

## Assessing Pharmacists' Knowledge and Practices Regarding Malaria Management in Sebha, Libya: A Cross-Sectional Study

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تقييم معارف وممارسات الصيادلة فيما يتعلق بإدارة الملاريا في سبها، ليبيا: دراسة مقطعية

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Received: January 31, 2026

Accepted: February 25, 2026

Published: March 29, 2026



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### Abstract:

Background: Although Libya has been certified malaria-free since 1973, the influx of imported cases poses a continuous threat of reintroduction. Pharmacists, as frontline healthcare providers, play a critical role in early detection and management. This study aimed to evaluate the knowledge and practices of pharmacists regarding malaria treatment in Sebha, Libya. Methods: A descriptive cross-sectional study was conducted among 100 pharmacists in Sebha from January to June 2025. Data were collected using a structured questionnaire assessing knowledge of epidemiology, diagnosis, treatment, adverse effects, and practical scenarios. Results: The majority of pharmacists (56%) demonstrated poor overall knowledge, while 34% had moderate knowledge, and only 10% exhibited good knowledge. Knowledge was highest regarding epidemiology (60%) but significantly lower for standard treatment guidelines (40%) and adverse drug reactions (31%). Only 34% correctly identified Artemisinin-based Combination Therapy (ACT) as the first-line treatment for uncomplicated malaria. Furthermore, significant gaps were observed in managing special populations, such as pregnant women. However, recent training was strongly associated with better knowledge (OR ≈ 5, p < 0.001). Conclusion: There are substantial gaps in the knowledge and practices of pharmacists in Sebha regarding current malaria management guidelines. Implementing targeted, continuous educational programs and integrating pharmacists into national pharmacovigilance and surveillance systems are essential to maintain Libya's malaria-free status and ensure optimal patient care.

**Keywords:** Malaria Treatment, Pharmacists, Knowledge and Practices, Artemisinin-Based Combination Therapy (ACT), Pharmacovigilance, Libya.

### الملخص

الخلفية: على الرغم من إعلان ليبيا خالية من الملاريا منذ عام 1973، إلا أن تدفق الحالات الوافدة يشكل تهديدًا مستمرًا بعودة المرض. ويلعب الصيادلة، بصفتهم مقدمي الرعاية الصحية في الخطوط الأمامية، دورًا حاسمًا في الكشف المبكر عن

المرض وإدارته. هدفت هذه الدراسة إلى تقييم معارف وممارسات الصيادلة فيما يتعلق بعلاج الملاريا في سبها، ليبيا. المنهجية: أجريت دراسة وصفية مقطعية شملت 100 صيدلي في سبها خلال الفترة من يناير إلى يونيو 2025. جُمعت البيانات باستخدام استبيان مُهيكل لتقييم المعرفة بعلم الأوبئة، والتشخيص، والعلاج، والآثار الجانبية، والسيناريوهات العملية. النتائج: أظهرت غالبية الصيادلة (56%) معرفة ضعيفة بشكل عام، بينما امتلك 34% منهم معرفة متوسطة، و10% فقط أظهروا معرفة جيدة. كانت المعرفة في أعلى مستوياتها فيما يتعلق بعلم الأوبئة (60%)، ولكنها كانت أقل بكثير فيما يتعلق بإرشادات العلاج القياسية (40%) والآثار الجانبية للأدوية (31%). لم يُحدد سوى 34% من الصيادلة العلاج المركب القائم على مادة الأرتيميسينين (ACT) بشكل صحيح كخط العلاج الأول للملاريا غير المعقدة. علاوة على ذلك، لوحظت فجوات كبيرة في إدارة الحالات الخاصة، مثل النساء الحوامل. ومع ذلك، ارتبط التدريب الحديث ارتباطاً وثيقاً بتحسين المعرفة (نسبة الأرجحية  $\approx 5$ ، قيمة  $p < 0.001$ ). الخلاصة: توجد فجوات كبيرة في معارف وممارسات الصيادلة في سبها فيما يتعلق بالإرشادات الحالية لإدارة الملاريا. يُعدّ تنفيذ برامج تعليمية مستمرة وموجهة، ودمج الصيادلة في أنظمة اليقظة الدوائية والمراقبة الوطنية، أمراً ضرورياً للحفاظ على خلو ليبيا من الملاريا وضمان تقديم أفضل رعاية ممكنة للمرضى.

