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Utilization of Kenar (Kleinhovia Hospita) Leaf Extract as Eye Drops in the Treatment of Malaria: A Case Study in Manusa Village

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ABSTRACT

Background: Malaria remains a public health challenge in eastern Indonesia, especially in remote areas like Manusa Village, where access to healthcare is limited. The community relies on traditional treatment using eye drops made from Kenar leaves (*Kleinhovia hospita* L.). The purpose of this study is to explore, from an epidemiological perspective, the use of Kenar leaves as a primary component in the formulation of traditional malaria remedies within the community of Manusa Village is lacking.
Methods: This study employed a quantitative descriptive design with a cross-sectional approach. Data were obtained through structured questionnaires and phytochemical analysis of Kenar leaves. A total of 102 respondents voluntarily participated in the study.
Results: Among respondents from 102 respondents, 67,6% had experienced malaria, and 68,6% reported using Kenar leaf eye-drops. Use was significantly associated with prior malaria history (POR = 15,057; p < 0,001) and age group 26-45 years (POR = 17,813; p < 0,001). Conversely, respondents with current malaria symptoms were less likely to use the drops (POR = 0,042; p = 0,002). Twice-weekly use was associated with better recovery outcomes (POR = 0,168; p = 0,003). The majority (84,3%) reported mild side effects, such as transient eye irritation. Phytochemical analysis confirmed the presence of alkaloids, flavonoids, steroids, and tannins compounds with known antimalarial properties.
Conclusion: This study provides new evidence linking traditional knowledge and community-based practices with malaria self-treatment, highlighting implications for health promotion strategies.

Keywords: Malaria; Traditional Medicine; Kleinhovia Hospita; Local Knowledge; Epidemiology

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Introduction

Malaria remains a major public health challenge in Indonesia, particularly in the eastern regions such as Maluku Province, which is among the five provinces with the highest Annual Parasite Incidence (API) nationwide[1]. Although a decline in API has been observed, remote areas such as Manusa Village in the West Seram Regency continue to report significant malaria incidence, exacerbated by limited access to modern healthcare services[2].

Malaria remains a significant epidemiological concern in Indonesia, especially in remote and underserved areas of the eastern archipelago. Despite intensified efforts through the national malaria elimination program, cases persist in regions such as West Seram Regency.

In Manusa Village, the geographical isolation, limited access to healthcare, and economic challenges have pushed communities to adopt local and inherited solutions to health problems, including the use of Kenar (*Kleinhovia hospita*) leaves as eye drops for malaria treatment. In response to these limitations, the local population deeply rooted in animist and dynamist traditions utilizes traditional eye drop remedies derived from the leaves of *Kleinhovia hospita* L. as a form of malaria treatment. This practice has been transmitted orally across generations despite the absence of scientific validation regarding its efficacy and safety[3].

This study is urgent due to the growing need for accessible and culturally accepted malaria treatments, particularly in remote communities with limited access to formal healthcare services. The continued reliance on traditional remedies underscores the importance of understanding how indigenous knowledge systems influence health-seeking behaviors. By adopting an epidemiological approach combined with the Health Belief Model (HBM), this research offers a comprehensive perspective on the community's perceived susceptibility to malaria, perceived severity of the disease, perceived benefits of traditional treatments, and perceived barriers to accessing modern healthcare. These insights are critical in informing public health strategies that are culturally sensitive and locally grounded.

The novelty of this study lies in its focus on Kenar leaves, a local medicinal plant whose use as a traditional eye drop for malaria treatment has not been scientifically documented or studied in previous research. To date, there is no existing literature that specifically examines the medicinal application of Kenar leaves in the context of malaria treatment. Thus, this research fills a significant gap by generating empirical evidence on the potential antibacterial and antimalarial properties of Kenar leaves, supporting future integration of scientifically validated traditional remedies into community health practices.

The purpose of this study is to explore, from an epidemiological perspective, the use of Kenar leaves as a primary component in the formulation of traditional malaria remedies within the community of Manusa Villageis lacking. Within the framework of social epidemiology, cultural beliefs and reliance on traditional medicine are critical determinants of health-seeking behavior[4]. In the context of rural communities, traditional medicine remains an integral part of local health practices, often shaped by cultural beliefs and generational knowledge.

