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Malaria in Libya: Re-emergence or Importation? A Short Literature Review

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ABSTRACT

Libya recorded its last indigenous malaria case in 1973, yet confirmed cases continue to be diagnosed every year, and reports of locally acquired infections have prompted claims that the disease is returning. This review appraises published and official evidence on whether malaria in Libya represents re-emergence of local transmission or continued importation from endemic countries. The evidence indicates that endemic transmission has not been re-established. Nearly all diagnosed cases are imported, chiefly in migrants and workers from Niger, Chad, Sudan and other sub-Saharan countries, and positivity in southern convenience samples ranged from 14.8% to 64.4% depending on population and assay. Locally acquired events are few and heterogeneous: a suspected non-imported case in 2004, two cases without travel in Wadi Al-Shati in 2015 that were never fully published, and a fatal 2024 Benghazi cluster that investigators attributed to an aircraft-imported mosquito rather than to local vectors. Receptivity nonetheless persists, because *Anopheles sergentii* and *An. multicolor* remain established in Fezzan oases and *An. sergentii* has been recorded in north-western Libya. Rising vulnerability from Sahelian and Sudanese population movement, the spread of *An. stephensi* across Sudan to its border with Libya, and the absence of parasite genotyping or vector infection studies leave Libya at genuine risk of introduced transmission, particularly in the Fezzan.

الملاريا في ليبيا: عودة للظهور أم حالات وافدة؟ مراجعة أدبية قصيرة

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الكلمات المفتاحية:
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الملاريا المُدخَلة
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الهجرة

الملخص

سُجّلت آخر حالة ملاريا محلية في ليبيا عام 1973، ومع ذلك لا تزال حالات مؤكدة تُشخَّص كل عام، وقد أثارت تقارير عن إصابات مكتسبة محليًا ادعاءات بعودة المرض. تُقيّم هذه المراجعة الأدلة المنشورة والرسمية لتحديد ما إذا كانت الملاريا في ليبيا تمثل عودةً لظهور السراية المحلية أم استمرارًا لوفود الحالات من البلدان الموبوءة. وتشير الأدلة إلى أن السراية المستوطنة لم تُستأنف؛ فجميع الحالات المشخّصة تقريبًا وافدة، ولا سيما بين المهاجرين والعمال القادمين من النيجر وتشاد والسودان وغيرها من بلدان أفريقيا جنوب الصحراء، وتراوحت نسبة الإيجابية في العينات الملائمة من الجنوب بين 14.8% و64.4% بحسب الفئة السكانية ونوع الاختبار. أما الأحداث المكتسبة محليًا فقليلة ومتباينة: حالة يُشتبه في أنها غير وافدة عام 2004، وحالتان دون تاريخ سفر في وادي الشاطئ عام 2015 لم تُنشر تفاصيلهما كاملة، وعنقود مميت في بنغازي عام 2024 عزاه المحققون إلى بعوضة وافدة على متن طائرة لا إلى نواقل محلية. ومع ذلك تظل قابلية السراية قائمة، إذ لا يزال البعوض *Anopheles sergentii* و*An. multicolor* مستوطنًا في واحات فزان، كما سُجّل *An. sergentii* في شمال غرب ليبيا. ويؤدي تزايد قابلية التعرض الناتج عن حركة السكان من منطقة الساحل والسودان، وانتشار *An. stephensi* عبر السودان حتى حدوده مع ليبيا، وغياب دراسات التنميط الجيني للطفيليات ودراسات إصابة النواقل، إلى جعل ليبيا عرضة لخطر حقيقي من السراية المُدخَلة، ولا سيما في فزان.

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1. Introduction

Whether malaria has returned to Libya is a question of classification as much as of case counts. The World Health Organization (WHO) distinguishes imported cases, acquired outside the country, from introduced cases, acquired locally from an imported case, and from indigenous cases, acquired locally without evidence of importation [1]. Airport malaria, in which a person living near a point of entry is bitten by an infected mosquito carried by aircraft, is a separate event that implies no local vector at all [1–3]. WHO's operational definition of re-established transmission is the occurrence of at least three indigenous cases of the same species in the same focus for three consecutive years [4].

Libya occupies an unusual position within this framework. It is commonly described in national literature as certified malaria-free in 1973, but WHO lists Libya on its supplementary register of countries where malaria disappeared, entered in 2012, rather than among countries formally certified after an elimination programme [5]. WHO regional profiles report that the last local case occurred in 1973 and that all confirmed cases since then have been imported, for example 88 confirmed cases in 2012 with no local case [6].

