WHO-EM/MAL/393/E

Summary report on the

Regional meeting for countries of the Middle East and North Africa on the prevention of re-establishment of local transmission of malaria

Cairo, Egypt
14–16 July 2025

World Health Organization
Eastern Mediterranean Region

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1. Introduction

The Middle East and North Africa (MENA) region has made remarkable progress toward malaria elimination over the past six decades. By the 1970s, countries/territories, such as Bahrain, Jordan, Kuwait, Lebanon, Libya, the occupied Palestinian territory, Qatar and Tunisia, had successfully eliminated local malaria transmission. In the past 20 years, others, including Morocco, Algeria, Egypt, the Syrian Arab Republic, Iraq, the United Arab Emirates, Oman, Saudi Arabia and Socotra Island in Yemen, reported their last indigenous cases. Four countries, the United Arab Emirates (2007), Morocco (2010), Algeria (2019) and Egypt (2024), have been officially certified malaria-free by the World Health Organization (WHO). The Islamic Republic of Iran reported zero indigenous cases from 2018 to 2021; however, local transmission resumed in 2022. Saudi Arabia has reported zero indigenous cases since 2021. Yemen remains the only malaria-endemic country in the MENA region.

Achieving elimination is a major public health milestone, but sustaining it remains an ongoing challenge. Although many MENA countries have made substantial progress in their health systems and socioeconomic development, they continue to face significant vulnerabilities. In an increasingly interconnected world, rising levels of migration and travel mean that imported malaria cases remain a reality, even in settings declared malaria-free. Climate change, unplanned urbanization and construction activities can create conditions favourable for mosquito breeding sites, thus increasing the threat of malaria re-establishment. Since elimination does not necessarily imply the absence of malaria vectors, the continued risk of reintroduction and re-establishment requires vigilant and sustained prevention efforts.

To address this situation, a collaborative initiative exists between the WHO Regional Office for the Eastern Mediterranean, the Global

Institute for Disease Elimination (GLIDE) and ministries of health from the MENA region to develop the region's first integrated malaria knowledge platform and database to guide prevention of re-establishment of local malaria transmission. The platform brings together over 100 years of historical data with maps of vector habitats and environmental risk factors, creating a regional archive to support evidence-based planning and cross-border collaboration.

Against this background, a regional meeting for MENA countries on the prevention of re-establishment of local transmission of malaria was held in Cairo, Egypt, from 14 to 16 July 2025, in a hybrid format that combined in-person and virtual participation.

The objectives of the meeting were to:

- review the current status and challenges of malaria and other vector-borne diseases in the MENA region;
- identify and share best practices in sustaining malaria-free status through national experiences and technical sessions;
- update participants on the progress of the GLIDE-funded project on malaria data platforms and receptivity modelling;
- assess ecological and epidemiological factors that contribute to the risk of re-establishment of local malaria transmission;
- develop a regional plan of action to enhance cross-border coordination, integrated surveillance and vector control strategies;
- explore opportunities for resource mobilization and regional support to high-burden neighbouring countries.

The meeting convened national malaria control programme managers, entomologists and public health experts from Egypt, Iran (Islamic Republic of), Iraq, Libya, Oman, Qatar, Saudi Arabia, Tunisia, the United Arab Emirates and Yemen. It was organized by the WHO Regional Office for the Eastern Mediterranean, in collaboration with

GLIDE. Participants included WHO staff from the Regional Offices for the Eastern Mediterranean and Africa, the Global Malaria Programme (GMP), the Neglected Tropical Diseases unit at WHO headquarters, and country offices, as well as representatives from GLIDE, the Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise Giuseppe Caporale (IZSAM), the Kenyan Medical Research Institute (KEMRI) and the University of Oxford.

2. Summary of discussions

The meeting opened with remarks from Dr Benedetta Allegranzi, Director of the Department of Communicable Diseases at the WHO Regional Office for the Eastern Mediterranean, who welcomed the participants. She highlighted the regional urgency of sustaining malaria-free status amid growing threats from importation, climate change and political instability, emphasizing that achieving and maintaining zero local transmission requires robust strategies and high-level commitment. Dr Benedetta reinforced the message that sustaining zero local transmission requires robust strategies and high-level commitment.

GLIDE introduction

Mr Simon Bland, Chief Executive Officer of GLIDE, outlined the institute's mission to support malaria elimination through innovation, regional partnerships and targeted investments. Dr Farida Al Hosani, Deputy Chief Executive Officer, and Dr Ngozi Erondu, Technical Director, highlighted the importance of sustainable financing and the development of operational tools that are country-owned and context-specific.