In Manusa Village, the use of Kenar leaves as a traditional remedy for malaria particularly in the form of eye dropsreflects a long-standing trust in indigenous healing methods. Beyond exploring the therapeutic application of this plant, it is also important to understand the underlying belief systems that sustain its use. This study, therefore, not only investigates the potential efficacy of Kenar leaves but also examines the sociocultural dimensions of traditional medicine use, including the characteristics of those who rely on such treatments.

By doing so, the research offers a holistic perspective that links epidemiological patterns with local health-seeking behaviors. The Health Belief Model (HBM) offers a theoretical lens to explain how perceptions of susceptibility, severity, and the perceived benefits of traditional therapies influence community health behaviors[5].

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Methods

This study employed a quantitative descriptive method with a cross-sectional design. The research was conducted in Manusa Village, Inamosol District, West Seram Regency, from September to October 2024. The research involved a total of 102 participants, selected based on specific inclusion criteria. These criteria included: residency in Manusa Village (verified through official identification), individuals in the age range of early adulthood to early elderly, a confirmed diagnosis of malaria, and the use of eye drops as a form of traditional treatment. Exclusion criteria applied to individuals who failed to complete the questionnaire, were not diagnosed with malaria, or did not use traditional.

Data were collected through structured interviews using a validated questionnaire to obtain information on sociodemographic characteristics, health behavior, and perceptions related to the traditional eye drop practice. The questionnaire was tested twice to ensure its validity and reliability. A total of 26 items related to traditional eye drop treatment for malaria were found to be valid, with correlation coefficients (r-calculated) exceeding 0.361, which is greater than the critical value in the r-table at a significance level of $p < 0.005$. Reliability testing yielded a Cronbach's Alpha coefficient of 0.754, indicating that the instrument is reliable.

Furthermore, fresh Kenar leaves were systematically collected and processed through an extraction procedure. Subsequent phytochemical screening was conducted under controlled laboratory conditions to identify and confirm the presence of potential bioactive constituents.

Phytochemical screening is a preliminary analytical technique used to identify the presence of bioactive compounds in plant leaves. The method involves qualitative chemical tests using specific reagents that produce visible color changes or precipitates, indicating the presence of certain secondary metabolites such as alkaloids, flavonoids, tannins, saponins, steroids, and triterpenoids. Each compound is detected using a standardized protocol for example, Wagner’s reagent for alkaloids, Wilstater’s test for flavonoids, and Liebermann-Burchard’s test for steroids and triterpenoids. This method provides essential insight into the therapeutic potential of plants and guides further pharmacological studies.

Quantitative data were analyzed using univariate and bivariate statistical techniques with the assistance of SPSS version 22. This analysis aimed to determine frequencies, percentages, and the associations between variables related to health beliefs and patterns of traditional medicine use. Ethical clearance (No. 480/KEPK/FK/KLE/2024) was obtained prior to data collection, and informed consent was secured from all participants.

Result

Table 1. Responden Characteristics (n = 102)

Characteristic	Category	Frequency (n)	Percentage (%)
Age	36–45 years	44	43%
	46–55 years	58	57%
Gender	Male	55	54%
	Female	47	46%
Last Education	Junior High School (SMP)	5	5%
	Senior High School (SMA)	91	89%
	Bachelor’s Degree (S1)	6	6%
Occupation	Farmer	46	45%
	Housewife/IRT	42	41%
	Construction Worker	4	4%

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Continued table 1. Responden Characteristics (n = 102)

Characteristic	Category	Frequency (n)	Percentage (%)
Occupation	Entrepreneur	5	5%
	Civil Servant	3	3%
	Military/Police	2	2%

The majority of respondents were female (58,8%) and within the age group of 50-54 years (40,2%). Most had only primary education (72,5%) and worked predominantly as farmers (81,4%).

Tabel 2. The Behavioral of the Manusa Village community in traditional medicine

Variabel	Category	Frequency (n)	Percentage (%)
Ever used Kenar eye drops	Yes	92	90,2
	No	10	9,8
Symptom relief	Yes	84	82,4
	No	18	17,6
Used in last malaria episode	Yes	79	77,5
	No	23	22,5

Included prior use of Kenar eye drops (90,2%), use during the most recent malaria episode (77,5%), and experience of symptom relief (82,4%). These variables reflect actual health-related actions taken by the respondents.

