Resurgence of Malaria Prevalence Worldwide Between 2019 and 2023: A Review

Snehal Patil

Department of Zoology, Mahendra Pratap Sharada Prasad Singh College of Arts, Commerce and Science, Bandra East, Mumbai, Maharashtra 400051.

Abstract

Malaria has experienced a resurgence worldwide, posing a significant threat due to the transmission of the Plasmodium parasite through mosquito bites. Most people thought that significant progress had been made in lowering the burden of malaria through worldwide efforts to control and eradicate the disease. However, data and studies from the past few years point to a global rebound in malaria prevalence between 2019 and 2023. Several factors, such as the decline in malaria control initiatives, insecticide-resistant mosquitoes, and the quick spread of antimalarial drug resistance, could be to blame for the disease's reappearance. This article reviews the malaria resurgence.

Keywords

resurgence, malaria prevalence, worldwide, 2019-2023, drug resistance, insecticide resistance, funding, control programs, intervention strategies

Introduction to Malaria Resurgence (2019-2023)

Malaria, a severe mosquito-borne illness caused by the Plasmodium parasite, has remained an ongoing global health issue for many years. The disease infects more than 200 million people annually and leads to nearly one million deaths worldwide. The global effort to control and eliminate malaria has faced a setback, as indicated by the approximately 229 million cases of malaria worldwide in 2019, according to the World Health Organization. The number of malaria cases had been declining between 2010 and 2014, giving hope for the eradication of this deadly disease. However, recent years have seen a concerning resurgence in malaria prevalence (Golding et al., 2021). Several factors have contributed to this global resurgence of malaria (Iqbal et al., 1999). These factors include insecticide resistance in the Anopheles mosquito, rapid spread of antimalarial-drug resistance, and increased movement of populations due to international travel and immigration. The resurgence of malaria can be attributed to factors such as limited funding for control measures and the emergence of drug-resistant parasites (Kanyangarara et al., 2016). This resurgence poses a significant challenge to the sustainability of previous progress made in reducing malaria cases (Kanyangarara et al., 2016). This review aims to examine the factors that have contributed to the resurgence of malaria

worldwide. The global resurgence of malaria can be attributed to insecticide resistance in mosquitoes, drug resistance in parasites, increased population movement, limited funding for control measures, and social instability. According to several sources, these factors have led to the global resurgence of malaria. Furthermore, the occurrence of malaria is on the rise, even in countries like Korea. (Cho et al., 2001).

Global Malaria Prevalence Trends: 2019-2023

Despite efforts to control and eliminate malaria, there has been a worrying resurgence of the disease between 2019 and 2023. According to various sources, malaria has experienced a global resurgence, threatening the progress made in reducing cases in previous years. The re-emergence of malaria can be attributed to several factors. One of the primary factors is the development of insecticide resistance in the Anopheles mosquito, which is the main carrier of the malaria parasite. This resistance reduces the effectiveness of insecticide-treated bed nets and indoor spraying, leading to an increase in malaria transmission.

In addition, the rapid rise of antimalarial-drug resistance has aided the revival of malaria. This resistance reduces the efficiency of routinely used antimalarial drugs, making treatment and control more challenging. Inadequate funding for malaria control measures and social instability in certain regions have also contributed to the resurgence of malaria. These factors have disrupted previous successful control strategies and hindered the progress in reducing malaria cases. The convergence of these elements has resulted in a notable rise in the occurrence of malaria globally from 2019 to 2023. Therefore, improving our knowledge of malaria epidemiology is essential for creating focused and successful control measures (Kanyangarara et al., 2016).

Underlying Factors of Malaria Resurgence

Multiple underlying factors can be attributed to the resurgence of malaria prevalence between 2019 and 2023. These elements consist of major Anopheles vectors' resistance to pesticides, drug resistance by Plasmodium parasites, and limited funding for control programs (Kanyangarara et al., 2016). Control efforts against malaria have been severely undermined in many countries by a lack of funding for programs.

As an outcome, it is now harder to find insecticide-treated bed nets, indoor spraying programs, and antimalarial drugs. To treat and stop the spread of malaria, these control methods are essential. Unfortunately, they are no longer as effective or accessible in many areas due to a lack of funding. Moreover, the resurgence of malaria has been made worse by the Plasmodium parasites developing drug resistance. Treatment and control of the disease are more difficult due to the compromised effectiveness of commonly used antimalarial medications.

