

## Original Article

# Treatment-seeking behavior for malaria among communities in Indonesia: A systematic review

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## Abstract

Indonesia stands as one of the nine malaria-endemic countries in Southeast Asia with a total of 443,530 cases in 2022. Eastern Indonesia is listed as an area with high malaria endemicity and the Indonesian government has set a target of eliminating malaria by 2030. From 2010 to 2014, the number of malaria cases decreased but stagnated until 2020 and have continued to increase. Stagnation may occur as a result of many non-medical treatment-seeking behaviors. The aim of this systematic review was to provide a summary and overview of malaria treatment-seeking behavior among communities in several regions in Indonesia. The searches were conducted through four databases (Cochrane, PubMed, Google Scholar, and ScienceDirect) using medical subject headings (MeSH) "treatment-seeking behavior" OR "health-seeking behavior" AND "malaria" AND "Indonesia". This systematic review was limited to studies conducted in Indonesia that were published between 2013 and 2023 using either a quantitative or qualitative approach. Out of 2831 studies, a total of thirteen studies were included. The pattern of seeking malaria treatment varied between doing nothing or no action, self-treatment (purchasing drugs at pharmacies and consuming leftover medicines), traditional medicine, and medical treatment (public health facilities or malaria control clinics). Those behaviors are attributed to education level, socioeconomic level, occupation, distance from home to health facilities, geographical conditions, and people's perceptions of malaria and antimalarial medicines. There is still a range of malaria treatment-seeking behavior outside of recommended medical treatment in communities in several regions in Indonesia. The phenomenon of medical pluralism and syncretism requires approaches from various sectors in order to achieve a malaria-free Indonesia by 2030.

**Keywords:** Malaria, behavior, treatment-seeking, health-seeking, Indonesia

## Introduction

Malaria is a parasitic infection of the genus *Plasmodium* sp. which is transmitted by female *Anopheles* mosquitoes [1,2]. Based on data from the World Health Organization (WHO), Indonesia stands as one of nine malaria-endemic countries in Southeast Asia and accounts for 15.6% of cases reported from the entire region with a mortality rate of 22% [3]. The prevalence of malaria in Indonesia in 2022 was 443,530 cases. The provinces of Papua, East Nusa Tenggara, West Papua, North Sumatra, Maluku and North Maluku are recorded as the provinces with the highest incidence of malaria [4]. The annual parasite incidence (API) in Indonesia in 2022 was



1.6 with a national target of API <1 [4]. Between 2010–2014, the number of malaria cases decreased before finally stagnating [4]. The Indonesian government, in collaboration with WHO, has targeted the elimination of malaria in Indonesia no later than 2030. Around 130 million people in Indonesia live in high-risk areas, but the geographic distribution of transmission is very heterogeneous [5].

In the human-mosquito life cycle, six species of the malaria parasite (*Plasmodium falciparum*, *P. ovale wallickeri*, *P. ovale wallickeri curtisi*, *P. vivax*, *P. malariae*, and *P. knowlesi*) undergo ten or more morphological states and replicate from one to more than 10,000 cells. In human hosts, only a small number of morphological stages can cause humans to become infected and get symptoms such as fever, anemia, malaise, chills, myalgia, arthralgia, and others [6]. Treatment of malaria includes combination therapy targeting the morphological stages of both erythrocytes and hepatocytes. Schizonticidal drugs, supportive care, hospitalization of at-risk patients, and 24-hour monitoring of patients receiving antimalarial treatment are needed to achieve recovery and avoid complications of this disease [7]. The complications of malaria include cerebral malaria, anemia, respiratory failure, kidney failure, and even death [8]. However, not all individuals in societies apply those recommended medical treatments in malaria treatment-seeking behavior.

Malaria treatment in Indonesia is sought through various approaches, including doing nothing or “no action”, self-treatment, and traditional medicine. The stagnation of malaria cases in Indonesia can be attributed to such treatment-seeking behaviors, which is not limited to recommended medical treatments. Public perception regarding the etiologies of malaria and antimalarial drugs is closely related to the decisions made in selecting a treatment for malaria. Inappropriate treatments could result in life-threatening complications, anti-malarial resistance, and relapse. The aim of this study was to provide a summary and overview of malaria treatment-seeking behavior among communities in several regions in Indonesia.