The country nonetheless sits on the main trans-Saharan migration corridors between highly endemic Sahelian states and the Mediterranean, in a region where climate change, armed conflict and cross-border mobility all move pathogens [7], and its southern oases historically sustained malaria transmission. In March–April 2026 the International Organization for Migration counted 943,748 migrants in Libya, including about 325,000 Sudanese, 193,000 Nigeriens and 91,000 Chadians [8]. This review draws together historical, entomological, clinical and outbreak-investigation evidence to judge whether current malaria in Libya reflects re-emergence of local transmission or continued importation, and where the evidence is too weak to decide.

2. Historical endemicity and elimination

Malaria in Libya was never hyperendemic, but it was entrenched in specific ecological niches. Malariological records kept under Italian, British and Libyan administrations from the early 1900s describe the Fezzan as historically the most malarious part of the country, with recurrent epidemics of *Plasmodium falciparum* introduced by caravan traffic from the south and transmitted by local anophelines, while *P. vivax* predominated near the coast [9]. Italian control campaigns were operating around Ubari in the 1930s, and WHO-supported pre-eradication surveys in the late 1950s described oasis malaria as a distinct Libyan problem [9].

The last indigenous case was recorded in 1973 [6,10,11]. Serosurveys conducted in the early 1980s supported interruption of transmission: native schoolboys showed no antibodies to any malaria species, whereas immigrant labour groups, particularly from South Asia, carried substantial antibody evidence of past relapsing malaria [12]. Episodes after elimination were consistently traced to imported sources. A 1976 epidemic of falciparum malaria among petroleum-company workers and a cluster of 18 *P. vivax* infections in the coastal town of Zuara, attributed to migrant workers, are both cited in the national literature as introduced events that did not lead to sustained transmission [10,13].

3. Anopheline vectors and receptivity

Libya remains receptive to malaria because competent indigenous vectors persist, although their distribution is patchy and poorly mapped. Fourteen *Anopheles* species were recorded up to 1960, but critical reappraisal reduced the epidemiologically relevant fauna to two desert species, *An. sergentii* and *An. multicolor*, which are sufficiently widespread to sustain transmission, with *An. labranchiae* important only around Touarga on the Tripolitanian coast [9]. Historical records of the Afrotropical vector *An. gambiae* in the Fezzan were judged erroneous [9]. Later regional reviews retain *An. multicolor* and *An. sergentii* as the principal potential vectors in Libya [14,15], and one notes that the dominant species among imported cases there has historically been *P. vivax* [14].

Receptivity in the Fezzan is closely tied to water management. By 1983, deep bores and sprinkler irrigation had removed larval habitats from the Wadi Etba and Wadi Al-Ajal oases, whereas both vectors persisted in Wadi Al-Shati, the Hun–Waddan and other oasis groups, and *An. sergentii* remained common in Wadi Tanezzuft near Ghat [9]. The same analysis warned that exploitation of deep Saharan aquifers could create new breeding sites and that improved trans-Saharan roads could open a route for *An. arabiensis* or *An. gambiae* from Tibesti or the Algerian Tassili, less than 80 km from Ghat [9].

Recent entomological work is sparse. Larval surveys in Tarhuna in 2018 recorded *An. sergentii* among seven mosquito species, on a route used by migrants moving north [16]. In contrast, light-trap surveillance around Benina airport in Benghazi in late 2024 collected only *Culex pipiens*, consistent with national data indicating that *Anopheles* is generally absent from coastal urban areas [17]. No published study was identified that has examined Libyan anophelines for *Plasmodium* infection or insecticide susceptibility, so vectorial capacity is inferred from species presence rather than measured.

4. Imported malaria: burden, origins and species

Importation accounts for virtually all malaria diagnosed in Libya, and its scale tracks the size and origin of incoming populations. WHO regional data for 2003–2012 classify every confirmed case as imported, ranging from 5 to 27 cases a year in 2004–2009 and reaching 88 in 2012, of which 51 were *P. falciparum* or mixed and 28 *P. vivax* [6]. Facility and community studies, summarised in Table 1, show that positivity varies more with population and assay than with place.

Table 1. Malaria prevalence studies in Libya after elimination (newest first).

Study	Setting and period	Population (n)	Method	Positive, n (%)	Notes
Al-Haddad and Elsalem [13]	Sebha, 2020–2021	Expatriate workers seeking health cards (363)	RDT, HRP2/pLDH	141 (38.8)	*P. falciparum* 27.8%; pan-only 11.0%; highest in workers from Chad (55.6%) and Niger (41.4%)
Alhaddad and El-Salem [18]	Sebha, February–March 2020	Asymptomatic expatriate workers seeking health cards (135)	RDT, HRP2/pan	20 (14.8)	19 *P. falciparum*, 1 mixed; Niger 20.6%; none of 14 Egyptian workers positive
Mahanay et al. [19]	Brak Al-Shati, Sebha and Bergen centres	Irregular migrants (303)	ELISA, antibodies	195 (64.4)	172 positives had arrived within 10 months; most positives from Ghana (70), Niger (40) and Bangladesh (39)
Hamid et al. [10]	Sebha Medical Centre, 2012–2015	Febrile patients from Sebha, Murzuq, Ghat and Um Al-Aranib (220)	RDT and microscopy	43 (19.5)	39 *P. falciparum*, 4 *P. vivax*; 41 positives were Libyan; travel history not reported
University of Tripoli [20]	Tripoli, 2006–2007	Legally employed foreign workers (1,038)	RDT and microscopy	10 (1.0)	9 *P. falciparum*, 1 *P. vivax*

RDT, rapid diagnostic test; HRP2, histidine-rich protein 2; pLDH, *Plasmodium* lactate dehydrogenase; ELISA, enzyme-linked immunosorbent assay.