Eastern Mediterranean Region malaria and vector control overview

In 2023, the WHO Eastern Mediterranean Region reported an estimated 10.2 million malaria cases, with about 572 million people at risk. Six

countries (Afghanistan, Djibouti, Pakistan, Somalia, Sudan and Yemen) remain in the burden reduction phase, while the Islamic Republic of Iran and Saudi Arabia are advancing toward the elimination phase but face country-specific challenges. Malaria incidence has continued to rise, reaching 17.9 cases per 1000 population at risk in 2023, almost double the incidence recorded in 2015. The Region therefore is not on track to meet malaria reduction targets.

At the same time, 14 countries/territories (Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, the occupied Palestinian territory, Oman, Qatar, the Syrian Arab Republic, Tunisia and the United Arab Emirates) are considered malaria-free, with zero indigenous cases reported for three or more consecutive years. They are now in the prevention of re-establishment phase. However, these countries remain both receptive (continued presence of malaria vectors) and vulnerable (imported cases, population movement and effects of climate change). The Malaria Action Plan for the Eastern Mediterranean Region 2022–2030, aligned with the Global Technical Strategy for Malaria 2016–2030, provides the framework for strengthening surveillance, enhancing outbreak preparedness and elimination, and supporting prevention of re-establishment.

Regarding neglected tropical diseases (NTDs), an estimated 78 million people in the Eastern Mediterranean Region require interventions, with 84% concentrated in Afghanistan, Pakistan, Sudan and Yemen. The burden amounts to an estimated loss of 1 million disability-adjusted life years (DALYs) due to NTDs, with nearly half (48%) due to leishmaniasis and soil-transmitted helminthiases. In the Region, 10 countries have eliminated at least one NTD, most recently Jordan (leprosy, 2024). Regional priorities include updating national master plans, strengthening capacity for case management and surveillance, expanding access to NTD medicines (through the Dubai Hub), and enriching Arabic-language technical guidance and training tools.

Implementation of integrated vector management (IVM) in the Region to prevent and control malaria and other vector-borne diseases is guided by the Global Vector Control Response 2017–2030 strategy that focuses on strengthening national capacity, improving vector surveillance and enhancing coordination and integrated action across sectors and diseases, with an emphasis on intersectoral collaboration and community engagement. WHO supports countries to strengthen integrated vector surveillance and control through an IVM strategy based on a vector control needs assessment. Countries are encouraged to introduce WHO prequalified novel tools and innovations and generate local evidence for informed decision-making.

Despite significant progress, malaria and NTD programmes in the Region face multiple challenges. Protracted humanitarian crises, fragile health systems and extreme climatic events weaken response capacity. Emerging biological threats, such as the spread of *Anopheles stephensi* and *Aedes aegypti/albopictus*, growing insecticide and drug resistance, and HRP2/3 gene deletions, further complicate control efforts. In addition, insufficient and sustainable financing, with reliance on external donors, threatens programme continuity. Sustained progress requires stronger coordination across programmes and integrated approaches to address emerging vector-borne diseases. Investments are urgently needed to strengthen health systems, particularly in fragile and high-burden settings. Priorities include addressing human resource gaps, improving infrastructure and enhancing service quality. Increased domestic contributions, aligned with country-led priorities is critical. Finally, effective community engagement, climate resilient health systems and improved access to affordable, quality assured commodities through regional production are essential to sustain malaria-free status and prevent re-establishment of transmission.

Launch of the first-ever global guidance on prevention of re-establishment of malaria transmission

Dr Xiao Hong from the WHO Global Malaria Programme introduced the newly-published *Prevention of re-establishment of malaria transmission: Global guidance*. The guidance was developed in response to increasing threats of the reintroduction of malaria, particularly in countries that have achieved elimination but remain ecologically receptive. The guidance was described as adaptable and modular, enabling countries to tailor actions based on receptivity, risk of importation and health system readiness.

The guidance aligns with existing WHO malaria strategies, while filling a gap in global guidance for sustaining malaria-free status. Participants welcomed the publication, noting its timeliness in light of increasing cross-border movement, climate variability and the spread of invasive vectors such as *An. stephensi* in the Region. The session concluded with countries expressing their intent to integrate the prevention of re-establishment guidance into their national malaria strategies, using it to reinforce cross-border coordination, and aligning it with national legislation and emergency preparedness structures as a critical instrument to maintain malaria elimination gains and prevent re-establishment.

