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MSc THESIS

ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS IN KERSA MELLIMA WOREDA, SOUTH WEST SHEWA ZONE, OROMIA REGIONAL STATE

BY

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As members of the Examining Board of the final MSc open defense, we certify that we have read and evaluated the Thesis prepared by: Lemessa Sori Gemeda entitled "Ethnobotanical Study of Medicinal Plants in Kersa Mellima Woreda, South West Shewa Zone,Oromia Regional State,Ethiopia" and recommend that it be accepted as fulfilling the thesis requirement for the degree of Master of Science in Biology..

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TABLE OF CONTENT

Content **page**

List of table's **page**

List of figures **page**

Abstract

The study was dedicated to uncovering the valuable traditional knowledge that the people of Kersa Mellima Woreda hold about medicinal plants. It shows how the rich variety of plants in the local and the wisdom passed down through generations are woven into their everyday lives. The study aimed to uncover where these plants come from, how they are prepared, and how they are administered. Through a combination of semi-structured interviews, direct observations, informant consensus, and group discussions, and using descriptive statistics alongside ethno botanical methods for analysis. For data collection, first, questionnaires were handed out to 20 women and 30 men to gather basic information about their knowledge of medicinal plants. Second, 45 women and 60 men were interviewed to learn more about the types of ailments they treat, how they prepare the plants, and how they administer them.

A total of 155 participants were used in the study and the individuals were selected from randomly chosen nine kebeles based on their knowledge of medicinal plants. Both primary and secondary sources were used to collect data. For analyzing the ethno botanical data, both qualitative and quantitative methods were combined.

The research uncovered 77 different medicinal plants used to treat various ailments. In the study area, different types of plants were prevalent: climbers were the most common (41.19%), followed by trees (22.07%), shrubs (24%), and herbs (32.55%).When it came to preparing these medicinal plants, most remedies were made from a single plant or its parts, making up 66.23% of the plants used. The rest were mixed from different species, accounting for 33.77%.In terms of how these remedies were administered, the study found that 50.64% were taken orally. Other methods included oral and dermal application (6.49%), nasal application (7.79%), and just dermal application (28.57%).The most common techniques of preparation were pounding (30.3%), squeezing (17.1%), and powdering (9.2%), with less common methods like sniffing and chewing at 1.3% each. Other methods such as boiling, roasting, and crushing made up 7.9% of the total.

Fourteen important medicinal plants were considered most effective for treating stomachaches. Fourteen informants ranked these plants from most to least preferred. By adding up the scores,Cynoglossum coeruleu was rated highest for treating stomachaches with a score of 149, while Ruta chalepensis was rated lowest

with a score of 70. Based on the informants' input, seven multifunctional plant species were selected and recorded their use diversities. Hordeum vulgare, with a score of 8, was identified as the least versatile, while Ritchie halbersii, scoring 23, was found to be the most multifunctional. The study found that Allium sativum was the most favored treatment for malaria in the area.In this study, Allium sativum and Euphorbia abyssinica were found to be the most reliable, with both plants receiving a 100% rating for treating infectious and abdominal disorders. Following them was Acmella caulirhiza, which scored 85%, showing its notable importance in traditional medicine.

The community widely agreed that Allium sativum was the best option, scoring 63. Taverniera abyssinica and Croton macrostachyus followed with scores of 49 and 42, respectively as the consensus among participants on the most commonly used medicinal plants for treating specific diseases. There was a strong agreement among informants on how to treat toothaches and tonsillitis, with these conditions having the highest ICF value of 0.96. On the other hand, treatments for elephantiasis had the lowest ICF value of 0.77, indicating fewer consensuses on how to handle this condition.

The research revealed that the majority of medicinal plants were gathered from home gardens (21 species), with forests (15 species) and grasslands (14 species) also playing significant roles. In study area, the main threats included overgrazing, firewood collection, deforestation, and agricultural expansion. The study highlighted growing concerns about the diminishing availability of these plants, largely due to changes in their natural habitats and unsustainable harvesting practices. This underscores the urgent need to educate the community on conserving and sustainably managing these invaluable plant resources to safeguard them for future generations. Increased public support, involvement from various stakeholders, and continuous awareness campaigns are essential for conserving and sustainably using medicinal plants

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1. INTRODUCTION

Medicinal plants are those with therapeutic qualities or that can be used to make effective medicines. This distinction helps us separate plants with unverified healing claims from those whose benefits have been proven through scientific research.

Traditional medicine has long relied on various plants. Even though some of these plants show promise, more rigorous studies, like double-blind clinical trials, are often needed to confirm their effectiveness. Despite this, these plants are still valued for their potential healing properties. Pharmacologists and pharmacists often refer to these plants or their parts as "crude drugs of natural or biological origin" (Newman & Cragg, 2020; Zhang et al., 2021).

Recent research by Newman and Cragg (2020) outlines several categories of medicinal plants:

1. Plants or plant parts used in preparations such as decoctions and infusions, like Cascara bark.
2. Plants providing pure substances for medicine or for creating medicinal compounds, such as diosgenin from Dioscorea yams used in hormone production.
3. Food, spice, and perfumery plants used medicinally, such as ginger.
4. Microscopic plants, including fungi and actinomycetes, used to isolate drugs, especially antibiotics (e.g., ergot and Streptomyces griseus).
5. Fiber plants like cotton, flax, and jute, which are used in surgical dressings.

This broad classification shows how plants contribute to medicine in various ways.

Around the world, especially in developing countries, medicinal plants are crucial for healthcare. The World Health Organization (WHO, 2023) reports that more than 3.5 billion people in these areas turn to natural remedies for their health needs.

In Africa, it’s common for 70–80% of individuals to seek help from traditional medical practitioners (Cunningham et al., 2020). This reliance on traditional medicine isn't just limited to Africa; globally, it’s gaining recognition as an effective way to increase access to primary healthcare. For many Africans, particularly those with everyday health issues like high fever, traditional medicine often serve as the first line

of defense (Hill et al., 2021). This widespread use highlights the essential role medicinal plants play in addressing various health challenges.

In Ethiopia, traditional medicine is much more than an alternative healthcare option; it's deeply woven into the cultural and public health fabric (Demelash et al., 2020; Hassan et al., 2021). This importance is even more evident given the limited access to modern healthcare services. For example, Ethiopia's Health Sector Development Program (HSDP) aims for one hospital per 100,000 people and one health post per 5,000. However, the reality is starkly different, with only one doctor for every 10,000 people and one nurse for every 5,000 (HSDP, 2022). In light of these challenges, traditional medicine is a vital part of primary healthcare and plays a significant role in the country's efforts to achieve universal health coverage. Research indicates that about 90% of Ethiopia's livestock and over 70% of the population rely on traditional medicine, underscoring its critical role in the nation's healthcare system (Assefa et al., 2021;Tesfaye et al., 2022).

Ethiopia's tradition of using medicinal plants is a key part of its national identity. The country's diverse landscape and climate support around 6,000 species of vascular plants, which are crucial not only for human health but also for livestock well-being. Traditional healers, known by different names in various regions, play a central role in this practice. The strong belief in the healing power of plants, along with their cultural significance and affordability, drives the high demand for medicinal plants in Ethiopian communities. This reliance on traditional medicine is further emphasized by the scarcity of modern health facilities and shortages of medications and healthcare professionals, making it an indispensable aspect of daily life (Anselm et al., 2023).

Ethnobotany is all about exploring how people interact with plants. It dives into how different cultures identify, grow, and use the plants around them (Martin et al., 2020; Balick et al., 2021). This field uncovers the deep connections people have with their natural environments, showing us how knowledge about plants is passed down through generations and embedded in daily life (Reed et al., 2021; Hassan et al., 2022;). Plants have been crucial for more than just providing food and shelter; they've also been vital for developing remedies that tackle a range of health issues (WHO, 2023). For centuries, natural substances from plants and other sources have played a key role in healing (Gottfried et al., 2019; Schippmann et al., 2022). Recognizing

these traditional practices as valid parts of healthcare can make a real difference in preventive health and reduce overall healthcare costs (Iwu et al., 2020; Hussain et al., 2023).

In Africa, traditional medicine is more than just a fallback; it's often a primary or essential part of healthcare. Many people rely on Traditional Medical Practitioners (TMPs) to address their health needs, showing just how integral traditional remedies are to their lives (Adams et al., 2018). In areas with limited access to modern healthcare, traditional medicine often becomes the first line of defense (Fadhl et al., 2022; Mothibe et al., 2023). The widespread use of traditional medicine is shaped by factors such as the high cost of modern treatments and the uneven distribution of healthcare services, particularly in rural areas (Nwosu et al., 2020; Antwi-Baffour et al., 2021). Cultural beliefs and practices also play a big role in how these remedies are used and valued across different regions (Kassaye et al., 2020;Balemie et al., 2021).

In Ethiopia, traditional medicine is deeply woven into the fabric of daily life. Many people turn to traditional remedies because modern healthcare can be expensive and isn't always readily available (Muluye et al., 2021; Gebremariam et al., 2022). The way medicinal plants are used varies widely across the country, reflecting Ethiopia's rich cultural diversity (Adams et al., 2022; Mekonnen et al., 2023). However, these valuable plants are facing threats from deforestation, agricultural expansion, and other human activities, which also put traditional knowledge at risk (Abebe et al., 2023; Tadesse et al., 2023). Research in places like Kersa Mellima Woreda is crucial for understanding and documenting the traditional uses of medicinal plants, including how they are prepared and the challenges people face (Jemal et al., 2023; Tesfaye et al., 2024). This study aims to shed light on these practices and contribute to efforts to preserve both the plants and the cultural knowledge surrounding them.

This study aims to catalog the medicinal plants used in traditional medicine, detailing their various parts, applications, habitats, and methods of quality control. 77 different medicinal plant species were examined, discovering that the leaves and roots are the most commonly used parts in traditional remedies. Local healers utilize these plants to address a range of health issues, including headaches, asthma, dysentery, malaria, eye conditions, cancer, and skin disorders. The use of medicinal plants for human and animal health has a long and established history.

These plants thrive in diverse environments such as riverbanks, cultivated fields, disturbed areas, bushlands, forest edges, forests, grasslands, and home gardens. They play a crucial role in the healthcare system for

many Ethiopians. However, their survival is threatened by environmental degradation caused by factors like investment projects, deforestation, urbanization, and agricultural expansion. These pressures have led to a decline in both the number of medicinal plants and their natural habitats. To tackle these challenges and ensure the protection of these valuable plants and their environments, it is essential to involve local communities in conservation efforts and support research-driven initiatives. This study focuses on documenting the traditional knowledge of therapeutic herbs among the people of Kersa Mellima Woreda.

1.1. Background of the study

The objective of this study is to capture the traditional knowledge that local people in Kersa Mellima Woreda have about medicinal plants. This study is all about documenting the medicinal plants used in traditional remedies, focusing on their different parts, uses, growing conditions, and how they're managed. 77 different types of medicinal plants were identified, finding that leaves and roots are the most commonly used parts in traditional medicine. Local healers use these plants to treat a wide range of ailments, including stomachaches, asthma, dysentery, malaria, eye problems, cancer, skin conditions, and headaches. The use of medicinal plants for both human and animal health has a long history.

These plants thrive in various settings, like home gardens, riverbanks, farm fields, disturbed areas, bushlands, forest edges, and forests. In Ethiopia, many people rely heavily on these plants as part of their healthcare system. However, their survival is increasingly threatened by habitat loss caused by things like development projects, road construction, urban expansion, farming, and deforestation. This loss is leading to a decline in both the plants and their natural habitats. To tackle these issues, it's crucial to implement conservation strategies that involve both local communities and research.