## Methods

### Study setting and search strategy

A systematic review was conducted in accordance with the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines. The systematic searches were conducted through four databases (Cochrane, PubMed, Google Scholar, and ScienceDirect) with medical subject headings (MeSH) "treatment-seeking behavior" OR "health-seeking behavior" AND "malaria" AND "Indonesia".

### Eligibility criteria

This systematic review included studies within the last ten years (2013–2023) with both quantitative and qualitative approaches. The search was conducted in English and Indonesian as of August 8, 2023. This systematic review was limited to studies conducted in Indonesia that described the pattern of seeking malaria treatment in the community and related factors such as education level, socioeconomic level, occupation, distance from home to health facilities, geographical conditions, direct costs, and perceptions of disease. Study was excluded if did not focus on the pattern of treatment-seeking for malaria and the research was not conducted in Indonesia.

### Evaluation of methodological quality

The quality assessment was carried out with the criteria of JBI Critical Appraisal Tool for quantitative studies [9] while quality of qualitative studies was assessed using the Critical Appraisal Skills Program (CASP) criteria [10].

### Data extraction

Studies included were categorized based on the research method. Data extraction was carried out by two researchers with the following variables: title, author, year of publication, study location, number of samples, subject characteristics, conclusions from both quantitative and qualitative components.

## Data synthesis

The data were synthesized qualitatively. The findings from the systematic reviews were presented in summary of malaria treatment-seeking behavior and factors associated. Data extracted from the studies were categorized into four distinct groups: no action, self-treatment, traditional medicine, and medical treatment. No action refers to the absence of any drug consumption despite the presence of malaria symptoms. Self-treatment encompasses the consumption of drugs acquired from pharmacies or local drug stores without requiring a prescription. Traditional medicine includes remedies provided by local traditional practitioners without formal medical qualifications. Lastly, medical treatment comprises treatments obtained from official healthcare facilities. Factors related to treatment decisions such as public perception of the causes of malaria and the perception of antimalarial drugs were also presented.

## Results

### Results of study selection

The literature searches yielded a total of 2831 studies. After screening of titles and abstracts, 1,051 studies were excluded due to duplication, conducted outside Indonesia, review articles, not being written in Indonesian or English, and had no full articles. The PRISMA flow diagram is presented in **Figure 1**. A total of 23 studies were considered potentially relevant and underwent thorough assessment. Additional nine studies were excluded as they only discussed the names of drugs or herbs that were used without addressing treatment-seeking behavior in the community. Furthermore, one study was excluded as it did not clarify the definitions and categorize treatment-seeking behavior into "good" and "not good" categories. Following the assessment process, a total of 13 studies were included in this systematic review (**Table 1**).