Global Institute for Disease Elimination

Dr Diana Yousef from GLIDE shared its evolving role as a dynamic partner in disease elimination. Established in 2019 and rooted in the long-standing health philanthropy of the United Arab Emirates, GLIDE operates as a global accelerator and knowledge hub with a mission to advance sustainable elimination of infectious diseases. Dr Yousef emphasized the importance of cross-border collaboration, innovation and operational research, particularly in the context of limited resources and

persistent threats, such as resurgence following certification. Through its strategic pillars – capacity strengthening, operational research and advocacy – GLIDE supports country-led solutions, integrated health systems and evidence generation. Its activities include the Falcon Awards for Disease Elimination, the Disease Elimination and Eradication Course (DEEC), the Injaz Fellowship and technical convenings, such as roundtables and symposia. The team reiterated its commitment to working with WHO and countries in the MENA region to strengthen surveillance, promote shared learning and catalyse impactful action against malaria and other eliminable diseases.

Malaria data platform for prevention of re-establishment in the MENA region

Professor Bob Snow, Professor of Malaria Epidemiology at the University of Oxford, and the principal scientist at the KEMRI, presented a project on malaria data platforms and nationally-driven analytics to understand receptivity and recession in the MENA region, which aims to establish a regional malaria knowledge platform to guide prevention of re-establishment of malaria transmission and support surveillance and elimination strategies. Spanning MENA countries from Morocco to the Islamic Republic of Iran, the project is led by the WHO Regional Office for the Eastern Mediterranean in collaboration with GLIDE, the University of Oxford, KEMRI-Wellcome Trust (Nairobi) and WHO GMP. The project has compiled data on the historical distribution of malaria risk and geo-coded inventories of *Anopheles* mosquito distribution, representing the first updated version of ecological risk since the 1960s and the largest vector data repository for the region. These data are useful for future modelling of receptivity to the re-introduction of malaria in countries that have eliminated malaria. The project has provided valuable insights to guide prevention of re-establishment

strategies but equally has underscored the need for continued surveillance and improved cross-border data sharing.

During discussions, participants stressed the importance of integrating the platform with national surveillance systems, ensuring regular updates to maintain relevance and making outputs accessible for operational use at subnational levels. Several participants expressed the need for capacity-building to develop, interpret and apply the modelling efforts for receptivity and highlighted the benefit of harmonizing entomological datasets to allow better model validation across borders. Participants agreed that the final database should not only serve as a dynamic decision-support tool for strengthening prevention of re-establishment policies and certification readiness, but also provide a scalable foundation for integration into broader vector-borne disease surveillance and control efforts.

Ecological niche modelling for vector-borne diseases in the Islamic Republic of Iran

The presentation by Professor Ahmad Ali Hanafi, Department of Vector Biology and Control of Diseases, School of Public Health, Tehran University of Medical Sciences, outlined how ecological niche models or species distribution models are used to identify high-risk areas for vectors and understand their relationship with environmental and climatic factors. The approach integrates geocoded occurrence data of vectors, environmental variables (e.g. temperature, rainfall, Normalized Difference Vegetation Index values, land cover, soil type and population density) and statistical or machine learning models such as MaxEnt and Random Forest to generate both ecological suitability and habitat distribution maps. In the Islamic Republic of Iran, modelling was conducted for seven malaria vector species, producing detailed maps of current and potential future habitats, including under climate change scenarios for the 2030s. Although malaria transmission is now restricted

to the south-eastern part of the country, imported cases have occurred in malaria-free central areas, indicating ongoing receptivity and vulnerability. Climate change and invasive species, notably *An. stephensi*, could expand habitat suitability, with some predictions already confirmed by subsequent field detections. The work has also extended to other vector-borne diseases – dengue, leishmaniasis, Crimean-Congo haemorrhagic fever and West Nile virus – demonstrating multi-disease applicability of ecological niche modelling for surveillance, outbreak prediction and targeted vector control.

Participants highlighted the value of such models in cross-border collaboration, as ecological suitability zones often extend beyond national boundaries. Concerns were raised about the lack of standardized regional environmental datasets, which could limit model comparability. Several countries expressed interest in applying similar modelling to strengthen prevention of re-establishment strategies, integrate outputs with existing surveillance platforms and expand the approach to other vector-borne diseases.