This study is dedicated to uncovering the valuable traditional knowledge that the people of Kersa Mellima Woreda hold about medicinal plants. This knowledge is more than just facts—it's a vital part of their cultural heritage and reflects a deep bond between the community and their natural surroundings (Demelash et al., 2020; Hassan et al., 2021). It shows how the rich variety of plants in the region and the wisdom passed down through generations are woven into their everyday lives (Tadesse et al., 2022; Jemal et al., 2023). For centuries, herbal medicine has been a key aspect of this tradition, used to treat various health issues.

In Ethiopia, traditional medicine has a long history, and a large part of the population still relies on it for their health needs (Assefa et al., 2021; Tesfaye et al., 2022). This underscores just how crucial the knowledge of medicinal plants is for the well-being of many people across the country.

In Kersa Mellima Woreda, situated in Ethiopia's Oromia region, we conducted an ethnobotanical study focusing on medicinal plants. Here, as in other parts of Ethiopia, people have a deep-seated tradition of using these plants for self-care. However, recent research (Awas et al., 2020; Tesfaye et al., 2021) shows that human activities and environmental changes are leading to a decline in native plants. This loss is also threatening the traditional knowledge that comes with them. Studies (Mekonnen et al., 2022; Tadesse et al., 2024) have highlighted how heavy use of forests is disrupting the natural growth of these important plants. Our project not only aims to understand and document these traditional practices but also seeks to contribute to conservation efforts and reveal new insights into how these plants can continue to benefit communities. By documenting both the plants and the knowledge surrounding them, we hope to support both cultural heritage and environmental sustainability.

1.2. Statement of the problem

In the past, the wisdom about medicinal plants was mostly held by the older, close-knit members of the community, who shared their knowledge through stories and personal teachings. However, passing this information on to younger generations has become increasingly difficult. With the rise of modern influences, younger people seem less interested in traditional practices, which have contributed to a gradual loss of this valuable knowledge. The lack of organized methods for documenting and sharing this information has compounded the problem.

The study reveals that this generational gap is causing traditional knowledge about medicinal plants to fade. Since much of this knowledge was passed from generation to generation orally, it wasn’t systematically documented or included in formal education. If action isn’t taken soon, we risk losing these important traditions.

Medicinal plants are also under threat from factors like agricultural development and a decline in interest among younger people. To combat this, it's crucial to document the traditional knowledge carefully, identify the plants used, and develop methods for preparing herbal remedies. Involving local communities in growing and managing these plants can help preserve them for future generations.

If these issues were do not address, the rich tradition of using medicinal plants in Ethiopia could be severely impacted. The loss of this ethno botanical knowledge would be a significant blow to both cultural heritage and traditional healthcare practices.

1.3. Objectives of the study

General Objective

The objective of this study was to identify and document medicinal plants and the associated ethno botanical knowledge in Kersa Mellima Woreda.

Specific Objectives

To explore and compare how social groups in Kersa Mellima Woreda understand and use medicinal plants.

To investigate the various medicinal plants in the area, including which parts are used, how they are applied, their growth habits, and the environments in which they thrive.

1.4. Significance of the study

Regarding the diversity of numerous plant species, Ethiopia is the origin of many of them and one of the world's species richest nations. Research on ethnobotany is essential to exploring these varied biological resources for therapeutic applications. Due to their availability, capacity to heal, affordable cost, profound indigenous knowledge, and other related cultural values, medicinal plants have remained essential in providing the population in the study region with healthcare. It is necessary to encourage the sustainable use and conservation of the various therapeutic plants. This study advocated systematic documenting, preservation of the rich knowledge of local populations, and additional research on certain prospective species.

In many developing countries, including Ethiopia, traditional medicine plays a crucial role in healthcare, with medicinal plants being particularly important. However, these valuable plant resources are under threat due to over exploitation and environmental pressures. To tackle this issue, it's vital to not only preserve traditional

medicinal plants knowledge but also to develop effective conservation strategies for these plants and their habitats, especially in rural areas where modern health care options are limited.

This study is significant for several reasons. It provides a detailed account of how medicinal plants are used to treat various diseases, serving as a reference for their application in both human and animal health. The research underscores the importance of integrating traditional knowledge into formal education to ensure it is passed down through generations, as much of this knowledge is currently transmitted orally.

Additionally, it's crucial to document the use, ecological context, and traditional knowledge of these plants. Protecting medicinal plants by conserving their natural habitats, growing them in home gardens, and raising local awareness are essential steps. A community-based and research-focused approach will be key to preventing the loss and extinction of these important plants.

1.5. Limitation of the study

The transfer of indigenous knowledge was declining from generation to generation as a result of oral transmission. Therefore, the limitation of the study was lack of getting information from new generation. The patients asked knowledgeable people to provide medicinal plants to treat diseases. Hence, some knowledgeable people used as a source of income and had no interest to talk about medicinal plants.

1.6. Scope of the study

This study delves into the rich tradition of using medicinal plants in Kersa Mellima Woreda, Oromia, Ethiopia. It captures the wisdom of local communities who have relied on these plants for generations to treat various ailments. The research aimed to explore and document the wealth of knowledge about these plants, identifying not only the species used but also how they are prepared, dosed, and applied in everyday healthcare.

Conducted across nine kebeles, the study involved local healers, elders, and other community members who are well-versed in traditional medicine. Through interviews, discussions, and field visits, the research shed light on the specific plants that are most commonly used and how they are integral to the community’s health

practices. Importantly, the study also touched on the challenges these plants face, such as deforestation and environmental changes that threaten their survival.

This research highlights the invaluable role that traditional medicine plays, particularly in areas where modern healthcare is less accessible. It underscores the need for urgent conservation efforts to protect not only the medicinal plants but also the knowledge that has been passed down through generations. The findings also pave the way for future research to scientifically validate the healing properties of these plants, ensuring they can be used sustainably for generations to come.

2. LITERATURE REVIEW

Recent studies underscore the enduring significance of traditional medicinal plants in healthcare systems worldwide. Niazi and Monib (2024) report that traditional medicinal plants are central to approximately 40% of global healthcare, with about 85% of these remedies derived from plants. In Southeast Asia alone, over 6,500 plant species have been integral to traditional healing practices. Currently, researchers are investigating these plants for their potential in developing new antimicrobial and anticancer treatments.

A fascinating trend in modern medicine involves leveraging traditional knowledge to address neurodegenerative diseases. For instance, Galanthamine, derived from plants in the Amaryllidaceae family, is showing promise in treating Alzheimer's disease. This development highlights how traditional medicinal plants can connect ancient practices with contemporary medical advancements (Frontiers, 2024).

The role of natural products, especially plants, extends far beyond medicine. Throughout history, plants have been indispensable in various aspects of human life, providing food, shelter, tools, and economic value. They have also been crucial in traditional medicine, helping to prevent and cure diseases. Over centuries, people have identified and utilized these plants through experience, careful observation, and cultural practices (Edae et al., 2017;Awolola et al., 2021). This deeply rooted knowledge has allowed generations to harness the health benefits of plants effectively.

2.1. Global and local perspectives on the role and conservation of medicinal plants

Traditional medicine has been a key component of human healthcare for thousands of years. Around the world, countless people still turn to traditional remedies, often made from medicinal plants, to address a wide range of health issues. For example, in China, traditional medicine remains vital, with *Artemisia annua*—a plant used for nearly 2,000 years—continuing to play a crucial role in treating malaria, particularly against strains resistant to other treatments (Wang, Yang, & Chen, 2021).

In Africa, traditional medicine is deeply woven into the fabric of daily life and healthcare. In countries like Nigeria and Kenya, many people rely on herbal remedies that are both affordable and culturally significant. These remedies are essential for managing both infectious and chronic diseases across the continent (Muthee et al., 2019;Osei, Meroe, & Asare, 2020). However, the increasing strain on natural resources due to

urbanization, deforestation, and agricultural expansion threatens the availability of these plants, putting traditional medicine practices at risk.

Ethiopia stands out for its incredible plant diversity, with over 6,500 species, around 12% of which are found nowhere else in the world (Tesfaye et al., 2020;Ayalew& Merawi, 2021). Here, about 80% of the population depends on traditional remedies, with more than 90% of these remedies derived from local plants. In rural areas, where modern healthcare services are limited, traditional medicine remains deeply connected to cultural practices and the accessibility of these plants (Kidane et al., 2018; Gizaw et al., 2019; Tegen et al., 2020;Selam et al., 2022;Wale & Gedefaw, 2022).

Ethiopia faces significant health challenges, including a rise in non-communicable diseases linked to lifestyle changes, urbanization, and nutritional issues. While infectious diseases remain a major concern, non-communicable diseases are becoming more common and contribute heavily to the health burden in the country (Shiferaw et al., 2018). Medicinal plants play a critical role in treating various conditions, from stomach issues to skin problems and respiratory ailments. These health issues often hit hardest in impoverished communities where sanitation is poor, and diseases spread through contaminated resources (Selam et al., 2022; Wale & Gedefaw, 2022).

Traditional knowledge, which includes practices, beliefs, and cultural traditions, is essential for the continued use of medicinal plants in Ethiopia. Yet, this knowledge is at risk of being lost. It is often passed down orally and can be kept secret, making it vulnerable to disappearing as traditional healers become less common. Without proper documentation, valuable information about plant identification, collection, preparation, and use could be lost (Selam et al., 2022). To preserve this rich heritage and ensure the sustainable use of medicinal plants, it is crucial to document these practices and the plants involved.

2.2. The role of medicinal plants in health care

Traditional medicine has been a cornerstone of human health care for thousands of years, with evidence showing that ancient civilizations across different continents practiced some form of it. This age-old practice remains vital today, especially in regions where modern medical facilities are limited. For example, in China, *Artemisia annua* has been used for nearly 2,000 years and continues to play a crucial role in treating malaria strains that other treatments cannot handle (Moges et al., 2019).

Around the world, people turn to herbal remedies for health and wellness, with about 85% of the global population relying on plant-based medicines for both prevention and treatment. Remarkably, around 25% of all medications contain plant-derived ingredients. Ongoing research is uncovering how these remedies can help manage chronic conditions like rheumatism, gout, asthma, and even serious diseases like cancer, AIDS, and malaria.

In Africa, traditional medicine is deeply embedded in many cultures and healthcare systems. Herbal remedies are commonly used due to their affordability, accessibility, and cultural significance. However, only about 10% of medicinal plant species are cultivated, leaving the majority in the wild and increasingly threatened (Tamene et al., 2020).

2.3. Conservation and sustainability of medicinal plants in Ethiopia

Ethiopia is especially notable for its rich plant diversity, with over 6,500 species, including around 12% that are unique to the region (Ayalew & Merawi, 2021). The southwestern part of Ethiopia, which contains more than 62.5% of the country's forest area, is particularly rich in medicinal plants. These plants are used to treat a wide range of health issues for both humans and animals.

Medicinal plants are incredibly valuable, not only for their health benefits but also for their ecological, economic, and cultural roles. In Ethiopia, they are a vital part of healthcare, especially in areas where modern medical services are limited. These plants are not only affordable but also deeply ingrained in local traditions, making them a trusted choice for many people (Tefera & Kim, 2019). The reliance on these plants is further highlighted by the scarcity of modern healthcare facilities, particularly in rural and lower-income communities.

Despite their importance, there is a significant gap in knowledge about these plants. We lack comprehensive information on their scientific names, uses, ecological roles, and conservation needs. This gap is concerning because the ongoing loss of plant species threatens the future of traditional medicine practices (Tamene et al., 2020). Deforestation, habitat destruction from agriculture and commercial activities, and inadequate quality control for herbal products are major factors contributing to this decline in Ethiopia (Tefera & Kim, 2019). Additionally, the erosion of traditional knowledge—often passed down orally through generations—further threatens this valuable information, which may be lost over time.

