

A Literature Review on Plant Medicine Used For the Treatment of Malaria in Ethiopia

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Abstract

Malaria is known as “weba” in local terminology in Ethiopia. Malaria is one of the major disease in Ethiopia, which affects the countries peoples financially and health wise. it is an infectious disease that are transmitted to people by the bites of the infected mosquitoes. parasite invades the body and multiplies in the host's red blood cells, causing symptoms ranging from mild to severe. Malaria disease is mostly common in Africa, Asia and Latin America. it is caused by a protozoa of genus plasmodium. and it is transmitted from person to person by the bite of the female mosquito of the genus Anopheles. It is the leading causes of death and disease worldwide, especially among children and pregnant women. The main symptoms of malaria are fever, chills and a flu-like infections, malaria can bring more other life complications like anemia, renal failure and potentially life-threatening cerebral malaria. Various plant medicines have been discovered and used in Ethiopia in different parts of the country. the goal of this literature review is to study the effective usage of Ethiopian plant medicines that are used to treat malaria disease. There are different types of malaria, and the severity of the disease and the risk of complications depend on the type of parasite that causes the infection. Malaria can be prevented by using mosquito nets and insect repellents and can be treated with a variety of medicines. the medicinal plants which are used by traditional users in Ethiopia are arranged according to alphabet followed by their scientific name, common name, family name and parts used. These plants are the major source for the development and discovery of anti-malarial drug.

Key words: weba, traditional medicine, herbal medicine, WHO, Ethiopia, antimalarial, plant medicine.

Introduction

Malaria is an infectious disease that are transmitted to people by the bites of the infected mosquitoes. parasite invades the body and multiplies in the host's red blood cells, causing symptoms ranging from mild to severe. Malaria is mostly common in Africa, Asia and Latin America. It is the leading causes of death and disease worldwide, especially among children and pregnant women. The main symptoms of malaria are fever, chills and a flu-like infections, malaria can bring more other life complications like anemia, renal failure and potentially life-threatening cerebral malaria [1].

There are different types of malaria, and the severity of the disease and the risk of complications depend on the type of parasite that causes the infection. Malaria can be prevented by using mosquito nets and insect repellents and can be treated with a variety of medicines. Malaria is transmitted to people when the infected mosquito bites healthy person after biting an infected person. After a person gets infected by the infected mosquito, the parasite that causes malaria is extracted from the blood. Mosquitoes can transmit parasites to other people when they bite them. After some time, the parasites invade the red blood cells and multiply again, causing symptoms of the disease. Infected people can also pass the parasite to other mosquitoes when they bite them. Malaria is not transmitted directly from person to person. By Shaking hands and share food and drink. However, blood transfusions and organ transplants can transmit the disease if the donor is infected with parasites the 60% of Ethiopia's population lives in at-risky environment, majority of malaria disease case is present in Oromia, Amhara, Southern Regions and Peoples and Peoples (SNNP) region, tigray and BGRS (Benishangul Gumuz) ,and Gambella region [1,2].

As per the WHO study, malaria has affected humans since ancient times. Malaria is the leading killer disease causing the deaths of millions of children, pregnant women and adults. Malaria is an infectious disease caused by a protozoon of genus plasmodium. and it is transmitted from person to person by the bite of the female mosquito of the genus Anopheles. There are 5 types of parasites which causes malaria in people: *plasmodium falciparum*, *plasmodium vivax*, *plasmodium malariae*, *plasmodium oval*, *Plasmodium knowlesi*. Among them, the two among five which is *plasmodium falciparum* and *plasmodium vivax* are one of the common species in Ethiopia. *plasmodium falciparum* is the most dangerous leading to many fatal complications including cerebral malaria [3,4].

Malaria disease statistics

As per the study of WHO, in 2020, there were million of cases of malaria worldwide and thousands of deaths due to the disease. Most of the cases and deaths occurred in African Region, where malaria is the leading cause of death and illness. However, the number of cases and deaths due to malaria has decreased significantly over the past 20 years, due to increased efforts to control and prevent the disease. In 2020, it was estimated that 74% of malaria cases and 76% of deaths due to the disease occurred in children under the age of 5 years [5].

Malaria is a preventable and treatable disease, and there are a number of interventions that have been proven to be effective in reducing the number of cases and deaths due to the disease. by the

use of various methods such as mosquito net, spraying and various antimalarial drugs for the treatment of malaria infection.[5,6].