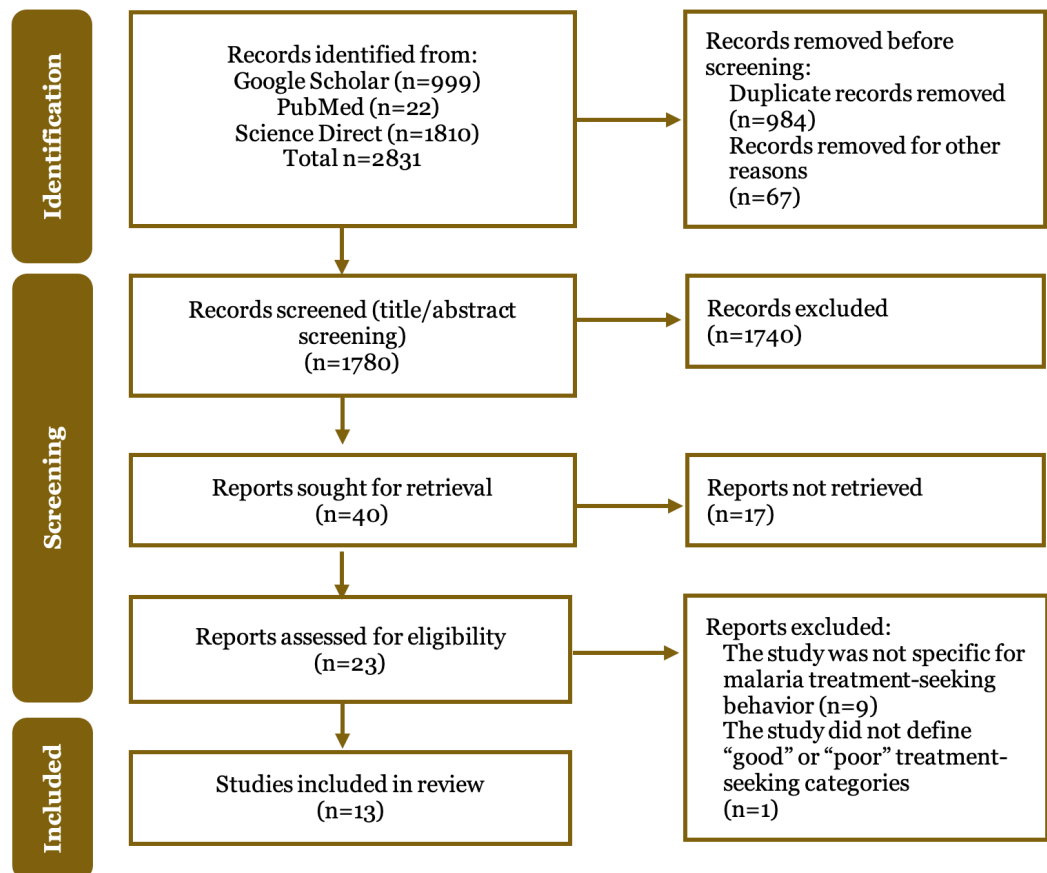


Figure 1. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow diagram.

Table 1. Characteristics of the studies and factors associated with the seeking behavior for malaria

Authors	Year	Location	Study design	Sample	Main findings
Ngambut & Sila [11]	2013	Kupang Timur Subdistrict, Kupang District, East Nusa Tenggara	Cross sectional	185 individuals from 185 households	<ul style="list-style-type: none"> <li>• 21.4% of the population chose health facility</li> <li>• 78.6% of the population chose stall/pharmacy</li> <li>• 16.4% of the population chose traditional medicine</li> <li>• 45.7% of the population seek treatment after 4-6 days (mostly women and people with low levels of education)</li> <li>• Only 3.6% of the population went directly to health facilities</li> </ul>
Ipa & Dhewantara [17]	2015	Bengkulu, Maluku, North Maluku, East Nusa Tenggara, Papua, and West Papua	Cross sectional	287 households	<ul style="list-style-type: none"> <li>• In urban areas, 40.5% of the population opted to purchase drugs at a pharmacy, while 30.2% chose to buy drugs at a stall</li> <li>• In rural areas, 2/5 households purchase drugs at stalls</li> <li>• &lt;14% of the population seek their initial treatment at health facilities (mostly people with high socioeconomic level)</li> <li>• The majority of people living in Kupang seek treatment after more than 4 days of symptoms</li> </ul>
Mahmudi & Yudhastuti [12]	2015	Pandean, Trenggalek Regency, East Java	Cross sectional	26 respondents	<ul style="list-style-type: none"> <li>• In migration destination areas, 19.2% individuals received initial treatment at a hospital, 42.3% at a public health center, 3.8% at a midwife practice, 15.4% at a clinic, and 7.7% at a private medical practice</li> <li>• 34.6% individuals seek treatment after &gt;3 days of symptoms</li> <li>• 26.9% individuals seek treatment after &gt;7 days of symptoms</li> </ul>
Karyana <i>et al.</i> [13]	2016	Mimika, Papua	Cross sectional	5,255 individuals from 825 households	<ul style="list-style-type: none"> <li>• 76% individuals opted for medical treatment (mostly people with high socioeconomic level and non-Papuan), 46% of them went to a private hospital and sought treatment after more than 2 days of symptoms</li> <li>• 24% individuals chose to do nothing (mostly people with low socioeconomic level)</li> </ul>
Suswardany <i>et al.</i> [14]	2017	33 provinces in Indonesia	Cross sectional	241,946 participants	<ul style="list-style-type: none"> <li>• 1 episode of fever cost 11% of the household's monthly income</li> <li>• The majority of individuals who choose traditional medicine are men, married, currently smoking, educated for &lt;9 years, worked as a farmer, previously used traditional medicine, and are experiencing recurrent malaria</li> <li>• Traditional medicine is favored by poorer households due to the high cost of transportation and difficult terrain</li> <li>• Traditional medicine is considered more natural, safer and has fewer side effects</li> </ul>
Devine <i>et al.</i> [15]	2018	Mimika, Papua	Cross sectional	4,010 individuals from 800 households	<ul style="list-style-type: none"> <li>• In 2013, 94% of the population took medicine after 2 days of fever. The lower socioeconomic group opted for public providers instead of private providers</li> <li>• The average mean cost per fever episode is 41.9 US\$</li> </ul>
Sillehu <i>et al.</i> [16]	2018	Namrole, Buru Selatan District, Maluku Island	Cross sectional	128 individuals	<ul style="list-style-type: none"> <li>• Closed community groups were three times as likely to use traditional medicine as modern medicine</li> <li>• Traditional medicine is often associated with lack of health facilities, areas surrounded by forests and mountains, and no health personnel</li> </ul>