To tackle these challenges, it is crucial to focus on conserving and sustainably using Ethiopia's medicinal plants. This means documenting their medicinal properties, understanding their ecological roles, and improving quality control practices for herbal products. In Ethiopia, about 887 plant species are used in traditional medicine, with 26 of these being endemic and increasingly at risk (Tefera & Kim, 2019; Tamene et al., 2020). Most of these plants are found in the southern and southwestern regions of the country, which are known for their rich biological and cultural diversity (Tamene et al., 2020).

In Ethiopia, the survival of medicinal plants is increasingly jeopardized by various human activities and environmental changes. Practices such as overharvesting, deforestation, agricultural expansion, overgrazing, and urban development are significantly impacting these valuable resources. Recent studies by Getnet et al. (2020) and Cunningham et al. (2021) indicate that many medicinal plants are now confined to difficult-to-reach areas like cliffs, hills, mountains, gorges, riverbanks, and remote valleys, complicating their collection.

Additionally, traditional knowledge regarding the identification, preparation, and use of these plants is also at risk. Tolosa et al. (2022) note that this knowledge, passed down orally through generations, is fading alongside the plants themselves. The erosion of traditional healthcare practices and the potential loss of medicinal plant species could severely affect local communities, as warned by Awas et al. (2021).

Addressing these challenges requires a concerted effort to document and protect medicinal plants. Mekonnen et al. (2022) and Belete et al. (2023) and emphasize the importance of safeguarding natural habitats, promoting the cultivation of medicinal plants in home gardens, and raising community awareness. Collaborative efforts and focused research are essential to prevent the loss of these crucial resources and preserve traditional knowledge.

Medicinal plants have been essential to human health for thousands of years. Today, it is estimated that about 10% of all vascular plants are used for medicinal purposes (Jäger & Lötter, 2018), with estimates ranging from 350,000 to nearly 500,000 species (Fabricant & Farnsworth, 2021). Throughout history, people have relied on plants to treat various ailments. Early healers learned through trial and error, discovering which plants had beneficial effects and refining their knowledge over generations (Vasanthi et al., 2019;Bussmann et al., 2020). This rich tradition of using plants for healing became known as traditional medicine.

Traditional medicine is deeply rooted in the cultural beliefs and practices of different societies. According to the World Health Organization, it involves a wide range of knowledge, skills, and practices based on indigenous theories used to maintain health and treat illnesses (World Health Organization, 2021). Every civilization has developed its medical systems based on local plants, with some suggesting that this ancient knowledge laid the foundation for modern medicine and pharmacy (Giday et al., 2019).

Today, we see the fruits of this ancient wisdom in modern medicine. Many therapeutic drugs are derived from plants, and the cultivation of medicinal plants continues worldwide (Patel et al., 2023). This ongoing use of plant-based remedies highlights the lasting impact of traditional knowledge, showing how ancient practices have evolved into vital components of contemporary medicine (Santos et al., 2022). The connection between traditional healing and modern therapeutic practices underscores the enduring significance of medicinal plants in our lives.

2.4. Uses of medicinal plants in treating different disease types

Medicinal plants and traditional knowledge are receiving more attention than ever worldwide. In China, researchers continue to explore the potential of *Artemisia annua*, a plant thkat has been used for centuries to fight malaria and other illnesses (Wang, Yang, & Chen, 2021). Similarly, in Peru, there is growing interest in how indigenous plants can address conditions like cancer and respiratory issues, highlighting the global appreciation for traditional remedies (Callejas, Linares, & Fernández, 2022). In Africa, traditional medicine is a vital part of daily life, deeply woven into cultural practices. Nigeria, for example, has extensive records of how local plants are used to treat various ailments, including malaria. These plants are not only medicinal but also hold cultural significance, reflecting long-held traditions (Osei, Meroe, & Asare, 2020).

Ethiopia offers a vivid example of the enduring role of medicinal plants. For centuries, these plants have been central to treating a wide range of health issues, from minor skin problems and digestive issues to more serious conditions like cancer and malaria. In many rural areas, traditional healers are the first to provide care, especially where access to modern healthcare is limited (Birhanu et al., 2019). Plants used in Ethiopian traditional medicine often address multiple health concerns, showcasing their remarkable versatility (Birhanu et al., 2019; Kassa et al., 2021). Beyond their medicinal value, these plants are also deeply embedded in the cultural fabric of local communities. Traditional healers are revered not only for their knowledge but also for their role in preserving cultural practices and heritage (Giday et al., 2019; Kassa et al., 2021). This rich

interplay between traditional medicine and cultural tradition underscores the importance of safeguarding both the plants and the knowledge that surrounds them.

Medicinal plants play a crucial role in healthcare worldwide, with different types of plants used across various cultures and regions. Globally, herbs are particularly prominent. For instance, in India, herbs are used in more than 60% of traditional remedies (Kumar et al., 2021), while in Brazil, herbs, shrubs, and climbers are commonly utilized, reflecting local environmental and cultural factors (Silva et al., 2020).

In Africa, traditional medicine is deeply integrated into healthcare systems, with herbs widely used due to their accessibility, affordability, and cultural relevance. Kenya's traditional medicine, for example, relies heavily on herbs, although shrubs and trees are also significant in various regions (Njoroge et al., 2022). Studies indicate that herbs make up a significant portion of medicinal plants, constituting between 40% and over 50% of traditional remedies (Chekole et al., 2015;Amsalu et al., 2018;Kidane et al., 2018; Ali et al., 2020; Hu et al., 2020).

Globally, shrubs play a key role in traditional medicine due to their remarkable adaptability and resilience. Across different regions, these plants are celebrated for their versatility and significant health benefits. In India, shrubs are a cornerstone of traditional medicine, with their ability to thrive in various climates making them an essential part of local remedies. Research by Sharma et al. (2020) highlights that shrubs are central to many traditional treatments, proving their value in both maintaining health and treating illnesses.

In Brazil, shrubs are similarly valued, with Costa et al. (2022) finding that their robustness and widespread availability make them a common choice in traditional medicine. These hardy plants are often included in local remedies to address a range of health issues, reflecting their importance in Brazilian healing practices. In Thailand, shrubs also hold a special place in traditional medicine. Suphaprom et al. (2021) discovered that local healing practices frequently rely on shrubs, influenced by the region’s unique climate and cultural traditions. Their resilience makes them a dependable source of medicinal compounds in Thai medicine. Overall, the global appreciation for shrubs in traditional medicine underscores their adaptability and essential role in health practices around the world.

Research shows that shrubs are also crucial in African traditional medicine. In Kenya, for instance, shrubs are a key component of local healing practices (Muthee et al., 2019). This trend is observed in other parts of Africa as well, with shrubs playing a significant role in traditional medicine due to their adaptability and resilience. Ethiopia stands out for its rich biodiversity and the prominent role of medicinal plants in

traditional medicine. The country is home to over 6,500 plant species, with about 12% being endemic (Tesfaye et al., 2020;Ayalew& Merawi, 2021).

In Ethiopia, medicinal plants are used to treat a wide range of health issues, from skin problems to more severe conditions like cancer and malaria (Birhanu et al., 2019). In the highlands of Ethiopia, herbs are particularly significant, forming a large part of traditional medicine practices (Teklay et al., 2021; Teshome et al., 2022). However, shrubs also play a vital role. In districts like Mana Angetu and Sekoru, shrubs constitute a significant portion of the medicinal plants used locally, while in the Wonago district, bushes are more prevalent. This reflects broader patterns seen in Africa, with local variations influenced by climate, cultural practices, and traditional healing traditions.

2.5. Medicinal plant parts used for preparation of traditional remedies

The choice of plant parts for medicinal use often comes down to practicality and the impact on the plant's well-being. Leaves are a popular choice because they are easy to gather, whereas collecting roots can be more challenging and harmful to the plant, as it disrupts its overall health. Recent studies illustrate how leaves are commonly favored. In India, Kumar et al. (2021) found that leaves are widely used in traditional medicine due to their ease of access and minimal impact on the plant, making them a preferred option that helps sustain plant populations while still providing effective remedies. Silva et al. (2020) reported similar findings in Brazil's Atlantic Forest, where leaves are often chosen for their convenience, while roots are used less frequently to avoid conservation issues.

Research by Njoroge et al. (2022) supports this trend, noting that leaves are the most frequently used part of medicinal plants in traditional practices, with roots being less common due to their potential to harm the plant. In Ethiopia, Teshome et al. (2022) observed that leaves are the primary choice for traditional medicine, reflecting their availability and ease of collection. Teklay et al. (2021) also found that leaves are generally preferred over roots for these reasons.

However, roots are still valued despite the challenges associated with their collection. Wang et al. (2021) highlighted that in Chinese traditional medicine, roots are extensively used, especially for conditions where leaves may not be sufficient. Their therapeutic benefits often outweigh concerns about sustainability. Giday et al. (2020) found that in South African traditional medicine, roots are important despite the potential impact on plant health, as their medicinal properties are highly valued. Similarly, Ali et al. (2020) noted that in some

areas, roots remain a crucial part of traditional remedies, valued for their potent medicinal qualities even though their collection poses challenges.

2.6. Method of preparation and route of administration of medicinal plants

Recent studies highlight the global significance of crushing in traditional medicine. In India, Kumar et al. (2021) found that crushing is widely used in preparing herbal remedies, valued for its ability to release active compounds from herbs and roots. Similarly, Njoroge et al. (2022) observed its common use in Kenya, emphasizing its effectiveness in traditional practices. Despite challenges, roots remain important in some regions, as noted by Ali et al. (2020), though their extraction can negatively impact plant health. In Africa, shrubs are vital in traditional medicine; in Kenya, for instance, Muthee et al. (2019) emphasized their adaptability and resilience, making them a staple in local healing practices. In Ethiopia, crushing is a preferred method for preparing traditional remedies. Amsalu et al. (2018) found that over half of the remedies are prepared this way due to its practicality and effectiveness. Teklay et al. (2021) confirmed the widespread use of this technique across various Ethiopian regions. Other methods, like concoction and grinding, are also prominent in specific areas such as Chencha and Gera (Mohammed & Seyoum, 2013; Kelayu et al., 2020).

Oral ingestion is the most popular method globally for administering traditional remedies. Silva et al. (2020) discovered that in the Amazon, many traditional remedies are consumed as teas or infusions. In China, Wang et al. (2021) highlighted that oral administration is crucial for treating internal health issues with traditional medicines. Similarly, Giday et al. (2020) found that oral ingestion remains a common practice for internal remedies in South Africa. Across Africa, Suphaprom et al. (2021) reported that oral ingestion is widely used, shaped by local climates and cultural practices. This method is central to many traditional remedies across the continent. In Ethiopia, oral administration is the most common way to use traditional remedies. Amsalu et al. (2018) noted its prevalence in treating various health issues, and further research by Meragiaw et al. (2016) and Kidane et al. (2018) confirmed its widespread use. Recent studies by Ali et al. (2022) and Teshome et al. (2023) continue to support oral ingestion as a primary method in Ethiopian traditional medicine.

2.7. Examples of popular medicinal plants

Eucalyptus globulus is well-known around the world for its ability to help with fever and respiratory issues. Kumar et al. (2021) have shown that it is particularly effective for colds and flu, making it a staple in many households. Similarly, *Ocimum urticifolium* is cherished across Africa for its various uses. Whether treating fever, diarrhea, tapeworms, colic, or coughs, Mokaya et al. (2023) confirm its significant role in traditional remedies throughout the continent. Widely used in African traditional medicine, *Vernonia* spp. is known for addressing a range of ailments, especially digestive issues. Nega et al. (2020) highlight its importance in traditional practices across various African communities. In many African regions, *Croton macrostachyus* is valued for its broad medicinal uses. Ali et al. (2022) and Teshome et al. (2023) underscore its effectiveness in treating wounds and infections, showcasing its versatility. Additionally, the *Spondias mombin* plant is used to tackle a variety of health problems, including fever, diarrhea, and liver issues. Ojo et al. (2024) highlight its role in traditional African medicine, noting its significance even in Ethiopia.