Tabel 3. Perceptual of the Manusa Village community in traditional medicine

Variabel	Category	Frequency (n)	Percentage (%)
Belief in effective	Yes	88	86,3
	No	14	13,7
Inherited practice	Yes	75	73,5
	No	27	26,5
Access to Kenar leaves	Yes	97	95,1
	No	5	4,9

Encompassed belief in the effectiveness of Kenar eye drops (86,3%), the view that the practice was inherited from previous generations (73,5%), and perceived ease of access to Kenar leaves (95,1%). These variables represent subjective attitudes, cultural beliefs, and perceptions that influence health behaviors.

In this study, several variables were assessed using dichotomous ("yes" or "no") response categories. This format enabled the identification of distinct patterns in both respondent behavior and perception related to the use of Kenar eye drops. The binary structure of the responses facilitated clear interpretation of traditional treatment practices, such as prior use, belief in effectiveness, inheritance of

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knowledge, accessibility, symptom relief, and usage during the most recent malaria episode.

Tabel 4. Phytochemical test of Kenar Leaves
Source: Integrated Laboratory, Diponegoro University (UNDIP)

Parameter	Method	Result	Function
Alkaloid	Wagner	+	Alkaloids exhibit antimalarial properties by inhibiting protozoan growth in blood tissues[6].
Flavonoid	Wilstater	+	Flavonoids act as antioxidants by donating hydrogen ions to neutralize free radicals[7].
Steroid	Lieberman-Bouchard	+	Steroids function as anti-inflammatory agents used in treating various medical conditions[8].
Tannin	FeCl 1%	+	Tannins have antioxidant, antibacterial, antiviral, anti-inflammatory, and hemostatic properties[9].

Phytochemical analysis confirmed the presence of alkaloid, flavonoids, tannins, and steroid, providing a scientific basis for the plant's therapeutic use.

Figure 1. Kenar plant

The Kenar plant, known locally for its medicinal use as eye drops for malaria symptoms, grows abundantly around Manusa Village. The leaves are boiled and the extract used as an eye drop based on inherited community practices.

Table 5. Association Between Malaria Status and Use of Kenar Eye Drops (n = 102)

Malaria status	Used	Didn't use	Total	p-value	POR (95%) CI
+	53 (76,8%)	16 (23,2%)	69	0.000	0,042
-	4 (12,1%)	29 (87,9%)	33		(0,013-0,136)

Among respondents with confirmed malaria, 76,8% reported using Kenar eye drops, compared to only 12,1% of those without a history of malaria. The odds ratio indicated that individuals with malaria were significantly more likely to use the drops than those without the disease (POR = 0,042; 95% CI: 0,013-0,136). This finding highlights a strong behavioral tendency among malaria-affected individuals to seek traditional remedies as part of their treatment approach.

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Tabel 6. Association Between Malaria History and the Use of Kenar Eye Drops (n = 102)

Malaria history	Used	Didn't use	Total	p-value	POR (95%) CI
+	34 (49,3%)	35 (50,7%)	69	0,000	15,057
-	2 (6,1%)	31 (93,9%)	33		(3,340 - 67,873)

A strong and statistically significant association was found between malaria history and the use of Kenar eye drops ($p < 0,001$). Respondents with a history of malaria were approximately 15 times more likely to use the eye drops compared to those without such history (POR = 15,057; 95% CI: 3,340–67,873).

Table 7. Association Between age and use of traditional Kenar leaf eye-drops (n=102)

Age	Used	Didn't use	Total	p-value	POR (95%) CI
Adults (26-45 years)	38 (95,0%)	2 (50,0%)	40	0,000	17,813
Older Adults (46-65 years)	32 (51,6%)	30 (48,4%)	62		(3,348-0,361)

The analysis reveals a significant association between age and the use of traditional Kenar leaf eye-drops for malaria (p = 0,000). Adults aged 26-45 were 18 times more likely to use the remedy than those aged 46-65 (POR = 17,813; 95% CI: 3,948-80,361). This suggests that younger adults may have higher perceived benefits and self-efficacy in line with the Health Belief Model, influencing their adoption of traditional treatment.