Authors	Year	Location	Study design	Sample	Main findings
Guntur <i>et al.</i> [18]	2022	East Sumba, Belu, and East Manggarai district, East Nusa Tenggara	Cross sectional	1,503 participants	<ul style="list-style-type: none"> <li>• Herbs are quick and highly available</li> <li>• 46.8% individuals seek treatment within less than 24 hours at health facilities</li> <li>• The majority of individuals (53.2%) who seek treatment after 24 hours are lower socioeconomic groups, low-educated, farmers, and live more than 3 kilometers away from the nearest health facility</li> <li>• The lower educated group is 4 times as likely to choose non-medical treatment</li> </ul>
Sidik <i>et al.</i> [19]	2022	Muari, Oransbari Subdistrict, South Manokwari District, Papua Barat	Mixed methods	8 Informants	<ul style="list-style-type: none"> <li>• 4 out of 8 people chose to do nothing</li> <li>• Self-treatment was done by purchasing drugs at a stall or consuming leftover quinine</li> <li>• Self-medication arises due to the long distance to healthcare facilities and difficult geographical areas</li> </ul>
Rahmalia <i>et al.</i> [20]	2023	Mimika, Papua	Mixed methods	714 participants	<ul style="list-style-type: none"> <li>• The majority of individuals who self-treat consumes acetaminophen or leftover antimalarial medicine (40.4%) or purchase drug at stalls (17%)</li> <li>• Individuals who chose medical treatment visit health facilities after 24 hours of onset (68.4% opted for public health facilities, 22.7% opted for malaria control clinics)</li> <li>• Treatment-seeking behavior is influenced by the perception of antimalarial drugs</li> <li>• Almost all believe in the effectiveness of medical treatment and consider herbal remedies as complementary</li> <li>• The treatment-seeking behavior is associated with the duration and intensity of pain</li> </ul>
Kadir, Yahya [21]	2019	Kupang Timur Subdistrict, Kupang District, East Nusa Tenggara	Qualitative research methods with ethnographic approach	Not mentioned	
Taek <i>et al.</i> [22]	2019	Bengkulu, Maluku, North Maluku, East Nusa Tenggara, Papua, and West Papua	Qualitative research methods with ethnobotany and anthropology approaches	94 informants	<ul style="list-style-type: none"> <li>• The majority of indigenous Tetun chose traditional medicine over medical treatment</li> <li>• Malaria is caused by the disturbance of hot-cold imbalance in the body</li> </ul>
Ekawati <i>et al.</i> [23]	2020	Lhoong, Saree, and Kuta Cot Gile Subdistricts in Aceh Besar Regency and Kureng Sabee Subdistrict in Aceh Jaya District, Aceh	Qualitative research	173 respondents	<ul style="list-style-type: none"> <li>• People chose to ignore the initial symptoms of malaria and treat them with analgesics/antipyretics. However, when the symptoms persisted, they bought chloroquine without undergoing a diagnostic test</li> <li>• Private clinics are considered more convenient because of their longer operating hours, efficiency, and ability to examine quickly</li> <li>• Public health care is thought to have higher transportation costs and only operate during working hours.</li> </ul>