**الكلمات المفتاحية:** علاج الملاريا، الصيادلة، المعارف والممارسات، العلاج المركب القائم على مادة الأرتيميسينين (ACT)، اليقظة الدوائية، ليبيا.

## Introduction

Malaria remains one of the most significant parasitic diseases globally, posing a major public health challenge, particularly in tropical and subtropical regions. According to the latest World Health Organization (WHO) reports, there were approximately 249 million malaria cases worldwide in 2022, resulting in about 608,000 deaths, with the vast majority occurring in the WHO African Region [1]. The economic and health burdens of the disease are substantial, perpetuating a cycle of poverty and illness in affected communities.

Despite the heavy global burden, significant progress has been made in malaria control over the past two decades. The expansion of control programs, including the distribution of insecticide-treated nets and the intensification of early diagnosis and prompt treatment with Artemisinin-based Combination Therapies (ACTs), has led to a reduction in incidence and mortality rates in many countries [2]. Consequently, several nations have been certified as malaria-free by the WHO.

Libya is among the countries that successfully eliminated local malaria transmission decades ago, receiving official WHO certification in 1973 [3]. Since then, Libya has been classified as a country free of local malaria transmission. However, imported cases remain a source of health concern. Recent decades have seen a steady influx of cases among returning travelers or expatriate workers from endemic countries. A recent study in Sebha, a city in southern Libya, revealed a significant prevalence of malaria among expatriate workers from neighboring countries, with 38.8% of a 363-worker sample testing positive via Rapid Diagnostic Tests (RDTs) [4]. Furthermore, a recent autochthonous cluster of *Plasmodium falciparum* cases identified near Benina International Airport in Benghazi in late 2024 highlights the vulnerability of malaria-free regions to imported vectors [5].

In this context, Sebha holds particular importance as a major urban center and transit hub for migrants from sub-Saharan Africa. Given the relatively limited health infrastructure in the region and the presence of environmental factors that could support vector proliferation, maintaining the readiness of the health system is crucial. Pharmacists are integral to this system, often serving as the first point of contact for patients seeking treatment for fever. Their role extends beyond dispensing medications to providing crucial clinical advice, ensuring adherence to complex regimens like ACTs, and participating in pharmacovigilance.

Despite their critical role, there is a lack of data regarding the readiness of Libyan pharmacists to manage malaria cases, particularly in high-risk areas like Sebha. This study aims to assess the knowledge, attitudes, and practices of pharmacists in Sebha regarding malaria diagnosis and treatment, identifying gaps that could hinder effective disease management and proposing targeted interventions.

## Materials and Methods

### Study Design and Setting

A descriptive, analytic cross-sectional study was conducted to evaluate the current knowledge and practices of pharmacists in Sebha, Libya. Sebha is the largest city in the Fezzan region of southern Libya and serves as a major urban and commercial hub. The study included pharmacists working in both public healthcare facilities (e.g., Sebha Medical Center and primary care clinics) and private community pharmacies.

### Study Population and Sampling

The target population comprised all practicing pharmacists in Sebha during the study period (January to June 2025). Due to the lack of an updated, comprehensive registry of all pharmacists, a convenience sampling method was employed. The final sample size was 100 pharmacists, representing a significant proportion of the active workforce in the city. Inclusion criteria required participants to hold a recognized degree in pharmacy (diploma,

bachelor's, or higher) and to be actively working in a pharmacy or healthcare institution in Sebha. Pharmacy assistants and technicians were excluded.