Geographical Spread of Malaria Between 2019 and 2023

The geographical spread of malaria between 2019 and 2023 has been a significant factor in the resurgence of the disease. The increased movement of human populations has played a role in the spreading of malaria to new regions. Factors such as international travel and immigration have facilitated the introduction of malaria into areas where it was previously uncommon or eliminated. Likewise, environmental changes such as deforestation and urbanization have created new breeding grounds for mosquitoes, increasing the transmission of malaria. Additionally, climate change has also contributed to the expansion of malaria-affected regions. With rising temperatures and alterations in rainfall patterns, areas that were once unsuitable for malaria transmission are now becoming conducive to the survival and proliferation of mosquitoes.

As a result, malaria transmission has extended into previously unaffected or low transmission areas, contributing to the overall increase in malaria cases between 2019 and 2023.

Impact of Malaria Resurgence on Public Health

The increase in malaria cases has led to an increase in malaria-related morbidity and mortality, particularly in areas with limited access to healthcare services. Without proper treatment and control measures, individuals infected with malaria are at risk of developing severe complications such as cerebral malaria, organ failure, and death. Additionally, the burden of malaria places a strain on healthcare systems, which may already be overwhelmed by other diseases and health challenges. This further hinders the delivery of adequate healthcare and resources to combat the disease, ultimately leading to higher mortality rates and reduced overall health outcomes in affected communities.

Strategies for Malaria Prevention and Control

To effectively prevent and control the resurgence of malaria, a comprehensive approach is needed (Maillard et al., 2015).

Strategies to combat malaria include strengthening healthcare systems and infrastructure, improving access to diagnosis and treatment services, scaling up vector control measures such as bed nets and indoor spraying, promoting effective antimalarial drugs for treatment and prevention, conducting regular surveillance of mosquito populations and insecticide resistance, educating communities about preventive measures, and addressing factors contributing to the resurgence of malaria.

The increase in funding for malaria control programs and research efforts is essential to combat the challenges of malaria resurgence. These strategies should be implemented through coordinated collaboration between governments, healthcare providers, researchers, and communities.

The resurgence of malaria prevalence between 2019 and 2023 poses a significant public health concern. However, with a comprehensive and multifaceted approach, including strengthening healthcare systems, implementing effective vector control measures, promoting the use of antimalarial drugs, and conducting regular surveillance, it is possible to reduce the burden of malaria and prevent further escalation of the disease (Kurtovic et al., 2021).

Lessons from Past Malaria Outbreaks

Lessons from past malaria outbreaks highlight the importance of sustained efforts and long-term commitment to malaria control. These lessons emphasize the need for continuous monitoring, evaluation, and adaptation of control strategies to address emerging challenges such as insecticide resistance and drug resistance. Additionally, community engagement and education are crucial in preventing the resurgence of malaria. With the ongoing threat of resurgent malaria, it is crucial to recognize that prevention strategies alone may not be sufficient to control the disease in high-transmission areas (Chipukuma et al., 2018).

Community participation and cooperation play a crucial role in successful malaria control efforts. By raising awareness, educating communities about preventive measures, and addressing barriers to participation, more effective and sustainable control measures can be implemented. The ongoing challenge of malaria resurgence calls for a comprehensive approach that includes vector control, innovative research for new interventions, improved surveillance systems, increased funding for control efforts, and community engagement.

Past malaria outbreaks emphasize the need for collaboration between countries and international organizations to address the global threat of resurgence. Countries can boost their control programs and limit disease transmission by exchanging resources and best practices. It's also critical to understand that combating malaria involves more than simply the health sector. Multi-sectoral collaboration encompassing sectors such as education, transportation, and agriculture is critical in lowering environmental and socioeconomic factors that contribute to malaria prevalence. Ultimately, sustained efforts and long-term commitment are necessary to combat the resurgence of malaria and achieve global malaria control goals (Nkumama et al., 2017).

Future Predictions and Implications of Malaria Resurgence

If the current trends of drug resistance and insecticide resistance continue, malaria prevalence could continue to increase globally (Parola, 2013). The resurgence of malaria poses significant challenges to public health and elimination efforts. Intensifying control measures, developing new interventions, and addressing underlying factors are crucial steps in combating the disease. Limited funding and competing health priorities must also be addressed. The global health community needs to be proactive in responding to this resurgence

as it threatens decades of progress. The increasing prevalence of malaria between 2019 and 2023 underscores the urgent need for new intervention strategies that target drug and insecticide resistance while prioritizing malaria control efforts.