The overview of the characteristics of the included studies such as study year, research design, sample size, and factors associated with the patterns of malaria treatment-seeking behavior within the studied communities are presented in **Table 1**.

The included studies were conducted across several provinces in Indonesia such as Papua, West Papua, East Nusa Tenggara, West Nusa Tenggara, Bengkulu, Aceh, and East Java. Among these, eight studies employed a quantitative approach with a cross-sectional design [11-18], three studies used a qualitative approach [19-21], and two studies used a mixed-methods approach [22, 23]. Seven out of thirteen studies employed interview techniques with questionnaire instruments [13-16,19,21,22].

### Study quality evaluation

The quality of the quantitative studies and qualitative studies were assessed using JBI Critical Appraisal Tool and Critical Appraisal Skills Program (CASP) checklist. The results are presented in **Table 2** and **Table 3**. Our assessments indicated that ten studies

**Table 2. JBI Critical Appraisal checklist of the included quantitative (n=8) and mixed-methods studies (n=2)**

Appraisal checklist used	Yes (%)	No (%)	Unclear (%)	Not applicable (%)
Were the criteria for inclusion in the sample clearly defined?	9 (90)	0 (0)	1 (10)	0 (0)
Were the study subjects and the setting described in detail?	10 (100)	0 (0)	0 (0)	0 (0)
Was the exposure measured in a valid and reliable way?	9 (90)	0 (0)	1 (10)	0 (0)
Were objective, standard criteria used for measurement of the condition?	10 (100)	0 (0)	0 (0)	0 (0)
Were confounding factors identified?	1 (10)	0 (0)	10 (90)	0 (0)
Were strategies to deal with confounding factors stated?	0 (0)	0 (0)	10 (100)	0 (0)
Were the outcomes measured in a valid and reliable way?	10 (100)	0 (0)	0 (0)	0 (0)
Was appropriate statistical analysis used?	10 (100)	0 (0)	0 (0)	0 (0)

**Table 3. Critical appraisal skills program (CASP) checklist of the included qualitative (n=3) and mixed-method studies (n=2)**

CASP checklist used	Yes (%)	No (%)	Unclear (%)
Was there a clear statement of the aims of the research?	5 (100)	0 (0)	0 (0)
Is a qualitative methodology appropriate?	5 (100)	0 (0)	0 (0)
Was the research design appropriate to address the aims of the research?	5 (100)	0 (0)	0 (0)
Was the recruitment strategy appropriate to the aims of the research?	4 (80)	1 (20)	0 (0)
Was the data collected in a way that addressed the research issue?	5 (100)	0 (0)	0 (0)
Has the relationship between researcher and participants been adequately considered?	3 (60)	0 (0)	2 (40)
Have ethical issues been taken into consideration?	3 (60)	1 (20)	1 (20)
Was the data analysis sufficiently rigorous?	5 (100)	0 (0)	0 (0)
Is there a clear statement of findings?	5 (100)	0 (0)	0 (0)
How valuable is the research?	5 (100)	0 (0)	0 (0)

### Malaria treatment-seeking behaviour and factors associated

#### No action

A study reported that a total of 1,104 people from 825 households in Mimika Regency, Papua who reported having a fever in the last 30 days had positive laboratory test results for malaria [13]. Among them, 270 individuals (24%) chose not to consume any medications [13]. According to the study conducted by Sidik *et al.*, in 2022 at Muari Village, South Manokwari, 4 out of 8 village members opted to take no action when they experienced symptoms of malaria. The same



symptoms of malaria, headaches, were reported by both studies, indicating that the illness was not severe and would resolve on its own with rest [19].