The contrast between 1.0% positivity in regularised workers in Tripoli and 14.8–64.4% in southern migrant samples reflects both true exposure gradients and methodological differences [13,18–20]. Antibody positivity marks past exposure rather than current infection [19]. HRP2-based tests remain positive for a median of about 15 days after treatment, and in 5% of patients for more than a month [21], while a pan-only result cannot be equated with *P. vivax*. The two Sebha surveys by the same group illustrate the problem: none of 14 Egyptian workers tested positive in early 2020, whereas 36.6% of 101 Egyptian workers and 30.8% of Tunisian workers did in 2020–2021, although neither Egypt nor Tunisia has local transmission [5,13,18]. Such results suggest acquisition during residence elsewhere, limited test specificity, or both. Libyan nationals who travel to endemic neighbours are also at risk: in 2017 a 25-year-old Libyan man returning from Niger was admitted to Sebha Medical Center with *P. falciparum* malaria complicated by multiorgan failure [11].

Evidence from receiving countries in Europe points the same way. *P. falciparum* malaria was diagnosed in Italy in Malian migrants who had lived in Libya for long periods, raising the possibility of acquisition in Libya [22]. A GeoSentinel analysis of 146 malaria cases in Eritrean migrants, mostly *P. vivax*, listed Libyan detention centres among possible exposure sites and called for molecular study of transit routes [23]. Neither report could exclude relapse or prolonged incubation, which are expected with *P. vivax* and *P. ovale* and occur with semi-immune *P. falciparum* carriage.

5. Reported locally acquired events

Only a handful of locally acquired infections have been reported since 1973, and none has been followed by detected onward transmission (Table 2). Their documentation ranges from a single sentence in a national report to a peer-reviewed outbreak investigation.

Table 2. Reported malaria events without travel history in Libya since 1973 (newest first).

Year	Place	Cases	Key evidence	Most likely classification
2024	Benghazi, about 450 m from Benina International Airport	4 *P. falciparum* in one family, 1 death	No travel or transfusion; 20 suspected contacts negative; light traps caught 8 *Culex pipiens* and no *Anopheles* [17]	Airport malaria, probably via cargo [17]
2015	Al-Disa, Wadi Al-Shati	2 (a pregnant Libyan woman and a relative)	No travel abroad or transfusion according to the national centre for disease control, which also reported female *Anopheles* locally; species and investigation unpublished [10,18,24]	Probable introduced cases; not confirmed
2004	Not specified	1 of several cases	Considered non-imported in a national report [10]	Undetermined
1976	Petroleum company sites	Epidemic among workers	Slide-confirmed *P. falciparum* [10]	Imported or introduced cluster

The Benghazi cluster is the only Libyan event with published epidemiological and entomological investigation. Its significance lies in the route rather than the place: infection was acquired in Libya, but through an imported vector, which by definition does not indicate local receptivity [1,17]. Comparable clusters near airports have been described in Frankfurt in 2022 and in Tunis in 2013, where

four neighbours living within 2 km of the airport were infected and entomological surveys were negative [2,3].

The 2015 Wadi Al-Shati cases are epidemiologically more important, because they arose in an oasis with historically documented vectors and a large migrant population [9,19]. They fit the definition of introduced malaria, yet without parasite species, genotype, entomological findings or follow-up surveillance in the published record, they cannot be distinguished from undisclosed travel, relapse of an earlier infection or misdiagnosis [18,24].

6. Regional pressures on Libya's malaria-free status

Neighbouring Saharan settings show what introduced transmission looks like when receptivity and importation coincide. Algeria, certified malaria-free in 2019, has recorded imported cases concentrated in its southern provinces since the late 1970s, and these have occasionally generated introduced cases in the south, including a cluster in Ouargla [25]. In 2007, 26 autochthonous *P. falciparum* cases occurred in Tinzaouatine near the Malian border, where larvae of *An. gambiae* sensu stricto were found for the first time in Algeria; more than 90% of southern Algerian cases originate in Mali and Niger [26]. North African reviews also describe probable local *P. falciparum* transmission in Algeria in 2013 and *P. vivax* cases in Aswan, Egypt, in 2014 that were officially classified as imported [14]. The southern Fezzan shares the same desert vectors and migration routes, with Ghat less than 80 km from the Algerian oases of Djanet [9].