In Ethiopia, the *Solanum tarderemotum* plant is especially valued for its effectiveness in treating stomachaches. Mekonnen et al. (2021) emphasize its importance as a go-to remedy for digestive troubles in Ethiopian herbal medicine. The *Ruta chalepensis* plant also has a broad range of uses in Ethiopian traditional medicine, from treating amoebas and stomachaches to alleviating abdominal pain, diarrhea, and colds. According to Getahun et al. (2022), it is a vital part of local therapeutic practices. In southwest Ethiopia, the *Nicotiana tabacum* plant is primarily used for veterinary purposes. Mekuria et al. (2022) provide insights into how it helps treat issues like pasteurellosis, bloating, and internal parasites in livestock. Lastly, in Ethiopia, the *Echinops kebericho* plant is used for treating pneumonia and snake bites. Tesfaye et al. (2021) highlight its critical role in addressing these serious health concerns, making it a valuable part of Ethiopian medicine.

2.8. Ecology and habitats of medicinal plants

Around the world, people often gather medicinal plants from natural areas like marshes, grasslands, and forests. Studies by Hassan et al. (2021) and Sharma et al. (2023) highlight how these wild plants are crucial for traditional medicine, thanks to their abundance and easy access. Additionally, many people cultivate medicinal plants in their home gardens, where they serve a variety of health needs. Singh et al. (2022) and

Alemayehu et al. (2019) show that these gardens are treasure troves of herbs, providing a convenient and reliable source of medicine for local communities.

However, overharvesting for fuel and construction is putting pressure on medicinal plants. Species like *Prunus africana* and *Hagenia abyssinica* are particularly at risk. Mekonnen et al. (2022) and Gashaw et al. (2023) stress the need for better conservation practices to ensure these valuable plants continue to thrive. Plants that grow near water sources have developed unique traits to survive, such as shorter roots that are well-suited to their environment. Research by Sultana et al. (2021) and Jones et al. (2023) sheds light on how these plants manage to flourish in their specific ecological niches. Kumar et al. (2024) delve into how medicinal plants adapt and how we can better protect them. Their study, published in the Global Journal of Botany and Plant Sciences, offers fresh insights into conservation strategies for these essential plants.

In Africa, traditional healers frequently collect medicinal plants from wild areas like forests and marshes. Hassan et al. (2021) and Sharma et al. (2023) highlight that these wild resources remain a key part of local health practices due to their availability and importance. Home gardens across Africa are also a vital source of medicinal plants. Alemayehu et al. (2019) and Singh et al. (2022) show that these gardens often contain a rich variety of herbs, making them a crucial resource for local communities. Nevertheless, overharvesting and habitat loss pose significant threats to plants like *Prunus africana* and *Hagenia abyssinica* in Africa. Mekonnen et al. (2022) and Gashaw et al. (2023) call for stronger conservation efforts to protect these important species.

In Ethiopia, people often harvest medicinal plants from diverse natural habitats. Research by Hassan et al. (2021) and Sharma et al. (2023) underscores the role these plants play in local health traditions. Ethiopian home gardens are a crucial source of medicinal plants, and Alemayehu et al. (2019) and Singh et al. (2022) highlight that these gardens are a key part of local medicine, providing easy access to a range of herbs. However, species like *Prunus africana* and *Hagenia abyssinica* face serious conservation challenges due to overharvesting and habitat destruction in Ethiopia. Mekonnen et al. (2022) and Gashaw et al. (2023) emphasize the importance of implementing sustainable practices to protect these plants. Additionally, plants growing near rivers and streams in Ethiopia have developed special traits, such as shorter roots, to adapt to their environments. Studies by Sultana et al. (2021) and Jones et al. (2023) explore how these adaptations help these plants survive and thrive.

2.9. Threats to medicinal plants

Medicinal plants are facing significant threats globally due to human activities. Overharvesting, deforestation, agricultural expansion, and charcoal production are major factors contributing to the decline of these vital resources. Indigenous communities have long observed the detrimental effects of overharvesting and firewood collection on medicinal plants. Recent studies by Smith et al. (2021) and Rashid et al. (2022) have highlighted how excessive collection for traditional medicine and firewood is leading to a concerning decrease in the availability of these plants.

Deforestation and agricultural expansion further exacerbate the problem. Research indicates that deforestation rates can vary from 28% to 90% depending on the region, with agricultural expansion responsible for 34% to 55% of habitat loss. Studies by Parker et al. (2022) and Mwangi et al. (2023) reveal the severe impact of these activities on the habitats of medicinal plants, particularly in tropical and subtropical regions.

In Ethiopia, additional challenges include the expansion of agriculture and the erosion of traditional knowledge about medicinal plants. Research by Jemal et al. (2022) and Belayneh et al. (2023) underscores how these issues are affecting regions traditionally rich in medicinal plant species.

The ongoing loss of natural vegetation due to fire, overgrazing, and deforestation continues to threaten plant biodiversity and traditional medicine practices. Studies by Yusuf et al. (2021) and Mekonnen et al. (2022) emphasize the impact of these challenges on both plant biodiversity and the preservation of traditional medicinal practices.

2.10. Conservation practice of medicinal plants

Globally, there is increasing interest in conserving medicinal plants through cultivation in home gardens. Despite these efforts, significant challenges persist. Research by Rodrigues et al. (2021) andNguyen et al. (2022) indicates that many medicinal plants are still collected from wild or semi-wild areas rather than being grown in gardens. Zhou et al. (2020) and Hernandez et al. (2023) highlight that ongoing issues such as land clearing, deforestation, and agricultural expansion continue to threaten these plants. Studies by Yao et al.

(2021) and Zhang et al. (2024) show that fewer than 15% of medicinal plants are currently cultivated in home gardens, underscoring the need for more extensive conservation measures.

In Africa, efforts to cultivate medicinal plants in home gardens are gaining traction as a conservation strategy. Usmane et al. (2019) and Amsalu et al. (2021) report successes with growing plants like *Ocimum lamifolium* and *Carica papaya* in gardens. However, these positive steps are overshadowed by persistent challenges such as deforestation and land conversion, which continue to exert pressure on natural habitats.

Ethiopia reflects these broader trends with its own local specifics. Research by Jima and Megersa (2020) and Lulekal et al. (2021) reveals that only a small fraction of medicinal plants are cultivated in gardens, ranging from 5.7% to 13.8% in districts like Mena Angetu and Gozamin. On a more positive note, about 20.6% of medicinal plants are found in agricultural areas or alongside crops, suggesting some integration into farming systems. This integration indicates potential for using agriculture as a tool for conservation, although challenges from habitat loss and other human impacts continue to persist.

In Ethiopia, the survival of medicinal plants is increasingly jeopardized by various human activities and environmental changes. Practices such as overharvesting, deforestation, agricultural expansion, overgrazing, and urban development are significantly impacting these valuable resources. Recent studies by Getnet et al. (2020) and Cunningham et al. (2021) indicate that many medicinal plants are now confined to difficult-to-reach areas like cliffs, hills, mountains, gorges, riverbanks, and remote valleys, complicating their collection.

Additionally, traditional knowledge regarding the identification, preparation, and use of these plants is also at risk. Tolosa et al. (2022) note that this knowledge, passed down orally through generations, is fading alongside the plants themselves. The erosion of traditional healthcare practices and the potential loss of medicinal plant species could severely affect local communities, as warned by Awas et al. (2021).

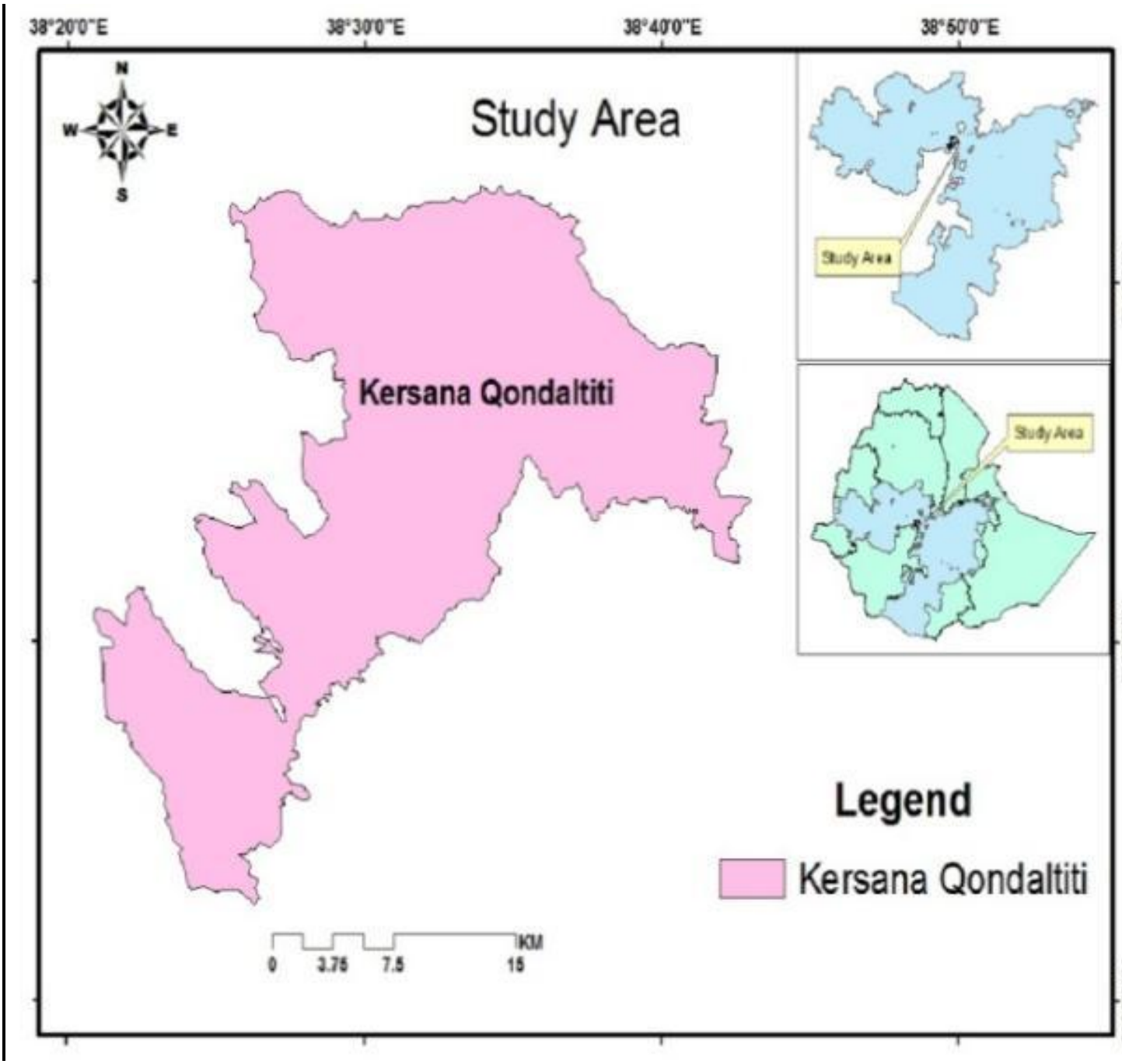
Addressing these challenges requires a concerted effort to document and protect medicinal plants. Belete et al. (2023) and Mekonnen et al. (2022) emphasize the importance of safeguarding natural habitats, promoting the cultivation of medicinal plants in home gardens, and raising community awareness. Collaborative efforts and focused research are essential to prevent the loss of these crucial resources and preserve traditional knowledge.