### ***Self-treatment***

The majority of urban residents choose to receive treatment from pharmacies (40.5%) and drugstores/stalls (30.2%) rather than formal health services (9.5%) [17]. In contrast, rural communities prefer to receive treatment from stalls (44.1%) [17]. Studies in East Kupang District reported that individuals chose to buy medicine from the nearest stall after noticing the initial symptoms (78.6%) and only went to a health facility if their symptoms worsened [12, 13]. The people of Muari Village, South Manokwari believe that treatment can be performed individually based on experience [19]. Fever and headache were considered as symptoms indicating malaria, so they decided to buy paracetamol at the stall [11,14]. Other studies found that people choose to purchase quinine or primaquine from pharmacies without a doctor's prescription or consume quinine leftover at home for previous malaria treatment [11, 15]. This is influenced by the distance between home and pharmacies, which is more easily accessible than the distance between home and health facilities [10,16-18]. The choice to seek treatment can also be affected by difficult geographical conditions and long distances [10,16-18]. Closed communities, who live in mountainous areas surrounded by forests and have not experienced environmental change or deforestation, tend not to seek treatment from neither health facilities nor health personnel [16,21].

### ***Traditional medicine***

A study conducted in East Kupang [11] reported that of 178 individuals with a history of malaria in the past year, 16.4% of those chose traditional treatment for malaria. The majority of these individuals were women with low educational levels that did not surpass elementary schools [11]. They tend to perceive that the traditional treatments are safe and natural with fewer side effects. A study found that individuals with low education levels are four times more likely to choose non-medical treatment than medical treatment [18]. A study found that group of married men who smoke, junior high school graduates, and work as farmers prefer traditional medicine to cure malaria [14]. In addition, high transportation costs, difficulty of the terrain, and absence of access roads to health facilities also influence individual decisions to prefer traditional medicine as a treatment for malaria [16, 19]. A study in Namrole, South Buru, Maluku, found that closed community groups were three times as likely to use traditional medicine as modern medicine [16]. Certain community groups in Aceh believe that malaria is a manifestation of malicious incantations contracted within work environments [23]. Consequently, traditional healers, commonly referred to as '*battr*', are perceived to possess the capability to effectively remedy this ailment through the utilization of written prayers and various religious objects [23]. That study also found that the selection of traditional healers is community-driven, grounded upon individual qualities. In addition, community members exhibit a heightened sense of security with *battr* due to their perceived heightened familiarity with patients with congruent cultural background and beliefs. This can be attributed to the intimate bond between the traditional healer and the community, stemming from their shared cultural backgrounds and congruent belief systems. This is in contrast to the majority of Papuan people who use traditional medicine as an alternative treatment and not as the primary choice for malaria [10,15,20].

### ***Medical treatment***

A study conducted in 2022 across five islands in East Nusa Tenggara showed that 99.8% people chose to seek healthcare facilities after experiencing malaria symptoms [18]. Among the population, 46.8% sought treatment at health care facilities within 24 hours of symptoms and 53.2% of the population sought treatment 24 hours after symptoms appeared. Deliberate delay in seeking treatment after 24 hours was also observed at the Mimika's society in Papua, as they believed that an early test might result in a negative result which can lead them to leave health care facilities without receiving any antimalarial treatment [20]. The individuals who tend to postpone the anti-malaria treatment are dominated by individuals who have never been college-educated and have lower socioeconomic status [12,16]. These people were occupied in the farming section, and the rest reside over three kilometers from the nearest health care facilities [12,18]. In