Earth Observation in vector-borne disease surveillance

The presentation by Dr Alessandro Ripani and Dr Annamaria Conte of IZSAM highlighted the use of Earth Observation (EO) data to enhance vector-borne disease surveillance and risk mapping. EO provides accurate geolocations, consistent environmental measurements and repeated coverage to detect changes over time, supporting the identification of climatic and ecological conditions favourable for vectors and disease transmission. Using data collected by different EO missions and satellites, including Copernicus Sentinel-1 and Sentinel-2, Landsat, MODIS sensors on NASA's Terra and Aqua satellites, and the VIIRS instrument, EO enables the extraction of key environmental and climatic variables – such as land surface temperature, vegetation indices, soil

moisture and rainfall – that influence vector ecology. Examples included the AIDEO and PROVNA projects, which applied EO and machine learning (e.g. XGBoost) to model West Nile virus circulation in Italy and define ecological "ecoregions" in North Africa. These ecoregions, each characterized by distinct climatic and environmental factors, support tailored surveillance strategies for different vector species and diseases.

In the discussion, participants explored the feasibility of adapting these methodologies to the MENA region, particularly to address gaps in entomological surveillance and ecological mapping for malaria prevention of re-establishment. They emphasized the value of EO in validating and refining ecological receptivity models, especially in areas with scarce field data. Several country representatives expressed interest in integrating EO products into national surveillance systems and linking them with real-time climate monitoring. The potential of EO to monitor habitat changes under climate variability, track invasive vector species such as *An. stephensi* and support cross-border surveillance was underlined. The approach was seen as a promising complement to ongoing prevention of re-establishment strategies, with strong potential for application in future regional initiatives such as CLIMATE-SPACE.

Overview of country presentations

Egypt was certified malaria free in 2024, supported by strong integrated vector surveillance, routine screening, cross-border coordination with Sudan and free chemoprophylaxis for travellers. Libya eliminated malaria in 1973 but faces rising reintroduction risks due to migration and political instability. Tunisia has been malaria-free for decades, following historical elimination campaigns supported by WHO, but remains concerned about the potential spread of invasive vectors such as *An. stephensi* and *Ae. aegypti/albopictus*. For North Africa, the greatest risks lie in imported malaria and the ecological threat posed by invasive, urban-adapted vectors.

These risks are exacerbated by resource shortages, limited human capacity and the presence of undocumented migrants. In addition, several reported deaths from some countries underscore the importance of raising awareness among travellers, migrants and health staff on ensuring access to quality malaria diagnosis and prompt treatment to prevent severe illness, death and ongoing transmission.

Oman, Qatar, Saudi Arabia and the United Arab Emirates (certified malaria-free in 2007) have eliminated local malaria transmission. Oman reported its last indigenous case in 2015, Saudi Arabia has reported zero indigenous cases since 2021, and Qatar has been free of local transmission since 1970. Their main challenge is the continuous influx of imported cases from expatriate workers, pilgrims and travellers arriving from malaria-endemic countries. National strategies focus on maintaining robust surveillance systems with real-time reporting, deploying rapid response teams, strengthening private-sector engagement, enhancing cross-border collaboration and providing chemoprophylaxis for travellers. These countries also invest in intersectoral collaboration, vector monitoring, insecticide resistance management and simulation exercises to sustain prevention of re-establishment of malaria transmission.

Iraq has been free of indigenous malaria since 2008 but remains vulnerable to reintroduction, particularly from religious tourism, refugees and migrant workers. Surveillance and free diagnosis and treatment continue to serve as the backbone of prevention of re-establishment, although insecticide resistance monitoring requires urgent updating. Iraq prioritizes awareness-raising for travellers, integrated vector management and cross-border collaboration to sustain its malaria-free status.

Yemen is the only malaria-endemic country in the participating countries, with ongoing malaria transmission and nearly 1 million estimated cases. The key vector control interventions include distribution of insecticide treated nets, small scale indoor residual spraying in highly-endemic districts (last round conducted in 2023 due to resource constraints) and larval source management (source reduction and chemical larviciding during outbreaks).

Monthly entomological surveillance confirms widespread presence of the invasive *An. stephensi*, *Ae. aegypti* and the recently-detected invasive *Ae. albopictus* in Al-Mahrah governorate. *An. stephensi* is now the dominant malaria vector in the Aden region, which has shifted malaria transmission from rural foci to urban and peri-urban areas, particularly affecting displaced populations. The increase of malaria risk in urban areas is exacerbated by extreme climate events and the concurrent burden of dengue and other vector-borne diseases (chikungunya, West Nile virus, leishmaniasis). Despite these challenges, significant achievements include maintaining Socotra Island malaria-free for 20 years and sustaining pre-elimination status in Hadramout governorate.