3. MATERIALS AND METHODS

3.1. Description of the study area

Kersa Mellima Woreda is located in the Oromia Regional State's in the South West Shoa Zone. Kersana Qondaltiti was the former name before Soddo Dachi Woreda isolated from Kersa Mellima Woreda. In this case the figure (1) illustrated the former of Kersa Mellima Woreda that only existed in the internet. It's about 64 kilometers southwest of Addis Ababa. The area is situated between 8°20'N and 8°40'N latitude and 38°20'E and 38°50'E longitude. The region is divided into 27 kebeles and features a mix of mountainous terrain in the north and lowlands in the south. Surrounding areas include Kokir Woreda to the west, Tole Woreda to the northwest, Sebeta Hawas Woreda to the east, and the Eastern Shoa Zone to the east. Lemen is the main town here, and notable landmarks include the Adadi Maryam Rockhewn Church and the Melka Kunture Prehistoric Archeological Site.

Kersa Mellima is characterized by three agroclimatic zones: highland, mid-altitude, and lowland. The region experiences its main rainy seasons in spring (March to April), summer (June toAugust), and fall (September to October). Rainfall varies between 1,880 and 2,080 millimeters per year, and the average temperature is around 22.98°C. The elevation ranges from 1,500 to 2,900 meters above sea level. The landscape is home to various herbs, bushes, and eucalyptus trees. In the highland areas, enset is a key edible plant that keeps the region green year-round. However, due to growing population pressure and widespread eucalyptus planting, the native vegetation is disappearing at an alarming rate.



Source :https://maps.google.com

Figure 1: Location of the study area

In 1994, Kersa Mellima Woreda had a population of 92,000 people, with an equal split between men and women-46,000 each. Most people, about 96%, lived in the countryside, where they relied on farming and agriculture for their daily needs. The rest of the population, about 4%, lived in cities.

The majority of the people in Kersa Mellima Woreda-, (98.23%)-, practice Orthodox Christianity, while small percentages-, (1.48%)-, are Protestant. The community primarily depends on farming, growing a variety of cereals like wheat, teff, maize, barley, and beans. They also raise animals, including horses, chickens, lambs, goats, and donkeys. The enset plant is widely cultivated in family gardens, with varieties like woina-dega and dega being quite common.

In terms of ethnicity, the largest group is Oromo, making up 94.01% of the population, followed by Amhara at (3.2%) and the Soddo Guraghe (2.44%). The remaining 0.34% includes various smaller ethnic groups. Oromiffa is the main language spoken by 98% of the people, with Soddo Guraghe spoken by 3.21% and Amharic by 2.8%. The rest of the population speaks a mix of other languages.

3.2. Design of the study

Descriptive research design was used to gain a deeper understanding of how local communities use therapeutic plants based on their current knowledge. One hundred fifty five participants from nine different kebeles were used-, including community members who use these plants, knowledgeable elders, and traditional healers. Data were collected using various methods, such as questionnaires, semi-structured interviews, field walks with guides, preference ratings, and fidelity level assessments. The data were then analyzed using descriptive statistics to get a clearer picture of the findings.

3.3. Source of the data

Both primary and secondary sources were used to collect data. The primary data were collected through questionnaires, interviews, and field observations of medicinal plants. For secondary data, published materials and conducted literature reviews relevant to my topic. This background information proved to be extremely valuable and played a crucial role in completing the study.

3.4. Population of the study

Ethical approval for the study was obtained from relevant ethical review boards and local authorities. Informed consent was obtained from all participants, ensuring that they were fully aware of the study's purpose and their right to withdraw at any time without consequence. Participants' privacy and confidentiality were strictly maintained throughout the research process. Efforts were made to respect local customs and traditions, and the study was conducted with sensitivity to the cultural context of the participants.

A total of 155 participants were used in the study and the individuals were selected from randomly chosen nine kebeles based on their knowledge of medicinal plants,-18 individuals from each Lemen 01, and Gibiso 01 kebeles and 17 from each of Waraboharo, Ilala sadden, Hawadhangago, Gutuurji, Algagaleyi, Kersawarko, and Mutedeyu kebeles.

Out of these participants, 91 (58.7%) were men, and 64 (41.3%) were women. Most of the informants-,(78.7%)-, were aged between 56 and 85, with 25.8% being over 40. Additionally, six younger informants under 40-, who were recommended by local healers, were included in the study.

Given the focus on rural locations, many of the informants had limited literacy. To ensure the reliability of the study, Participants were selected based on their extensive knowledge of medicinal herbs. Local residents who were eager to participate were selected and their general understanding of the plants was evaluated. Local healers were particularly valuable due to their in-depth knowledge of medicinal plants.

3.5. Sampling size

From July 19, 2022, to July 22, 2023, the research involved a sample of participants selected from nine kebeles across three different agro climatic zones. The sample consisted of 20 females and 30 males, totaling 50 participants who were given questionnaires, while 45 females and 60 males, totaling 105 participants, were interviewed. In total, the study included 155 participants across various data collection methods, focusing on their knowledge of traditional medicinal plants.

Participants were selected based on their age, their knowledge of traditional medicinal plants, and their roles as traditional healers. Information on the most knowledgeable individuals in the area was obtained from local communities, elders, and administrative officials.

3.6. Methods of data collection

To get a complete picture of how these plants are used, semi-structured interviews, group discussions, structured questioning, guided field trips, and participant observations were used. The main goal was to catalog the medicinal plants in the area and understand how they're used to treat different ailments.

The researcher introduced himself to the participants and asked their consent to participate in the study. After getting their consent, their responses were collected through questionnaires. Next, interviews were conducted with those who were available. After gathering information through these methods, field observations of the plants were conducted.

For data collection, first,questionnaires were handed out to 20 women and 30 men to gather basic information about their knowledge of medicinal plants. Second, 45 women and 60 men were interviewed to learn more about the types of ailments they treat, how they prepare the plants, and how they administer them. Finally, observations of the plants in their natural habitats were conducted to understand their growth and ecological conditions.

3.7. Ethno botanical data analysis

In ethno botanical research, combining both qualitative and quantitative methods created a well-rounded view of how plants were used and valued in different cultures. This blend of approaches helped us understand not just the numbers but also the stories and practices behind plant use.

Quantitative Methods: To get a clear picture of the data, researchers used descriptive statistics to calculate percentages and frequencies. This helped in understanding how often certain plants or practices were

mentioned. For example, descriptive statistics revealed which plants were most frequently cited by local informants, giving a snapshot of their importance and prevalence (Martin, 1995; Reyes-García et al., 2007).

Qualitative Methods: For a deeper dive into the details, qualitative methods came into play. These methods involved recording and coding information to interpret the data meaningfully. Techniques like informant consensus, preference ranking, direct matrix ranking, and paired comparison were used to uncover insights into the effectiveness and significance of different medicinal plants.

Informant Consensus: This technique measured how much agreement there was among informants about which plants were used for treating specific conditions. The informant consensus factor (ICF) helped us understand whether a plant was widely recognized and used across different individuals (Friedman et al., 1986).

Preference Ranking: Informants ranked plants based on their effectiveness for treating particular ailments. This helped identify which plants were considered the most valuable or effective by the local community, highlighting their practical importance (Gupta et al., 2012).

Direct Matrix Ranking: This method assessed how versatile plants were by rating them on various criteria. It helped determine how well each plant served multiple purposes, from medicinal to non-medicinal uses (Drew, 1994).

Paired Comparison: In this approach, plants were compared in pairs based on specific attributes or uses. This structured comparison allowed researchers to evaluate the relative importance or effectiveness of each plant in a more detailed way (Bussmann et al., 2006).

By using these methods together, researchers built a rich, nuanced picture of traditional plant knowledge and practices. This approach not only highlighted the numbers but also told the broader story of how plants were integrated into cultural practices and daily life.

3.8. Ethical consideration

The letter of consent written from AAU was provided to the culture and tourism office of Kersa Mellima woreda.Before data collection, written permission was obtained from the culture and tourism office of the woreda as well as permission from the local administration of each selected kebele. Following this, the purpose of the study was briefly explained to each informant and prior verbal consent was obtained. According to the researcher required all participants were gave full information about medicinal plants. The participants gave detail information about medicinal plants based on their interests. All informants were actively participating during data collection.Data collection was achieved without any problem and information was provided as it was required.

4. RESULTS AND DISCUSSIONS

4.1. Socio-demographic characteristics of the respondents

In this study area, there were 90 male and 65 female individuals aged 40 and above, selected based on their extensive knowledge of medicinal plants to ensure the study's reliability. The informants were chosen from the local population to assess the general knowledge of medicinal plants, depending on their willingness to participate. Local healers were also considered key informants due to their expected in-depth knowledge of medicinal plants.

The respondents predominantly followed Orthodox Christianity (81.9%) and Protestantism (16.8%). Most of them were farmers (103 individuals) and merchants (48 individuals). They primarily spoke Afan Oromo, with a few speaking Amharic and Gurage. Nearly all respondents were married and illiterate, although some had completed up to grade 8. They had acquired their knowledge of medicinal plants from parents, healers, and friends, as illustrated in Table 1.

Table 1:- The socio-demographic characteristics of respondents

Demographic characteristics of the respondents	The status of the respondents	Number of respondents	Percentage-(%)
Age	30-40	6	3.9
	41-55	24	15.5
	56-70	71	45.8
	71-85	51	32.9
	86-95	3	1.9
	Above 95	-	-
Religious	Orthodox	127	81.9
	Protestant	26	16.8
	Catholic	-	-
	Muslim	-	-
	Wakeffata	2	1.3
	Farmers	103	66.5

Occupation	Merchants	48	31
	Government work	4	2.6
Level of education	None	120	77.4
	Grade 1-6	22	14.2
	Grade 7-12	9	5.8
	Diploma	3	1.9
	Degree	1	0.6
Language	Afan oromo	141	91
	Amharigna	3	1.9
	Guraghigna	6	3.9
Marital status	Married	133	85.8
	Single	4	2.6
	Divorced	18	11.6
Source of knowledge about medicinal plants	Parents	85	54.8
	Healers	36	23.2
	Friends	22	14.2
	Relatives	12	7.7
	Health center	-	-
	Others	-	-

Nine kebeles were selected from the woreda based on the source of medicinal plants and three agro-climatic conditions, as illustrated in Table 2. From each kebele, the number of participants selected was either 10 or 11, focusing on healers or knowledgeable individuals regarding medicinal plants. Of the nine kebeles, two were urban, while the remaining seven were rural areas, as medicinal plants are predominantly found in rural areas.

Table 2:- Numbers of respondents, numbers of healers and climate condition of each kebele

No	Name of kebele	Number of respondents			Number of healers			Climate condition
		Male	Female	Total	Male	Female	Total	
1	Lemen 01(U)	11	7	18	2	1	3	Bereha
2	Gibiso 01 (U)	11	7	18	2	2	4	Woinadega
3	Waraboharo (R)	10	7	18	4	1	5	Woinadega
4	Ilalasadden (R)	10	7	17	1	1	2	Woinadega
5	Hawadhangago (R)	10	7	17	5	3	8	Dega
6	Gutuurji (R)	10	7	17	1	0	1	Woinadega
7	Alga galeyi (R)	10	7	17	2	0	2	Dega
8	Kersawarko(R)	10	7	17	5	2	7	Bereha
9	Mute deyu(R)	10	7	17	3	1	4	Bereha

U=Urban R=Rural

4.2. List of medicinal plants in the study area

In the study area, 77 different medicinal plants were observed.For each plant, a variety of details, including its scientific and Oromiffa/Amharic languages, how it grows, which parts are used, the preparation methods, how it's administered, and the kinds of ailments it can treat were collected.