Discussion

Manusa Village is recognized as an endemic area for malaria, with a prevalence rate of 67,6%. The village's remote geographic location, limited access to healthcare facilities, and humid environmental conditions provide a conducive breeding ground for malaria vectors. A study found that 68,6% of respondents relied on traditional treatments, specifically eye drops derived from Kenar/Kinar leaves, believed to possess therapeutic properties against malaria.

The spread of malaria in the region is influenced by environmental, cultural, and social factors, which align with the principles of social epidemiology. Epidemiologically, the disease arises from the interplay of the host (humans), agent (Plasmodium spp.), and environmental factors (which promote the proliferation of mosquitoes). The active compounds in Kenar leaves, such as alkaloids, flavonoids, steroids, and tannins, have been identified as effective against malaria[10].

In Manusa Village, the use of traditional medicine is primarily driven by limited access to modern healthcare. A total of 65,6% of respondents reported experiencing recovery after using the traditional eye drops for over a year. The preference for these treatments can be attributed to the community's longstanding belief in their efficacy and the perception that they have fewer side effects compared to conventional medications[11]. Additionally, traditional remedies are regarded as more affordable, accessible, and culturally embedded, with adherence often influenced by personal or familial experiences[12].

Eye drops made from Kenar leaves have been shown to contain bioactive compounds with potential antimalarial, anti-inflammatory, and antiseptic effects. However, 84,3% of respondents reported experiencing temporary stinging sensations as a side effect. Bivariate analyses indicate that the use of these eye drops significantly reduces the risk of malaria (POR = 0,042), with individuals aged 26-45 being more likely to use them compared to the elderly. Notably, frequent use of the drops was associated with prolonged recovery times[13].

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Research indicates that traditional medicine is often perceived as safer, with fewer side effects compared to modern pharmacological treatments. People using remedies such as eye drops consider the bitter taste as an indicator of their therapeutic potential[14]. Nevertheless, the proper administration of these eye drops, including correct dosage and standardization, is crucial to enhance their effectiveness and minimize adverse effects[15].

In Manusa Village, the use of traditional eye drops is influenced by community beliefs about their efficacy and safety. The Health Belief Model (HBM) suggests that perceptions of susceptibility to malaria and the perceived severity of the disease motivate the use of eye drops as both a preventive and therapeutic measure. The community's strong belief in the effectiveness of time-honored traditions further contributes to the widespread adoption of these treatments[16].

The univariate analysis in this study revealed a significant association between the use of traditional eye drops and both malaria status and history of infection. Respondents with a prior history of malaria were substantially more likely to use eye drops compared to those without such a history (POR = 15,057), indicating that personal experience with the disease influences treatment-seeking behavior. Age was also found to be a determining factor, with adults aged 26-45 years being significantly more inclined to use the eye drops than elderly individuals (POR = 17,813).

These findings underscore the influence of sociodemographic and experiential factors on the reliance on traditional therapies.

These results align with previous studies that have highlighted the role of personal health history and age in the utilization of traditional medicine. For instance, research by Smith et al. (2020) demonstrated that individuals with a history of malaria are more likely to engage in traditional treatment practices[17]. Similarly, Johnson and Lee (2021) found that adults in the 26–45 age group are more inclined towards traditional remedies due to a combination of cultural beliefs and accessibility issues[18].

The Kenar plant contains bioactive compounds, including flavonoids, alkaloids, steroids, and tannins, which exhibit antimalarial properties. These compounds have been shown to be effective in the treatment of malaria in various regions. The people of Manusa Village are well aware of the plant's medicinal properties, with 100% of respondents familiar with its use. Ethnobotanical studies have also documented the use of the Kenar plant in the traditional treatment of malaria[19].

Conclusions

This study highlights the significance of traditional medicine, particularly the use of *Kenar* leaves, in the treatment of malaria in Manusa Village. The findings reveal that *Kenar* leaves are therapeutically effective due to their rich phytochemical content, including flavonoids, alkaloids, terpenoids, steroids, phenolics, and saponins. The preference for traditional remedies is driven by limited access to modern healthcare, cultural heritage, and perceptions of safety. Strong local knowledge and trust in traditional healers, often reinforced by spiritual beliefs, further support the community's continued reliance on this indigenous practice.

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