contrast to two studies found that individuals in Mimika, Papua, prefer to seek medical treatment after more than 48 hours of feeling a fever [10,20]. The majority of Papuans and migrant workers in Kalimantan, Riau and Bengkulu preferred public health centers (*Puskesmas*) as the first choice in seeking medical treatment [15, 21]. Low socioeconomic level groups prefer the public sector compared to the private sector [15]. The direct cost for treatment at public health facilities is estimated at around Rp61,000.00 while at clinics it is around Rp252,000.00 and the average expenditure for one episode of fever is Rp628,000.00[15]. Around 22.7% of the population in Mimika, Papua, opt for malaria control clinics [20]. A similar pattern was found among forestry workers in Aceh, where malaria control clinics were the first choice for treatment [23]. This preference is due to the fact that malaria control clinics test all individuals, whether it is symptomatic or not, are less crowded, and have a higher likelihood of obtaining antimalarial medication [23]. Additionally, the operating hours of malaria control clinics were much longer so that it did not interfere with someone's daily activities [14,15].

### **Public perception of malaria and its treatment**

The Tetun ethnic community at South Halmahera in North Maluku thought that the main causes of malaria disease are sweet food and beverages such as sugarcane, ripe bananas, young coconut water, and young corn [22]. In addition, they tend to think that working under intense sunlight or in damp and cold places can induce malaria. This idea is associated with a disturbance in the body's heat-cold equilibrium. Hence, the approach to malaria treatment involves avoiding its underlying causes such as reducing the consumption of sweet foods and beverages alongside the consumption of bitter-tasting herbal remedies like *Carica papaya* leaves. According to the Tetun community, malaria treatment can also involve utilizing two types of medicinal plants. Warm plants are considered to raise body temperature and stimulate sweat production (e.g., *Acarus calamaus*), while cool plants work to absorb heat from the body, resulting in a return to normal body temperature (e.g., *Drynaria quercifolia*). Recovery is marked by sweating, normal body temperature, increased appetite, no chills, and being able to get up to go to work [22]. A qualitative study conducted in Topoyo village, West Sulawesi found that the decision making in seeking treatment was influenced by those closest to the patient [21]. People who were related or friends with *sando/tomanarang* (traditional healer) tend to choose traditional medicine and use medical treatment as an alternative, while others who were related or friends with doctors, nurses, midwives, or other health workers tend to choose medical treatment [21]. Moreover, people also have their own perceptions of antimalarials. According to the people of Mimika, Papua, administering the antimalarial combination of dihydroartemisinin-piperazine or the "blue drug" is socially acceptable [20]. However, giving primaquine or "chocolate medicine" is considered less effective and less important due to its size, so it is only considered as a supplement and is not consumed regularly and properly [20].

## **Discussion**

The findings of this systematic review highlight the persistence of two prevalent patterns in malaria treatment in Indonesia: no action and self-treatment. Medications are easily accessible to the public through pharmacies and local stores [11-13,17]. A study conducted in Ghana revealed that 57.7% of respondents adopted self-treatment practices. They acquired drugs by either using leftover medications stored at home (25%) or purchasing drugs from pharmacies (23.9%) [11]. Shortages of medication in healthcare facilities, long queues, inability to afford healthcare service costs, and the freedom to purchase drugs independently are key factors driving communities toward self-treatment [11,20,23].

Self-treatment practices often lead to delayed medical treatment seeking. A study identified specific groups most likely to delay medical treatment, including women, low-income individuals, married couples, and those lacking sufficient social support [24]. Treatment delays can also be attributed to the distance between healthcare facilities and residences, as communities tend to postpone treatment when the nearest healthcare facility is more than three kilometers away [18]. In Nigeria, the majority of the Aluu and Azikoro people prefer medical treatment for malaria [25]. However, the use of traditional medicines is more prevalent among the Aluu people in rural areas compared to the Azikoro people, who have closer access to teaching hospitals [25]. These findings



underscore the critical role of accessible healthcare services in shaping malaria treatment choices within communities.