Pressure from the east has increased sharply since the war in Sudan began in April 2023. By September 2024, more than 97,000 Sudanese refugees had arrived in Libya according to UNHCR estimates, mainly through Kufra, and humanitarian agencies reported suspected malaria cases there pending national investigation [27,28]; by 2026 Sudanese nationals formed the largest migrant group in the country [8]. The invasive urban vector *An. stephensi*, first recorded in Africa in Djibouti in 2012 [29], has spread across Sudan and has been confirmed in states bordering Libya, Chad and Egypt [30]. Its use of human-made breeding sites makes it far less dependent on oasis ecology than *An. sergentii*, and habitat models place many North and East African cities within its suitable range [31]. Its arrival would change Libya's receptivity, not only its vulnerability.

In addition to Sudan, the Sahel countries that border southern Libya, notably Niger and Chad, are among the most heavily malaria-endemic areas of Africa, and the large number of irregular migrants crossing from them into and through Libya is a significant risk factor for importation. In 2023, Niger alone accounted for an estimated 5.9% of global malaria deaths, and *P. falciparum* is the predominant species there [32]. Transmission in Niger has been intensified by heavier rainfall and by the expansion of surface water bodies through human activity, which provide breeding sites for the *Anopheles* vector [33]. In Chad, a national survey reported a malaria prevalence of approximately 40.9%, and *An. arabiensis* and *An. gambiae* sensu stricto, the most widely distributed vectors, account for most transmission [34]. Sustained cross-border movement from these countries can therefore be expected to increase the number of imported cases in Libya.

7. Re-emergence or importation? Appraising the evidence

The weight of evidence indicates that malaria in Libya is imported and has not re-emerged as endemic transmission. No published or official source reports indigenous cases recurring in the same focus over consecutive years, the WHO criterion for re-established transmission [4]. The parasites diagnosed in Libya arrive in people from sub-Saharan Africa, chiefly Niger, Chad, Sudan and West African states, and in 2024 in an aircraft-borne mosquito [13,17,19]. Importation does not mean the risk is external only. Libya combines persistent receptivity, through *An. sergentii* and *An. multicolor* in the Fezzan oases, with a vulnerability that is probably higher now than at any time since elimination, given large migrant and refugee populations from endemic countries in Sebha, Wadi Al-Shati and Kufra [8,9,19,27]. The historical pattern of caravan-borne epidemics in the Fezzan, and the 2007 Tinzaouatine outbreak across the border, show that this combination can produce local outbreaks [9,26]. Isolated introduced cases, such as those suspected in Wadi Al-Shati in 2015, are therefore the expected first signal, and their occurrence is consistent with importation rather than evidence against it [10,24].

The absence of documented local transmission should be read with caution, because the evidence base is thin. Most Libyan studies are single-site convenience samples using antibody or antigen tests, often without travel histories or confirmation of species [10,13,18,19]. No published study was identified that genotyped *Plasmodium* isolates from Libya or tested local anophelines for infection, so the origin of a locally acquired case cannot currently be traced with confidence [23]. The same limitation has been described for mosquito-borne arboviruses in the region, where low reported case counts cannot distinguish low transmission from non-detection [35], and many infections described as emerging in North Africa are newly detected rather than new [7]. National surveillance series after 2012 are not readily available in the peer-reviewed literature, and the recurrent description of Libya as certified in 1973, including in recent international literature, is inaccurate on WHO's own register [5,17].

8. Conclusions

On present evidence, malaria in Libya is an imported disease: it has not re-emerged as endemic transmission, but the conditions for introduced transmission are present in the south. The parasites come from endemic countries through migration and, exceptionally, through aircraft, while the receptive ground lies in the Fezzan oases where *An. sergentii* and *An. multicolor* persist [9,17,19].

Several measures would allow this conclusion to be tested rather than assumed. Every locally acquired case warrants a published investigation with travel history, species confirmation by microscopy or polymerase chain reaction, entomological sampling and follow-up case detection, as achieved in Benghazi [17]. Parasite genotyping of imported and suspected local cases would establish origin and detect onward chains [23]. An updated national vector map, with attention to Wadi Al-Shati, Ghat, Murzuq and Kufra and to early detection of *An. stephensi* at the Sudanese border, is the most pressing entomological need [9,30]. Diagnostic capacity in remote southern towns needs the same attention: in Ghat, on the borders with Algeria and Niger, chronic shortages of diagnostics, medicines and specialists were compounded by severe floods in March 2026 [36]. Free access to diagnosis and treatment for migrants and refugees, regardless of legal status, protects both those populations and Libya's malaria-free status [13,19].

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