Conclusion: Responding to the Malaria Resurgence

The recurrence of malaria is a serious problem that calls for a multifaceted solution. The necessity of ongoing research and strategy adaptation is underscored by the lessons learned from earlier eradication initiatives, such as the Global Malaria Eradication Program. Insecticide resistance, medication resistance, and socio-political variables that may impede control measures are some of the things that need to be addressed.

Prioritizing community participation and education is critical to effectively combating the recurrence of malaria. A multifaceted strategy that actively includes communities in control efforts and educates them on preventative measures is needed to address the growing malaria burden. This will enhance the therapies' efficacy and support their long-term viability.

Countries and international organizations must work together to combat the rising malarial burden. Information, resources, and expertise should be shared during this collaboration to create coordinated malaria control strategies. It is also essential to fund research and development for new instruments, such as enhanced diagnostics, potent vaccinations, and creative vector control strategies.

References

Abiodun, G. J., Adebiyi, B., Abiodun, R. O., Oladimeji, O., Oladimeji, K. E., Adeola, A. M., ... & Aceves, A. (2020). Investigating the resurgence of malaria prevalence in South Africa between 2015 and 2018: a scoping review. *The Open Public Health Journal*, *13*(1).

Araújo, M. S., Messias, M. R., Figueiró, M. R., Gil, L. H. S., Probst, C. M., Vidal, N. M., ... & Ozaki, L. S. (2013). Natural Plasmodium infection in monkeys in the state of Rondônia (Brazilian Western Amazon). *Malaria journal*, *12*(1), 1-8.

Chipukuma, H. M., Zulu, J. M., Jacobs, C., Chongwe, G., Chola, M., Halwiindi, H., ... & Michelo, C. (2018). Towards a framework for analyzing determinants of performance of community health workers in malaria prevention and control: a systematic review. *Human resources for health*, *16*(1), 1-16.

Cho, D., Kim, K., Park, S., Kim, Y., Lee, K., & Lim, C. (2001). Evaluation of rapid immunocapture assays for diagnosis of Plasmodium vivax in Korea. *Parasitology Research*, *87*, 445-448.

Cohen, J. M., Smith, D. L., Cotter, C., Ward, A., Yamey, G., Sabot, O. J., & Moonen, B. (2012). Malaria resurgence: a systematic review and assessment of its causes. *Malaria journal*, *11*, 1-17.

Ettari, R., Bova, F., Zappalà, M., Grasso, S. and Micale, N. (2010), Falcipain-2 inhibitors. Med. Res. Rev., 30: 136-167. https://doi.org/10.1002/med.20163

Feng, X., Huang, F., Yin, J., Wang, R., & Xia, Z. (2022). Key takeaways from China's success in eliminating malaria: leveraging existing evidence for a malaria-free world. *BMJ global health*, *7*(4), e008351.

Golding, T. M., Mbaba, M., & Smith, G. S. (2021). Modular synthesis of antimalarial quinoline-based PGM metallarectangles. *Dalton Transactions*, *50*(42), 15274-15286.

Gomes, H., Cesar, P., de Grandes, L. D. M. E., EmpreendimentosToledo, L. M., de Grandes, L. D. M. E., EmpreendimentosSabroza, P. C., ... & Cecília, M. (2019). Imported malaria in Rio de Janeiro state between 2007 and 2015: an epidemiologic approach. *Mem. Inst. Oswaldo Cruz*, e190064-e190064.

Iqbal, J., Sher, A., Hira, P. R., & Al-Owaish, R. (1999). Comparison of the OptiMAL test with PCR for diagnosis of malaria in immigrants. *Journal of Clinical Microbiology*, *37*(11), 3644-3646.

Isaïa, J., Rivero, A., Glaizot, O., Christe, P., & Pigeault, R. (2020). Last-come, best served? Mosquito biting order and Plasmodium transmission. *Proceedings of the Royal Society B*, *287*(1939), 20202615.