The results showed in table (3a) that herbs make up the largest group, with 32 species, accounting for about 41.55% of the total, as illustrated in Table 3a. This finding aligns with previous studies by Mesfin et al. (2009) and Giday et al. (2003), which also highlighted herbs as the most common. However, Lulekal et al.

(2013) noted that in Ankober, herbs were predominant, whereas shrubs were more common in the Wonago district.

Table 3a:- Medicinal plants grow in the form of herbs.

Scientific name	Oromiffa/ Amharic languages	Parts used	Method of preparation	Administration route	Type of disease treated	Habitats of medicinal plants
Allium sativum	Qullubbi(neč shnkurt)	bulb	Pounding with rhizome of Ginger finical and eating with honey	oral	Malaria, stomachache, allergic of eye, common cold	Home garden
Amaranthus caudatus	Iyyaasu(Chigogot)	leaf	Pounding and boiling	oral	Diarrhea	Forest
Artemisia abyssinica	Ariiti(Chigugn)	Root, leaf	Crushing and homogenizing in water and the patient smell and drink	Oral, nasal	Evil spirit, Headache	Homegarden
Echinops kebericho	Qorobicho(Kebericho)	root	Pounding and mixing with	oral	Vomiting, Headache	Cultivated land

			coffe			
Kalanchoe densiflora	Endahula	leaf	Squeezing and its drop is dropping on the wound	dermal	Gonorrhea	Forest
Cucurbita pepo	Buqqee (duba)	seed	Powdering and mixing with water and finally filtering	oral	Gonorrhea	Live fences
Ajuga intergrifolia	Harma guusa	leaf	Pounding and mixing with nut oil	oral	Epilepsy	Grass lands
Ocimium lamifolium	Hancabbii((Damakesie)	leaf	Squeezing and sniffing	nasal	Headache	River banks
Cynodon nemfuensis	Coqorsa gurraacha	Leaf stem	Crushing with teeth	dermal	Tonsillitis	Grass lands
Phytolocca dodecandra	Andoodee (andod)	leaf	Squeezing and juice is made	oral	Sinus	Forest
Plumbago zeylanica	Martus (Amira)	leaf	Squeezing and juice is made	oral	Cancer	Home garden
Rumex neppalensis	Tultii	root	Pounding and two cup of tea is taken with coffee	oral	Stomachache	Cultivated land
Zingiber	Zinjibila	Leafy-	Pounding and mixing with	Nasal, oral	Influenza, internal parasite	Home

officinale	(zijinbil)	stem	Allium sativum		treatment	gardens
Acmella caulirhiza	Barbaree(Yemdir berbere)	Seed	Powdering and mixing with water	Oral	Stomachache	Cultivated land
Ruta chalepensis	Xenadamii (Tenademi)	Leaf/ Seed	Boiling with coffee, Pounding	Oral, Nasal	Headache, Stomachache, Vomiting	Home gardens
Thymus capitatus	Xosiinyi (Tosign)	Leaf	Pounding and mixing with food	Oral	Stomach diseases, Cough, Asthma	Home gardens
Urtica pilulifera	Doobbii (Sama)	Leaf	Boiling and eating with oil	Oral	Sore joints	Road sides
Triticum dicoccon	Ajjaa(ajha)	Seed	Pounding, Boiling with water	Oral	Common cold	Cultivated land
Hordeum vulgare	Garbuu(gabs)	Seed	Pounding, mixing with water	Oral	Gastritis, Wound	Cultivated land
Musa accuminate	Muuzii(muz)	Seed	Eating	Oral	Gastritis	Home gardens
Ensete ventricosum	Warqee(qoco)	Stem	Pounding, making bread (qixxaa), eating	Oral	Diarrhea	Home gardens
Plantago lanceolata	Qoricha michii(mechi	Leaf	Squeezing, mixing with	Oral, dermal	Stomachache, fever, headache,	River banks

	)		Lamium purpuraum, Cynoglossum coeruleum and water		allergic on the skin and mouth	
Lamium purpureum	Aramaa michii(mechi)	Leaf	Squeezing with Plantago lanceolata, Cynoglossum coeruleum and water	Oral, dermal	Stomachache	River banks
Rumex acetosella	Shultii	Leaf	Rubbing, washing with water	Dermal	Skin irritation, itching	Home gardens
Malva neglecta	Liiti	Root	Pounding, mixing with water and Hagenia abyssinica	Oral	Tape worm	Home gardens
Solanum nigrum	Hiddii xixiqqoo	Seed	Swallowing	Oral	Eye disease	Grass land
Salvia officinalis	Urgooftu	Leaf	Smelling	Nasal	Headache, depression	Road sides
Rosemary officinalis	Xibs mabshaa(xib s mebsha)	Leaf	Boiling, mixing with food	Oral	Diarrhea	Home gardens

Shrubs come next to herbs, with 24 species (31.16%), as illustrated in Table 3b. This pattern aligns with a similar study conducted in East Hararghe, Eastern Ethiopia, which also found shrubs to be the second most abundant group after herbs. In the East Hararghe study, herbs accounted for the largest group, while shrubs followed closely, emphasizing a comparable distribution of plant species in both regions (Tafesse et al., 2019).

Table 3b:- Medicinal plants grow in the form of shrubs.

Scientific name	Oromiffa/ Amharic languages	Parts used	Method of preparation	Administration route	Type of disease treated	Habitats of medicinal plants
Carissa spinarum	Hagamsa	root	Pounding and mixing with tella	oral	Gonorrhea, Headache	Forest
Calpurnia subdecandra	Ceekaa(Digita)	leaf	Squeezing and rubbing on affected area	dermal	Skin disease	Forest
Taverniera abyssinica	Dingatanya (dingatanya)	root	Dried root id fumigating and tuting with teeth	oral	Spiritual disease, Internal parasite, Vomiting	Grass lands
Carissa spinarum	Hagamsa (Agam)	root	Pounding and mixing with tella	oral	Gonorrhea, Headache	Forest

Lepidium sativum	Shiffee (Feto)	Seed	Chewing	Oral	Stomachache, vomiting, fever	Home garden
Eleusine floccifolia	Coqorsa	Leaf	Above ground part pounded and paste on the skin	Dermal	Snake bit/ Snake toxin	Grass land
Impatiens ethiopica	Ashooshilla	Stem	Pounding, rubbing	Dermal	Snake toxin disease	Home garden
Cymbopogon corsius	Marra garaa	Leaf	Chewing and swallowing the juice	Oral	Stomachache	Cultivated land
Acokamthera schimperi	Qaraaru	Leaf	Squeezing, making solution and applying on the affected parts	Dermal	Scabies	River bank
Cynoglossum coeruleum	Qoricha michii(Mechi)	Leaf	Squeezing, mix with Plantago lanceolata, Lamium purpureum and water	Oral, dermal	Stomachache, fever, headache,allergic on the skin and mouth	River bank
Justicia schimperian	Qoricha simbira halkaani(Sensel)	Leaf	Rubbing	Dermal	Bat urine disease	Forest

Euphorbia wulfenii	Ayidaammo (Aydamo)	Stem	Rubbing	Dermal	Wound	Grass lands
Guizotia abyssinica	Ilillii(Mechi)	Root	Rubbing the skin	Dermal	Snake toxic disease	Road side
Lippia adoensis	Kusaaye	Leaf	Rubbing the affected wound	Dermal	Wound on the skin	Forest
Rytigynia neglecta	Mixoo	seed	Swallowing	oral	Diarrhea	Grass land
Withania somnifera	Kumo(Gizawa)	leaf	Powdering, juicing and drinking for 4 days	oral	Malaria, stomachache	Home gardens
Brucea antidysenrica	Qomonyo (Abalo)	leaf	Pounding and mixing with water	dermal	External parasite	Grass lands
Datura stramonium	Asaangira (Atse-faris)	Leafy-stem	Squeezing and its drop preparing with butter	dermal	Wart toothache	Home gardens
Nigella sativa	Gurra (Tikur azmud)	seed	Dry pounding seed with pounded dry Brassica juncea and Echinops kebericho root, powder is mixing with water	nasal	Headache, malaria, stomachache	Cultivated land

Bersama abyssinica	Lolchiisa (Azamir)	leaf	Squeezing and creaming on wound	dermal	Wound	Forest
Clerdendrum myricoides	Maraasisa (Misrich)	leaf	Extracting with cold water	oral	Abdominal distension	Forest
Ocimum gratissimum	Dammaakase e(Damakesie)	leaf	Squeezing and its drop is preparing	Oral, nasal	Allergic, Common cold	Home garden
Combertum paniculatum	Baggii	Bark latex	Pounding and mixing with soda and creaming on affected skin	dermal	Ringworm	Forest
Guizotia scabra	Adaa(Mechi)	leaf	Squeezing and its drop is prepared	dermal	Wound	Grass land
Coronopus didymus	Surumaa	Leaf and stem	Drying in sunlight, crushing and mixing with soup of sorghum	oral	Bone fracture, elephantiasis	Grassland
Crateva adansoni	Qollaadi	root	Powdering and mixing with water	oral	Gonorrhea	Grassland

In Kersa Mellima Woreda, trees were well-represented as illustrated from table (3c), with 17 species making up 22.07% of the total medicinal plants, which reflects their important role in local traditional medicine. This finding was consistent with results from East Hararghe, Eastern Ethiopia, where trees also play a significant role, though they account for 19% of the medicinal plant species (Tafesse et al., 2019). The similarity in results suggests that trees are a valuable resource in traditional healing practices in various Ethiopian regions, reflecting their widespread importance and utilization in ethno botanical knowledge.

Table 3c:- Medicinal plants grow in the form of trees

Scientific name	Oromiffa/ Amharic languages	Parts used	Method of preparation	Administration route	Type of disease treated	Habitats of medicinal plants
Ritchiea albersii	Arbuu	seed	Pounding and mixing with tea/water	oral	Cough	Wood land
Myrsine africana	Qacama	Fruit	Fruit grounded and concocted with powder of *Hagenia abyssinica*; and the solution drunk	Oral	Taeniasis / tapeworm	Forest
Citrus aurantifolium	Loomii (Bahre-Lomi)	Fruit	Fruit pounded and sip the extracted liquid after meal.	Oral	Abdominal pain	Home garden
Cucumis pustulatus	Haadhatu (Merara)	Root	Chewing, pounding and drinking with water	Oral	Stomachache	Woodlands

Citrus sinensis	Burtukaana/ Loomii(Birtukan)	Fruit	Eating, spitting to tonsil, rubbing skin	Oral, dermal	Stomachache, allergic, tonsillitis	Home gardens
Persea americana	Abokaado (Avocado)	Seed	Eating, rubbing	Oral, Dermal	Hair dust, Gastritis	Home gardens
Hagenia abyssinica	Heexoo(koso)	leaf	Pounding and mixing with water	oral	Tapeworm	Wood lands
Prunus africana	Hoomii	bark	Liquid extracts, pounding, juicing and drinking for treatment	oral	Benign prostatic hyperplasia, prostate gland hypertrophy	forest
Coffe arabica	Buna (Bunna)	seed	Rousting the seed, crushing, boiling and drinking	oral	Dizziness, headache, depression	forest
Clausena anisata	Uluma'i (Limich)	leaf	Pounding with Solanecio gigas and Justicia schimperiana	dermal	Skin irritation	River banks
Ficus sycomorus	Odaa(Banba)	sap	Sap is collecting from bark and creaming on skin	dermal	Hepatitis	Woodland
Maisa lanceolata	Abbayyii (Forssk)	Leafy-stem	Pounding and mixing with butter	dermal	Elephantiasis	Forest

Eucalyptus globules	Bargamoo adii(Nech berzef)	leaf	Boiling in water	nasal	Influenza, Allergic, Common cold	Wood lands
Albizia schimperiana	Imalaa	root	Powdering and clean cloth and tied to the neck of equines	nasal	Evil eye, swelling	Forest
Erythrina abyssinica	Beeroo	bark	Crushing and homogenizing in water	oral	Abdominal distention and cramp	Forest
Croton macrostachyus	Bakkaannisa (Bisana)	Leafy-stem	Powdering and mixing with water and butter and finally filtering	Dermal, oral	Wound, malaria, stomachache.	Woodland
Euphorbia abyssinica	Adaami (Sensel)	bark decoction	bark decoction is taken	oral	Gastro-intestinal,ascaris, gonorrhea	Grass lands
Acacia abyssinica	Laaftoo (Qontir)	leaf	Squeezing and the sap is made	dermal	Goiter	woodland

In Kersa Mellima Woreda, climbers were the least common among medicinal plant species, with only 4 species making up 5.19% of the total as indicated from table 3d. This finding was consistent with results from a study conducted in East Hararghe, Eastern Ethiopia, where climbers were also found to be the least

represented group (Tafesse et al., 2019). The low representation of climbers may have highlighted specific ecological or cultural factors influencing their use and prevalence in traditional medicine.