The way forward focuses on strengthening active case detection, updating and implementing an integrated vector management strategy, continuing insecticide resistance monitoring and mobilizing domestic and external resources (including KSrelief and Global Fund to Fight AIDS, Tuberculosis and Malaria support) to accelerate progress toward elimination and prevent re-establishment of transmission in elimination areas. In addition, the national programme will collaborate with WHO to pursue subnational verification of malaria- free status in Socotra Island.

Case study from the United Arab Emirates: a success story for strategies to sustain malaria elimination

The United Arab Emirates, certified malaria-free by WHO in 2007, has sustained elimination through strong political commitment, highly sensitive surveillance and cross-sectoral collaboration with border control, labour and immigration authorities. The national system ensures rapid case detection and response, supported by continuous entomological monitoring and private-sector engagement, given the large expatriate population. The experience of the United Arab Emirates demonstrates that with vigilant surveillance, integrated vector management and strong regional cooperation, malaria elimination can be achieved and also sustained.

Group discussion

The meeting included group discussions on the draft regional plan for prevention of re-establishment of malaria transmission 2025–2028. Two groups, the North Africa countries group (Libya, Tunisia, Egypt) and the Gulf Cooperation Council (GCC) member countries and Yemen (Oman, Qatar, Saudi Arabia, United Arab Emirates and Yemen), discussed and explored collaboration on the five regional priorities:

- regional governance and cross-border collaboration
- integrated surveillance and early warning
- integrated vector management and insecticide resistance monitoring
- case management and health system preparedness
- capacity-building, research and certification.

Participating countries agreed to develop a harmonized plan, with WHO support, in collaboration with national stakeholders. The plan seeks to maintain malaria-free status, accelerate elimination in endemic countries and strengthen vector-borne disease control through coordinated cross-border

collaboration. As a key outcome, participants highlighted the importance of supporting Yemen, with GCC member countries expressing interest in playing a vital role given Yemen's significance in preventing the re-establishment of malaria in the region. The plan aims to strengthen and expand current systems rather than duplicate efforts by leveraging existing platforms and mechanisms. Countries also emphasized knowledge sharing, encouraging the exchange of publications and strengthening peer learning.

3. Conclusion

The meeting provided an excellent opportunity for countries and partners to strengthen regional collaboration for a coordinated approach to malaria elimination and prevent the re-establishment of malaria transmission in the MENA region. The launch of WHO's new global guidance on the prevention of re-establishment of malaria transmission, provides a crucial framework for countries to sustain malaria-free status, avoid setbacks and support neighbouring endemic countries towards elimination.

Participants emphasized the importance of political commitment, sustainable resource allocation and mobilization, and coordinated regional action. Preventing the re-establishment of malaria requires vigilance, adaptability, investment and collaboration to address shared challenges such as population movement, political instability, climate change and the spread of invasive vectors.

4. Recommendations

1. **Develop harmonized strategies and strengthen cross-border collaboration.** Develop and adapt harmonized strategies for malaria and other vector-borne diseases. Establish and operationalize/use common mechanisms for cross-border collaboration for elimination and prevention of re-establishment of malaria in malaria-free areas. This should include regular information-sharing between countries, joint planning and response activities, and harmonization of prevention of re-establishment strategies at regional and subregional levels, in line with WHO guidance. Countries should use the experience of malaria elimination and prevention of re-establishment for joining efforts for multi-disease elimination across the region.
2. **Build national and regional capacity.** Support capacity-building for implementation of prevention of re-establishment strategies, including training of health workers, strengthening surveillance and response systems, and ensuring timely detection and management of imported cases. WHO should continue to support countries in achieving malaria elimination and in certification of malaria-free status, as well as in validation and verification of elimination of NTDs.
3. **Enhance data sharing and use.** Regularly update and maintain the MENA integrated platform to improve data availability, promote evidence-based decision-making and monitor progress towards malaria and other vector-borne diseases elimination and sustained zero local transmission across the Region.
4. **Target zero malaria mortality across the Region**. This needs continuous investment by countries in awareness-raising among at-risk groups and health care providers, and providing access to high-quality surveillance, diagnostics and medicine.

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