A segment of the community perceives traditional medicine as a safer treatment option [14, 16]. Traditional medicine, being the oldest method predating allopathic medicine, is often considered safer due to its reliance on natural materials [26]. Traditional healers, known as 'battra' are chosen by the community based on their personal quality [16]. *Battra* possess a deep understanding of their patients and share cultural backgrounds and belief systems, fostering trust [16]. The high cost and limited accessibility of healthcare facilities present significant barriers to seeking medical care, leading the community to frequently turn to traditional medicine [14,16]. This includes not only consultation and medication expenses but also the expenses associated with accessing healthcare facilities. Consequently, the total expenditure for medical treatment becomes impractical [27] Government subsidies for artemisinin combination therapy can help offset the high costs of healthcare services, encouraging the community to consider medical treatment as a viable option [28].

The severity of a disease is not only linked to the duration of pain but also to its intensity [21]. Individuals who perceive their malaria as a serious condition are 12.5 times more likely to seek medical treatment compared to those who view it as less severe [29]. Educational initiatives aimed at disseminating knowledge regarding the signs and symptoms of malaria play a pivotal role in raising awareness among rural populations. This, in turn, promotes timely treatment-seeking behaviors when malaria symptoms first appear. Delayed treatment beyond 24 hours can significantly increase the risk of severe complications, including severe malaria anemia, hospitalization, the need for blood transfusion, and higher mortality rates [18]. All *Plasmodium* species causing infections in humans can lead to various levels of complications, some of which can be life-threatening. Furthermore, the long-term impacts on the quality of life can persist even after recovery [30]. An intervention study in the Amazon region of French Guiana demonstrated that the distribution of 'Malakit', a rapid diagnostic tool for malaria, along with a regimen of artemether-lumefantrine and a single dose of primaquine, reduced malaria incidence by 42.9% in gold-mining communities [6]. This highlights the importance of community education and access to effective tools in malaria prevention.

In addition to perceptions of disease severity, the community's attitude toward antimalarial medications can significantly influence behaviors related to malaria treatment. In Mimika, Papua, for example, the perception of primaquine's inefficacy has a substantial impact on malaria relapse prevention [20]. Primaquine is the most widely accessible antimalarial medication in Indonesia, used to inhibit dormant *Plasmodium* in the liver and prevent relapses caused by *P. vivax*. However, suboptimal adherence to the recommended 14-day treatment regimen may limit its effectiveness [31].

The healthcare system is closely intertwined with the concept of medical pluralism, which involves the utilization of various medical modalities or traditions to achieve health and treat illnesses [33, 34]. This can manifest in different forms, such as the use of distinct treatment modalities, as seen in Namrole, Maluku, where a closed community prefers herbal treatments when dealing with malaria exposure [16]. Additionally, it can be hierarchical, as observed in Topoyo Village, West Sulawesi, where people initially opt for self-medication at the onset of malaria symptoms, turning to medical treatment if the symptoms worsen [21]. In some cases, individuals may simultaneously seek both traditional and biomedical treatments, often driven by a belief in mystical causes, a phenomenon referred to as medical syncretism in medical anthropology [34]. These communities place high value on interpersonal interactions and trust in traditional healers. However, they also seek assurance through biomedical tests and diagnostic technology [33]. Numerous community groups in Indonesia continue to work diligently towards seeking effective treatment through a variety of initiatives. In addition to comprehensive case management, rigorous monitoring and evaluation, and proactive malaria vector control efforts, effective communication strategies are crucial across various sectors beyond the medical field. The primary objective is to educate the populace about the significance of behavioral changes, ultimately aimed at diminishing the prevalence of malaria cases in Indonesia.

## Conclusion

There is still a range of malaria treatment-seeking behavior outside of recommended medical treatment in communities in several regions in Indonesia. The pattern of seeking malaria treatment varies between doing nothing/no action, self-treatment, traditional medicine, and medical treatment. The decision making also depends on individual characteristics and perceptions on malaria and antimalarial drugs. The phenomenon of medical pluralism and syncretism requires approaches from various sectors in order to achieve a malaria-free Indonesia by 2030.

## Ethics approval

Not required.

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## Competing interests

All the authors declare that there are no conflicts of interest.

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## Underlying data

Derived data supporting the findings of this study are available from the corresponding author on request.

## How to cite

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