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### Data Collection Instrument

A structured questionnaire was developed based on previous studies and WHO guidelines, adapted for the Libyan context. The questionnaire consisted of several sections:

- 1 **Demographic and Professional Data:** Age, gender, educational level, workplace, and years of experience.
- 2 **Knowledge of Epidemiology:** Local and global malaria context.
- 3 **Knowledge of Diagnosis:** Clinical signs and diagnostic methods.
- 4 **Knowledge of Standard Treatment:** Current WHO and local guidelines for uncomplicated and severe malaria, including special populations.
- 5 **Knowledge of Adverse Effects and Interactions:** Pharmacovigilance aspects of antimalarial drugs.
- 6 **Attitudes and Practices:** A 5-point Likert scale assessing counseling practices, adherence promotion, and attitudes toward continuing education.
- 7 **Clinical Scenarios:** Three hypothetical case studies to evaluate practical application of knowledge.

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### Data Analysis

Data were coded and analyzed using SPSS software (version 26). Knowledge scores were calculated by assigning 1 point for each correct answer across 34 items. The total score was converted to a percentage and categorized as poor (<50%), moderate (50-74%), or good ( $\geq 75\%$ ). Descriptive statistics (means, standard deviations, frequencies) were used to summarize the data.

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### Results and Discussion

#### Demographic Characteristics

The study included 100 pharmacists. The sample represented a diverse group of professionals from various practice settings, providing a comprehensive overview of the workforce in Sebha.

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#### Overall Knowledge Levels

The assessment of overall knowledge revealed significant gaps among the participants. As shown in Table 1, more than half of the pharmacists (56%) fell into the "poor knowledge" category, while 34% had moderate knowledge, and only 10% demonstrated good knowledge.

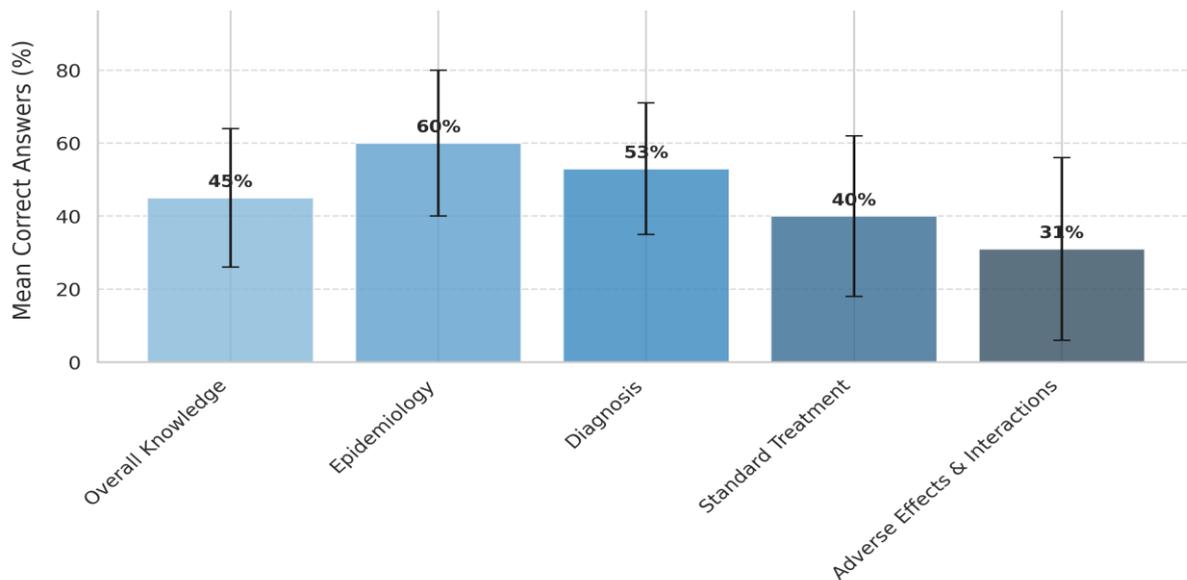
**Table 1:** Distribution of Pharmacists by Overall Knowledge Level

Knowledge Level	Score Range (%)	Number of Pharmacists	Percentage (%)
Poor Knowledge	< 50	56	56.0
Moderate Knowledge	50 – 74	34	34.0
Good Knowledge	$\geq 75$	10	10.0

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#### Knowledge by Specific Domains

When analyzing knowledge by specific domains, performance varied significantly. Pharmacists scored highest in general epidemiology (60% mean correct answers) but struggled with specific treatment protocols and adverse effects.