Malaria disease in Ethiopia

Malaria disease is the main health issue with in Ethiopia, which causes over millions of cases and so many deaths each year. It is the major cause of illness followed by death, majority of them are pregnant women and children below age of 5. Malaria is widespread throughout Ethiopia, with the highest prevalence in the country's low-lying regions, where the climate contributes to the transmission of the disease. However, malaria incidence in Ethiopia has declined significantly over the past decade due to increased efforts to control and prevent the disease. These efforts include the use of mosquito nets, spraying with insecticides, and administration of antimalarial drugs for disease prevention and treatment [6].

Amhara regional state, Oromia regional state, Tigray and (SNNP) region, as well as majority of the regions of the (BGRS) Benishangul Gumuz and Gambella regional state shows malaria hotspots in Ethiopia. Additionally, Ethiopian government has also implemented a number of other malaria control and prevention strategies such as nets. However, despite these efforts, malaria disease is still critical health problems in the some parts of the country [7].

Plant medicines used to treat malaria disease.

There are several plants used to treat malaria and other diseases, in Ethiopia and other parts of Africa. These plants are commonly used in traditional medicine systems and can be used alone or in combination with other plants and traditional medicines. However, the efficacy of these herbal remedies has not been extensively studied, many have not been shown to be safe or effective in treating malaria disease.

List of the plant medicine traditionally applied to treat malaria disease:

A. *Artemisia annua*: Also known as sweet wormwood or Qinghao, this plant is native to Asia but was introduced to other parts of the world, including Africa. It has been used for centuries to treat malaria. The plant's active ingredient, artemisinin, is now widely used to treat malaria.

B. *Andrographis paniculata*: Also known as the King of Bitters or Green Chireta, this plant is native to Asia and has been used for the treatment of a variety of medical conditions, including malaria.

C. *Eucalyptus globulus*: It is called blue gum or Tasmanian blue gum. The leaves of this tree have traditionally been used to treat malaria and other illness.

D. *Hypoxis Hemerocallidea*: Also known as African potato or star flower, this plant is native to Africa and has been used for the treatment of many other medical conditions including malaria disease [8].

Table 1. List of the plant medicine that are used in the treatment of malaria disease in Ethiopia.

S No	The Scientific name	Family name of the given plants.	Common name.	Parts of the plants used	The Method of preparation of the plant.
1	<i>Carica papaya</i>	Caricaceae	Paappaayyaa(p)	The root/leaf of the plants was used.	Dry the leaves until it becomes yellow, it will be dried, powdered, and then boiled in the water. the boiled leaf powder will be taken for few days with a cup to treat malaria.
2	<i>Allium sativum</i>	Alliaceae	Nech shinkurt(A)	The Bulb of the plant.	bulb was mixed with 'injera' and taken with <i>Capsicum annum</i> L. and should be taken for more than 3 days before breakfast.
3	<i>Lepidium sativum</i>	Brassicaceae	Shinfaa(O), feeto(A)	Seed of the plant.	The dry seed, powder is taken with injera to treat malaria. and it protects from the mosquito bite.
4	<i>Vernonia amygdalin</i>	Asteraceae	Eebicha(O)	The Leaf of the plant.	The Leaves was taken and crushed and soaked into the water taken orally for 3-5 days.
5	<i>Justicia schimperiana</i>	Acanthaceae	Sensel(A)	Leaf of the plant.	We take the leaf and Crush it and squeeze it and mix it with coffee and taken to treat malaria.

6	<i>Lantana trifolia</i>	Verbenaceae	Yewoba medihanit	Root of the plant is used.	The root is collected and Chopped and then soaked with water, and then it is mixed with some alcohol and taken to treat malaria.
7	<i>Croton macrostachyus</i>	Euphorbiaceae	Mekanisa(O)	The leaf, and Bark, fruit of the plant are used.	The leaf, fruit, bark, are taken and Crushed and the powder obtained is taken with water for the treatment of malaria.
8	<i>Cicer arietinum L</i>	Fabaceae	Shinbira(A)	The Seed of the plant.	The seed of shinbira was taken and Germinated and consumed with some local food.
9	<i>Lobelia gibberoa</i>	Lobeliaceae	Jibara(A)	The Root of the plant is used.	The root of jibara was taken and Crushed and powderized and taken with water to treat malaria disease.
10	<i>Acacia robusta</i>	Fabaceae	Wangey(O)	The Root of plant.	Concoction was prepared and consumed to treat malaria.
11	<i>Urtica simensis</i>	Urticaceae	Sama(A)	Root of the plant is used.	The root was taken and Crushed. after crushing it gets dried and then mixed with fresh water, and taken with milk to treat malaria.