Kanyangarara, M., Mamini, E., Mharakurwa, S., Munyati, S., Gwanzura, L., Kobayashi, T., Shields, T., Mullany, L. C., Mutambu, S., Mason, P. R., Curriero, F. C., & Moss, W. J. (2016). High-Resolution Plasmodium falciparum Malaria Risk Mapping in Mutasa District, Zimbabwe: Implications for Regaining Control. The American Society of Tropical Medicine and Hygiene, 95(1), 141-147. https://doi.org/10.4269/ajtmh.15-0865

Kurtovic, L., Wetzel, D., Reiling, L., Drew, D. R., Palmer, C., Kouskousis, B., ... & Beeson, J. G. (2021). Novel virus-like particle vaccine encoding the circumsporozoite protein of plasmodium falciparum is immunogenic and induces functional antibody responses in mice. *Frontiers in Immunology*, *12*, 641421.

Lopez, A. C., Ortiz, A., Coello, J., Sosa-Ochoa, W., Torres, R. E. M., Banegas, E. I., ... & Fontecha, G. A. (2012). Genetic diversity of Plasmodium vivax and Plasmodium falciparum in Honduras. *Malaria journal*, *11*, 1-10.

Maillard, O., Lernout, T., Olivier, S., Achirafi, A., Aubert, L., Lepère, J. F., ... & Filleul, L. (2015). Major decrease in malaria transmission on Mayotte Island. *Malaria Journal*, *14*, 1-12.

Mbanefo, A., & Kumar, N. (2020). Evaluation of malaria diagnostic methods as a key for successful control and elimination programs. *Tropical Medicine and Infectious Disease*, *5*(2), 102.

Michel, K., & Kafatos, F C. (2005, July 1). Mosquito immunity against Plasmodium.

Mint Mohamed Lemine, A., Ould Lemrabott, M. A., Niang, E. H. A., Basco, L. K., Bogreau, H., Faye, O., & Ould Mohamed Salem Boukhary, A. (2018). Pyrethroid resistance in the major malaria vector Anopheles arabiensis in Nouakchott, Mauritania. *Parasites & vectors*, *11*(1), 1-8.

Monroe, A., Williams, N. A., Ogoma, S., Karema, C., & Okumu, F. (2022). Reflections on the 2021 World Malaria Report and the future of malaria control.

Nkumama, I. N., O'meara, W. P., & Osier, F. H. (2017). Changes in malaria epidemiology in Africa and new challenges for elimination. *Trends in parasitology*, *33*(2), 128-140.

Palmer, C. J., Lindo, J. F., Klaskala, W. I., Quesada, J. A., Kaminsky, R., Baum, M. K., & Ager, A. L. (1998). Evaluation of the OptiMAL test for rapid diagnosis of Plasmodium vivax and Plasmodium falciparum malaria. *Journal of clinical microbiology*, *36*(1), 203-206.

Parola, P. (2013). The return of the big three killers. *Clinical Microbiology and Infection*, *19*(10), 887-888.

Shretta, R., Avanceña, A. L., & Hatefi, A. (2016). The economics of malaria control and elimination: a systematic review. *Malaria journal*, *15*(1), 1-14.

Ssemata, A. S., Nakitende, A. J., Kizito, S., Thomas, M. R., Islam, S., Bangirana, P., ... & McHenry, M. S. (2023). Association of severe malaria with cognitive and behavioural outcomes in low-and middle-income countries: a meta-analysis and systematic review. *Malaria journal*, *22*(1), 227.

Talapko, J., Škrlec, I., Alebić, T., Jukić, M., & Včev, A. (2019). Malaria: the past and the present. *Microorganisms*, *7*(6), 179.

Usluca, S., Babur, C., Kurtcebe, Ö., Topluoğlu, S., & Kılıç, S. (2019). Evaluation of Malaria Blood Smears Sent to National Malaria Reference Laboratory. *Türkiye Parazitolojii Dergisi*, *43*(4), 165.

Whittaker, C., Slater, H., Nash, R., Bousema, T., Drakeley, C., Ghani, A. C., & Okell, L. C. (2021). Global patterns of submicroscopic Plasmodium falciparum malaria infection: insights from a systematic review and meta-analysis of population surveys. *The Lancet Microbe*, *2*(8), e366-e374.

Yokoly, F. N., Zahouli, J. B., Small, G., Ouattara, A. F., Opoku, M., de Souza, D. K., & Koudou, B. G. (2021). Assessing Anopheles vector species diversity and transmission of malaria in four health districts along the borders of Côte d'Ivoire. *Malaria journal*, *20*(1), 1-11.