**Figure 1:** Mean percentage of correct answers across different knowledge domains. Error bars represent standard deviation.

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### Epidemiology and Diagnosis

While 60% of pharmacists correctly identified that malaria is not currently endemic in Libya, only 45% knew the most common global *Plasmodium* species. Regarding diagnosis, 85% correctly identified classic malaria symptoms, but only 60% recognized blood smear microscopy as the definitive diagnostic standard. Alarming, 30% stated they would dispense treatment based solely on symptoms without laboratory confirmation, contradicting the WHO's "Test and Treat" strategy.

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### Standard Treatment Guidelines

Knowledge of standard treatment was notably deficient (mean score 40%). Only 34% correctly identified Artemisinin-based Combination Therapy (ACT) as the current first-line treatment for uncomplicated *P. falciparum* malaria. Many selected outdated options like chloroquine or sulfadoxine/pyrimethamine. Furthermore, only 20% could identify the correct treatment for malaria in the first trimester of pregnancy, highlighting a critical knowledge gap concerning vulnerable populations.

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### Adverse Effects and Pharmacovigilance

This domain had the lowest average score (31%). Only 30% of participants were aware of the risks of administering Primaquine to patients with G6PD deficiency or pregnant women. In practice, reporting of adverse drug reactions was extremely low; only 30% agreed they actively report serious side effects, often citing lack of time or unfamiliarity with the reporting mechanisms.

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### Attitudes and Practices

Despite knowledge gaps, pharmacists showed positive attitudes toward patient counseling. For instance, 88% agreed on the importance of advising patients to take Artemether/Lumefantrine (AL) with fatty foods to enhance absorption. Additionally, 95% strongly emphasized the need for patients to complete the full course of treatment to prevent relapse.

Crucially, 92% of pharmacists expressed a strong desire to attend updated, short training courses on malaria treatment guidelines, indicating a high level of motivation to improve their clinical competence.

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### Discussion

The findings of this study reveal a substantial knowledge deficit among pharmacists in Sebha regarding current malaria management protocols. The fact that only 10% of participants demonstrated good knowledge is concerning, especially given the city's status as a transit hub for migrants from endemic regions.

The low recognition of ACTs as the first-line treatment (34%) is consistent with findings from other studies in non-endemic or low-transmission settings, where lack of regular exposure to the disease leads to knowledge decay [6]. In contrast, studies in highly endemic areas often show better familiarity with ACTs, though gaps in managing special populations remain common [7].

The reliance on outdated treatments and the willingness of a significant minority (30%) to dispense antimalarials without laboratory confirmation pose serious risks, including delayed diagnosis of other febrile illnesses, increased risk of severe malaria complications, and the potential contribution to antimalarial drug resistance.

However, the strong willingness of pharmacists (92%) to participate in continuing education is a highly positive indicator. Previous research has shown that targeted educational interventions can significantly improve pharmacists' knowledge and adherence to treatment guidelines [8].

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## Conclusion

While Libya remains officially malaria-free, the continuous threat of imported cases necessitates a vigilant and well-prepared healthcare system. Pharmacists in Sebha currently exhibit significant knowledge gaps regarding modern malaria treatment protocols, particularly concerning ACTs, management of special populations, and pharmacovigilance. To mitigate the risks associated with imported malaria and prevent potential re-establishment of local transmission, it is imperative to implement continuous, targeted training programs for pharmacists. Furthermore, integrating community pharmacies into national disease surveillance and pharmacovigilance networks will enhance the overall resilience of the healthcare system.

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