Table 3d:- Medicinal plants grow in the form of climbers

Scientific name	Oromiffa/ Amharic languages	Parts used	Method of preparation	Administration route	Type of disease treated	Habitats of medicinal plants
Asparagus africanus	Sariiti(Yeset qest)	leaf	Chewing and spitting	dermal	Wound	Grassland
Zehneria anomala	Hidda bofaa	root	Pounding and mixing with water	dermal	Skin irritation, snake toxin, itching	River bank
Cucumis melo	Dabaaqula	Fruit	Eating	Oral	Constipation, abdominal disorder, gastritis	Home garden
Stephania abyssinica	Kalaala (Yayit hareg)	Root	Root powder baked with flour of brown tef (*Eragostis* tef) and small amount given once	Oral	Rabies	Cultivated land, forest, homegarden
Galium aparine	Maxxannee	Leaf	Rubbing, mixing with water	Oral	Diuretic	Home gardens

4.3. Methods of medicinal plants preparation

When it came to preparing remedies, local practices varied. The most common techniques included pounding (30.3%), squeezing (17.1%), and powdering (9.2%), while less common methods like sniffing and chewing each accounted for 1.3%. Other techniques, such as boiling, roasting, and crushing, made up 7.9% of the total. These practices are consistent with the findings of Yineger et al. (2007), who also reported pounding as a predominant preparation method. However, Mesfin et al. (2009) found that in the Wonago District, powdering was more frequently used. Figure 2 illustrates the variation in local practices, with the higher use of pounding likely due to its effectiveness in extracting medicinal properties.

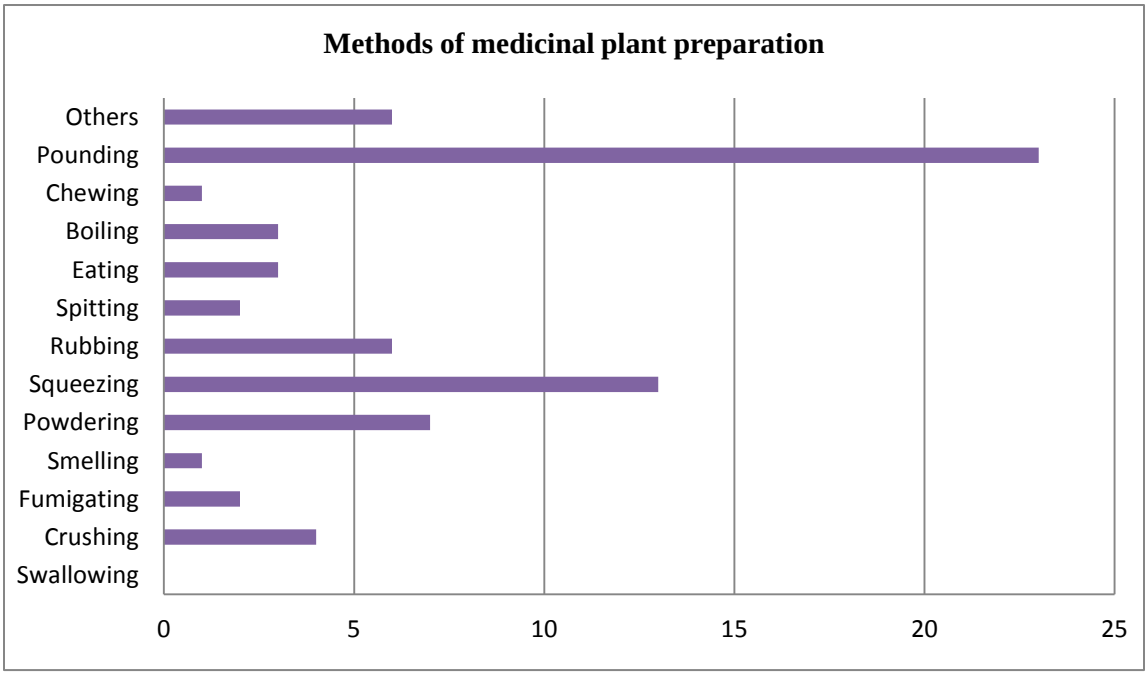


Figure 2:- Methods of medicinal plant preparation

4.4. Medicinal plant parts used for preparation of traditional remedies

Most participants responded that leaves were the part of the plant they used most often, which was better for conservation since it avoided taking the whole plant, including its roots. The findings showed that in Kersa Mellima Woreda, locals mostly used leaves (32 times), while roots and seeds were utilized less frequently (12 times). These results aligned with those of Mesfin et al. (2009), who also reported a preference for using leaves over other plant parts in their study in the Wonago District. Figure 3 illustrated this pattern, highlighting the conservation benefits of using leaves, which helped in preserving the overall plant population.

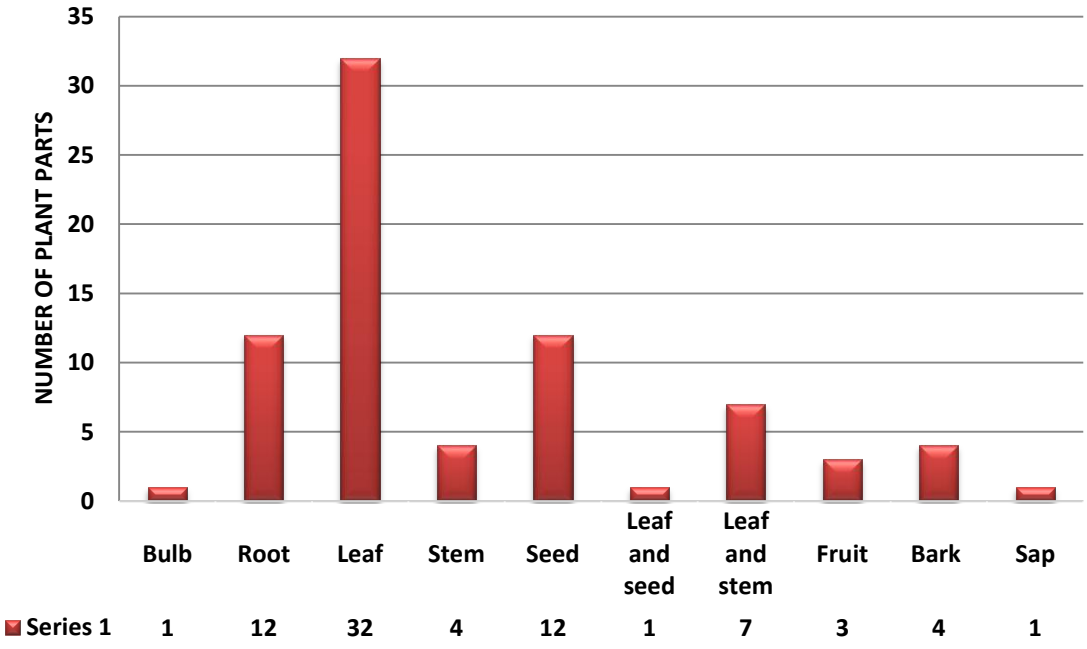


Figure 3:- Medicinal plant parts used to treat human illness

4.5. Mode of application of medicinal plants

In treating various diseases, locals used several methods to administer medicinal plants. Given that stomach problems were a major concern, taking the medicine orally was the most common approach, used in 39 cases (50.64%). Other methods included applying the medicine nasally (6 cases or 7.79%), a mix of dermal and oral methods (5 cases or 6.49%), applying it only on the skin (22 cases or 28.57%), and a combination of nasal and oral methods (5 cases or 6.49%). These findings are consistent with those of Yineger et al. (2007), who observed a similar preference for oral administration for stomach issues and a variety of application methods for different conditions. These results are also in line with research by Abdurhman et al. (2010) and Bekalo et al. (2009), where internal ailments were typically treated with oral preparations, while skin issues were addressed with topical treatments.

4.6. Solvents and additives to medicinal plants

People often mix medicinal plants with different solvents and additives. Based on the data from figure (4), the common additives included water (29 times), coffee (3 times), tella (1 time), soda (1 time), oil (2 times), butter (2 times), food(2 times), and other medicinal plants (11 times). According to locals, these additions not only make the remedies taste better but also help reduce side effects like vomiting and diarrhea, making the treatments more effective and easing discomfort.Additionally, there were 26 other types of therapeutic herbs used on their own.

When it came to preparing these medicinal plants, most remedies were made from a single plant or its parts, making up 66.23% of the plants used. The rest were mixed from different species, accounting for 33.77%. This is consistent with findings from Eshete et al. (2016) and Megersa et al. (2013), which showed a preference for using individual plants or components in traditional medicine.

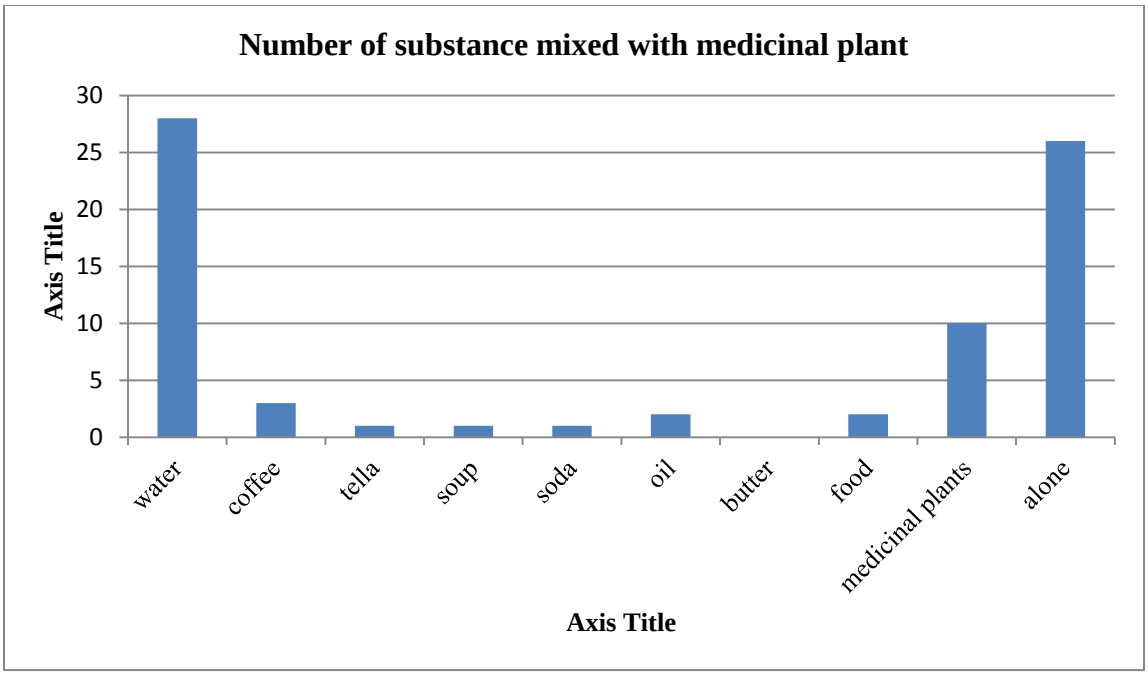


Figure 4:- Solvents and additives to medicinal plants

4.7. Treated disease categories versus medicinal plants

In ethnobotanical studies, medicinal plants are categorized based on their therapeutic applications, often reflecting the types of diseases they treat. According to local healers and community participants in this study, 36.36% of the medicinal plants (28 species) were used to treat non-infectious diseases, such as diabetes, hypertension, or cardiovascular conditions as illustrated from figure (5) . These plants hold great significance as they address chronic health issues that are not caused by pathogens but still pose major public health challenges in many regions (Gazzaneo et al., 2005).