Herbal formulation

Herbal formulation refers to the process of combining different medicinal herbs in specific proportions to create a therapeutic product for various health conditions. It is a traditional approach to healing that utilizes the natural properties of plants to promote health and wellness. The formulation may involve various parts of the plant, such as roots, leaves, stems, flowers and can be prepared in a different forms including teas, tinctures, powders, and creams [9].

There are several plants that have been traditionally used in Ethiopia and other parts of Africa to treat malaria and other illnesses. These plants are often used in traditional medicine systems and may be used alone or in combination with other plants or conventional medications. However, it is important to note that the effectiveness of these plant remedies has not been extensively studied in the treatment of malaria.

Some of plants that have been traditionally used to treat malaria include:

- ***Artemisia annua***: It has been used for centuries to treat malaria and other illnesses, and the active ingredient in the plant, artemisinin, is now widely used in the treatment of malaria.
- ***Andrographis paniculata***: This plant, also known as king of bitters or green chireta, is native to Asia and has been used as the traditional medicine for the treatment many medical conditions, including malaria.
- ***Eucalyptus globulus***: This tree, called a blue gum or a Tasmanian blue gum, they are found and common to Australia but has been introduced to other parts of the world, including Africa. The leaves of the tree have been traditionally used to treat malaria and other illnesses.[10,11,12].

Formulation of herbal medicine

A) Papaya

Papaya leaves are used to treat malaria disease. Papaya leaves are used in various countries as the treatment of malaria disease. However, it is important to note that more studies are required to understand the effectiveness and safety of this method of treatment.



Figure 1 Papaya leaf used in the treatment of malaria

Papaya leaves can be prepared as a tea by the following steps:

- Take a fresh papaya leaves and wash them thoroughly
- Chop the leaves of the fresh papaya and wash them thoroughly

- Add about 2 liters of water to the pot and boil the contents.
- Decrease the heat and let the mixture bubble until 30 minutes.
- Strain the mixture to remove the leaves and allow it cool
- Drink one cup of papaya leaf tea 3 times a day for several days, or as recommended by health care professional[13,14,15].

B) Garlic

Garlic has some antimalarial properties in laboratory studies, but more research is needed to determine its effectiveness as a treatment for malaria in humans. It is often used as a culinary ingredient, and can be consumed raw, cooked, or in supplement form. However, there is no established dosage for using garlic to treat malaria.



Figure 2 Garlic has antimalarial properties which can be used in the treatment of malaria

The steps for preparation and administration of garlic for the treatment of malaria:

- Take 2-3 cloves of fresh garlic and peel them.
- Crush the garlic cloves to release the active compound.
- Mix the crushed garlic with food, like honey or yogurt, to make it easier to consume.
- Take the garlic mixture 2-3 times a day for several days, or as recommended by a healthcare professional[16,17,18].

Herbal plants used for the treatment of malaria disease.

Apart from the pharmacological treatments, various options have been used since ancient times for many health ailments. Majority of the people in the world still rely on the herbal medicines. Use of several medicinal plants to cure certain ailments has been practiced in India since ancient times. The number of patients using the herbal plant medicinal remedies for the treatment of

malaria are different across the globe. different factors affect the use of herbal medicine for the treatment of malaria.[19].

Table 2 Herbal plants for the treatment of malaria disease

Plant name	Suggested Until body temp. of (°C)	Part of the herbal Plant used.	Method of preparation or How it is used	Side effects
<i>Cymbopogon citratus</i> (lemon grass)	Always recommended	Leaves of the plant.	The leaves was collected and taken with tea.	none
(garlic) <i>Allium sativum</i> .	Always recommended	Cloves of the plant.	The clove are collected heaped and the garlic are chopped and taken each day.	+ stomach ache
<i>Psidium guajava</i> (guava)	37.5	Leaf of the plant is used.	The leaf is taken in the form of tea (decoction).	No side effect.
<i>Artemisia annua</i>	39	Leaves	tea (infusion)	None
<i>Carica papaya</i> (pawpaw)	37.5	Leaves of the plant	The leaves are collected taken as a tea (infusion).	vomiting, allergies developing

