27137.
15. Cavarroglu S, Hasan MM, Mohan A, Xenophontos E, Costa ACdos S, Aboorde AT, Tkagkaris C, Outani O, Ahmad S, Essar MY. Measles returns to the Democratic Republic of Congo: a new predicament amid the COVID-19 crisis. J Med Virol 2021:jmv.27137. https://doi.org/10.1002/jmv.27137.
16. Christopher I, Rocha N, Hasan MMehedi, Goyal S, Patel T, Jain S, Ghosh A, Denise T, Cedeño D. COVID-19 and Mucormycosis syndemic: double health threat to a collapsing healthcare system in India. Trop Med Int Health 2021. https://doi.org/10.1111/tmi.13641.
17. Burundi Economic Outlook | African Development Bank - building today, a better Africa tomorrow, (n.d.). https://www.afdb.org/en/countries/east-africa/burundi/burundi-economic-outlook (accessed September 15, 2021).

Parvathy Mohanan1,2, Zarmina Islam3, Mohammad Mehedi Hassan4, Oluwakorede Joshua Adeideji5, Ana Carla dos Santos Costa6, Abdullahi Tunde Aborode7, Shaobi Ahmad8, Mohammad Yasir Essar9

1 Department of General Medicine, Medical University Sofia, Sofia, Bulgaria
2 Dow University of Health Sciences, Karachi, Pakistan
3 Department of Biochemistry and Molecular Biology, Faculty of Life Science, Mawlana Bhashani Science and Technology University, Tongi 1902, Bangladesh
4 Division of Infectious Diseases, The Red-Green Research Centre, BICCB, Dhaka, Bangladesh
5 Faculty of Pharmaceutical Sciences, University of Ilorin, Ilorin, Nigeria
6 Federal University of Bahia, Salvador, Bahia, Brazil
7 Health African Platform, Research and Development, Ibadan, Nigeria
8 West African Academy of Public Health, Abuja, Nigeria
9 Department of Medicine and General Surgery, Punjab Medical College, Faisalabad, Pakistan
Correspondence

Kabul University of Medical Sciences, Kabul, Afghanistan

* Corresponding author.

E-mail address: yasir.essar@gmail.com (M.Y. Essar).