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Letter to the Editor

Current challenges for controlling and eliminating malaria in Iran

Dear Editor,

Iran is one of the countries in the world where malaria is endemic. The first malaria control campaign in Iran was launched in 1945, resulting in significant successes. As a result of these efforts, most of the country is now free from malaria, with the disease being limited to three provinces in the southeast of Iran, including Sistan and Baluchistan, Kerman, and Hormozgan. Prior to the outbreak of COVID-19, there was a decreasing trend in malaria in some countries, leading to hope that it would be possible to eliminate malaria soon in some parts of the world. Iran was on track to achieve this, and health officials were optimistic that they could soon eliminate malaria in the country and receive a certificate of the elimination. According to reports from the WHO and Iran CDC (ICDC), there were no indigenous cases of malaria from 2018 to 2021. All reported cases during these years were imported or introduced. However, in 2022, there was a significant increase in indigenous malaria cases. An outbreak in Pakistan, caused by heavy flash flooding, led to 1439 reported indigenous malaria cases in Iran (Fig. 1) [1]. Extreme weather events, such as flooding, may lead to the disease outbreak. Similarly, after severe droughts suppress malaria transmission for a period, epidemics can occur when the rains return. Iran experienced drought in recent years, which contributed to a decrease in malaria cases from 2018 to 2021. The heavy flash flooding in Pakistan, followed by the movement of people to Iran, resulted in indigenous malaria cases in 2022. Unfortunately, following this event, it caused an interruption in the malaria elimination program in Iran. It should be noted that this event is not the sole reason for the failure of malaria control in Iran; other major factors are contributing to the country's struggle to eliminate malaria. In this letter, we aim to discuss the primary reasons and challenges in elimination of malaria in Iran.

Population movements from neighboring endemic countries have historically affected malaria in Iran. The frequent movement of people in the border areas between Iran and its eastern neighbors, Afghanistan and Pakistan, has caused an influx of migrants and refugees in Iran, resulting in a significant increase in local malaria cases in southeast Iran. For instance, following political instability in Afghanistan in 2021, a considerable influx of migrants and refugees entered Iran.

Despite having cross-border agreements with neighboring countries, there needs to be greater practical cooperation for detecting, monitoring, and controlling cases on both sides of the border, particularly between Iran and its eastern neighbors, Pakistan and Afghanistan. This highlights the importance of cross-border collaboration and surveillance on both sides of the border. Another issue is the increase in fuel smuggling along the border of Sistan and Baluchistan Province, which is contributing to the emergence of new foci of the disease.

It is important to remember the impact of sanctions against Iran on the failure of malaria elimination. Several articles have discussed the effects of these sanctions on the Iranian health sector and citizens [2]. The sanctions have significantly affected the health sector in Iran, making it challenging to obtain essential malaria commodities such as insecticides with health applications and fogging equipment.

Furthermore, there was a rise in both malaria cases and deaths in 2020 compared to 2019, which can be attributed to disruptions during the COVID-19 pandemic. Service disruptions during the pandemic resulted in an additional 47,000 deaths related to malaria [3]. During the COVID-19 pandemic, fatigue and burnout among healthcare workers were considerable subjects. Widespread pandemic-related burnout has been reported in many countries [4]. This phenomenon is also prevalent in Iran, and the technical staff who worked on the malaria program were not exempt from experiencing this issue. On the other hand, the malaria program is facing a shortage of technical staff at both headquarters and peripheral levels. Moreover, the spread of invasive *Aedes* and the increase in the imported cases of dengue fever, which recently appeared in the country, is another issue that takes up the time and energy of personnel and shows the lack of manpower in this program.

Changes in policies and insufficient funding for malaria control have also contributed to the increase in indigenous cases. If the government prioritizes the malaria elimination program, it can easily secure adequate funding from the regular budget. The low socioeconomic status of people living in malaria-endemic areas is a crucial issue in the southeast of Iran, where malaria is prevalent. Socioeconomic factors and development are the key determinants of malaria incidence in communities.

The technical challenges, including vector and parasite resistance, various vector behaviors, and developing new tools are other significant aspects of this issue. Addressing these technical points requires the willingness and engagement of the malaria elimination program and ICDC, as well as the cooperation of universities and research institutes. It is crucial to provide support to the universities and research institutes that are conducting operational research. Monitoring and evaluation (M&E) of the program are essential for ensuring its success. A comprehensive M&E system seems that has not yet been established.

The highlighted challenges mentioned are the most important aspects of the program. It is crucial that officials take effective and urgent action in response to these. Political and financial support must be maintained and increased as they are vital components of the program.

CRediT authorship contribution statement

Ismaeil Alizadeh: Visualization, Writing – original draft. **Mohammad Mehdi Sedaghat:** Methodology, Supervision, Writing – review & editing.

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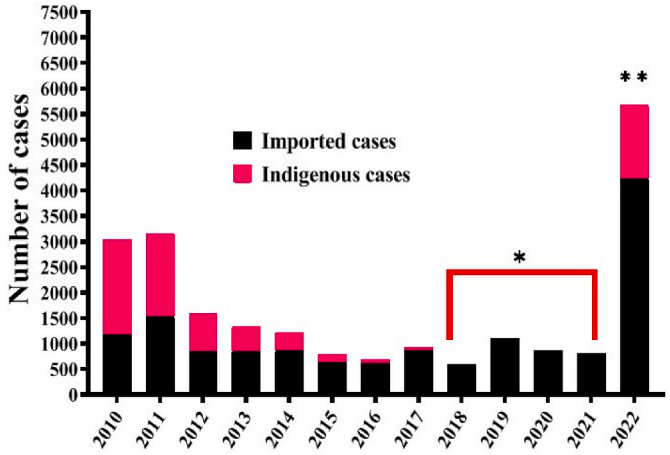

Fig. 1. Malaria cases based on WHO report during 2010–2022 in Iran (1).
*Zero indigenous cases during 2018–2021.
** 1439 indigenous cases and 4238 imported cases in 2022.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used Grammarly AI in order to improve readability and language of the work. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Ismaeil Alizadeh, Mohammad Mehdi Sedaghat*
Department of Vector Biology and Control of Diseases, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

* Corresponding author. Department of Vector Biology and Control of Diseases, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran.
E-mail addresses: sedaghmm@tums.ac.ir, sedaghat@hotmail.co.uk (M.M. Sedaghat).
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