Treatment of malaria with herbs

Various herbs are used to prevent malaria parasites from developing resistance to treatment. When we get infections bacteria it cause fever, especially when those bacteria die and begin to decompose. Fever All substances that cause are called pyrogens. Drinking helps to remove pyrogens from the body. it is also expelled from skin through perspiration. Especially hot lemongrass tea encourages the body to sweat and urinate, purifying the blood and the body. Sweating is particularly effective in removing toxins from the body. Adults with malaria are recommended to drink 2 liters of lemongrass tea daily, in addition to 1 liter of other herbal teas. it is recommend that drinking lemongrass tea from Each of these herbal remedies should be taken for 7 days. All teas can be mixed with sugar or honey. Malaria destroys sugar in the body, so replenishing blood sugar levels can help. In fact, malaria patients often lose their appetite and become malnourished, so they need to be fed[20,21,22,23

Conclusion

A large part of Ethiopia's population has limited access to modern medical services, as the cost of traditional medicine is low compared to modern medicine the people embrace traditional healers and local pharmacopoeias. Because of its widespread use, herbal medicines are used for reducing malaria disease severity. Therefore, further research is needed to improve the effectiveness of the new drugs used for the malaria disease treatment. This review highlights the various types of antimalarial drugs in Ethiopia, where patterns of herbal remedy preparation and use are similarly diverse. A literature review also reveals that the Ethiopian people have a wealth of traditional knowledge about the use of malaria medicinal plants.

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Conflict of Interest

There is no conflict of interest.

References

- 1.world health organitaton.Malaria.<https://www.who.int/health-topics/malaria>.
- 2.centers for disease control and prevention.<https://www.cdc.gov/malaria/index.html>.
- 3.Murraay CJ,Rosenfeld LC,Lim SS,et al.Global malaria mortality between 1980 and 2010:a systematic analysis.Lancet.
- 4.world health organitaton.world malaria report 2020.<https://www.who.int/punlications/I/item>.
- 5.world health organitaton.Malaria.<https://www.who.int/health-topics/malaria>.
- 6.world health organitaton.a reporta on malria.
- 7.world helath organitaion.(2021).world malaria report 2021.<https://www.who.int/publications>.
- 8.Willcox,M.L.,&Bodeker,G.(2004).traditional herbal medicines for malaria.
- 9.Van der pluijm RW,et al.
- 10.Singh R,et al.In vitro anti-malarial efficacy of neem(azadirachta indica) leaves extract aagainst plasmodium falciparum.
- 11.Tchinda AT,et al.Efficacy of a herbal formulation based on cryptolepis sanguinolenta in the treatment of uncomplicated falciparum malaria in chldre:a randomized controlled trial.Malar J.

12. Adewunmi CO, et al. safety and efficacy of herbal tea for the treatment of malaria. *Afr Health Sci*.
13. Ching Sze Y, et al. Antimalarial activity of papaya leaves and their potential use in the therapeutic approach to malaria. *Malar Res treat*.
14. Omoregie ES, et al. comparative study on the efficacy of dried carica papaya (pawpaw) leaves and chloroquine drug in the treatment of malaria infection in mice. *Eur J Med Plants*.
15. Onifade AK, et al. Papaya (carica papaya) consumption is unsafe in pregnancy.
16. Tona L, Cimanga RK, Mesia K, et al.
17. Jain R, Jain A, Jain A, Kumar D. Garlic in health and disease.
18. Rahman K. Historical perspective on garlic and cardiovascular disease.
19. Bodeker G, Willcox ML. Conference report: the first international meeting of the Research Initiative on Traditional Antimalarial Methods (RITAM). *J Alternative Complementary Med* 2000
20. Leaman DJ, Arnason JT, Yusuf R, Sangat-Roemantyo H, Soedjito H, Angerhofer CK, et al. Malaria remedies of the Kenyah of the Apo Kayan, East Kalimantan, Indonesian Borneo: a quantitative assessment of local consensus as an indication of biological efficacy.
21. Willcox ML, Bodeker G, Rasoanaivo P. *Traditional medicinal plants and malaria*. Boca Raton: CRC, 2004.
22. Willcox ML. A clinical trial of 'AM', a Ugandan herbal remedy for malaria. *J Public Health Med* 1999;21(3): 318-2.
23. Kidane G, Morrow RH. Teaching mothers to provide home treatment of malaria in Tigray, Ethiopia: a randomised trial.