Another 28.57% of the medicinal plants (22 species) were used for a wide variety of ailments, suggesting that these species have versatile uses. Such plants are often considered multipurpose remedies, treating everything from skin conditions to digestive issues and pain relief. The multifunctional nature of these species highlights their integral role in traditional healthcare systems, where a single plant might serve several purposes (Albuquerque et al., 2007).

Additionally, 22.07% of the plants (17 species) were specifically used to combat infectious diseases. These conditions, which include bacterial, viral, or parasitic infections, pose a direct threat to public health, particularly in rural areas with limited access to modern medical treatments. The use of plants for infectious diseases aligns with traditional medicine practices, where local communities rely on their environment to treat conditions such as respiratory infections, gastrointestinal disorders, and skin infections (Cox & Balick, 1994).

This distribution of plant use reflects the broad range of health challenges faced by local communities and underscores the importance of medicinal plants in addressing both infectious and non-infectious diseases. Moreover, it highlights the adaptability and depth of traditional knowledge in managing a variety of health conditions, providing an essential complement to modern medicine.

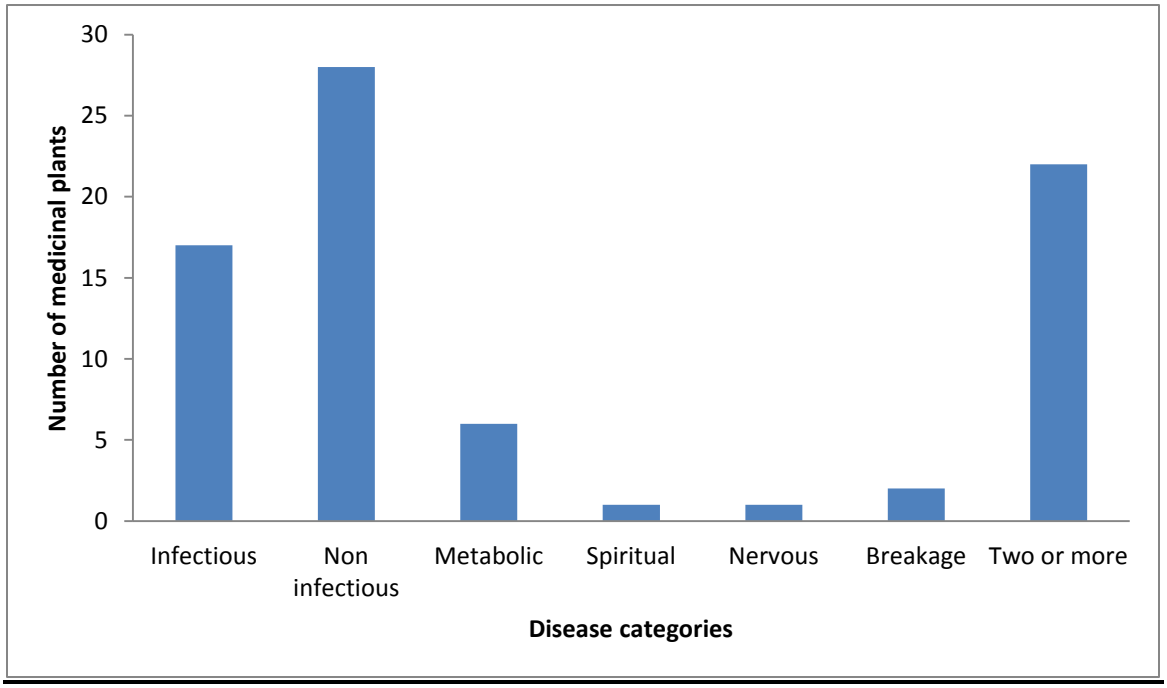


Figure 5:- Disease categories versus medicinal plants

4.8. Habitats and degree of accessibility in the study area

Medicinal plants in the study region grow in diverse environments, from the edges of agricultural fields to woodlands, rivers, and even home gardens. According to the figures (6), only 22 of these plants were found in home gardens, with the majority growing in more isolated locations.The bulk of these plants were collected from wild areas rather than cultivated or home garden settings. This pattern is supported by other studies, such as those by Tolosa et al. (2018) and Getnet et al. (2016), which similarly found that traditional healers primarily gather plants from natural habitats.

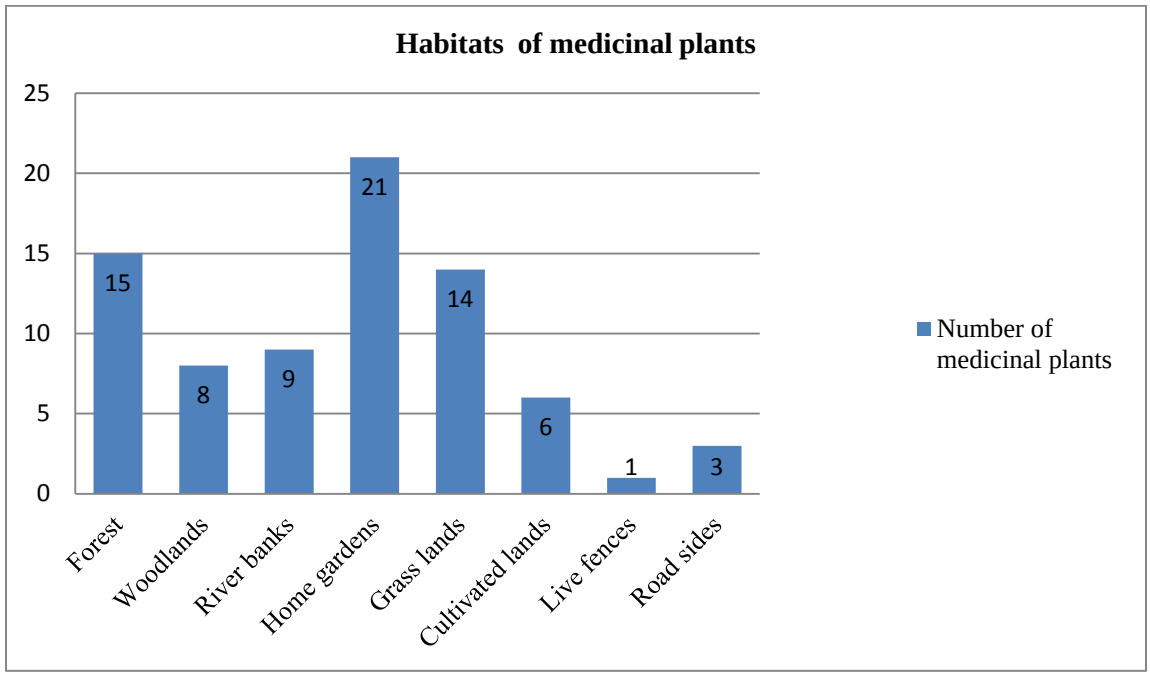


Figure 6:- Habitats of medicinal plants

To assess the availability of these medicinal plants, we used the Availability Index (AI) categories developed by Pieroni et al. (2001). The results showed from figure (7) that only three plant species were rare in the study area, while the majority (41 species) were either common or easily accessible.Plants like *Datura stramonium, Clausena anisata, and Plumbago zeylanica* were classified as "Rare." On the other hand, 15

species (19.48%) were considered "Middle" in terms of availability, 41 species (53.24%) were "Common," and 18 species (23.37%) were deemed very common.

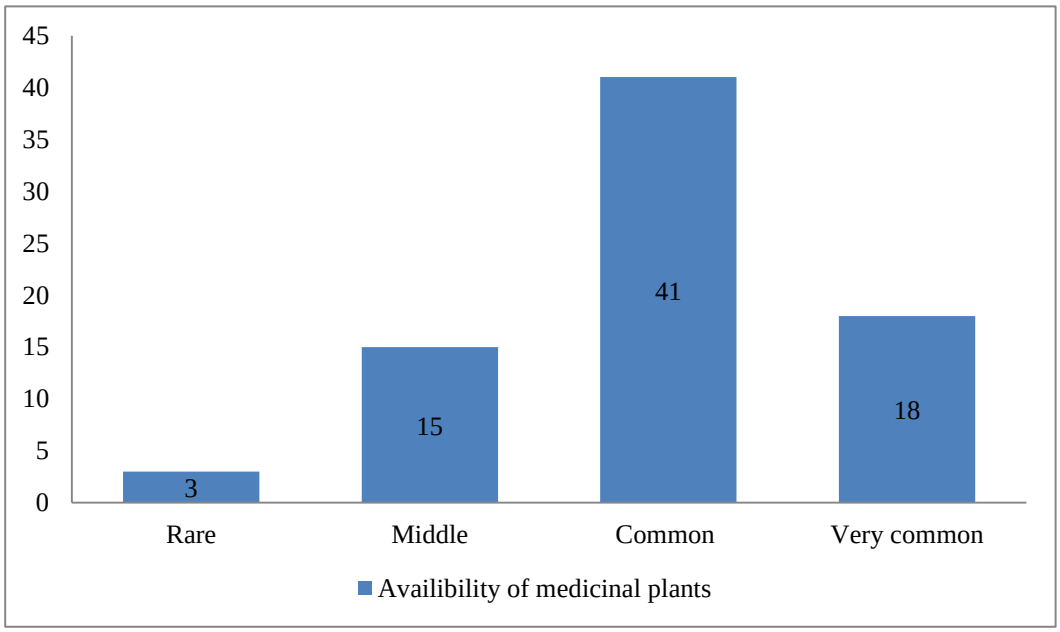


Figure 7:- Medicinal plants versus degree of accessibility

4.9. Importance of medicinal plants used by the local people

Preference ranking is an important method used to assess the perceived effectiveness of medicinal plants for specific ailments based on the knowledge and experience of local informants. Paired comparison was used to evaluate preferences among four medicinal plants used for malaria treatment. The versatility of seven different medicinal plants was assessed using a direct matrix ranking method. The fidelity level index quantified the importance and efficacy of various plants based on their consistent use for specific ailments. Additionally, the informant consensus value indicated how frequently each plant is used to address various health issues or treat specific conditions. The ranking of medicinal plants highlights their importance and widespread use within the community.

Preference ranking

In ethno botanical research, preference ranking is an important method used to assess the perceived effectiveness of medicinal plants for specific ailments based on the knowledge and experience of local informants. In the current study, this approach was used to evaluate which of 14 medicinal plants were considered most effective for treating stomachaches. Fourteen informants were asked to rank these plants from most to least preferred, based on their practical experiences with the remedies (Alexiades, 1996).

According to the results presented in Table 4, *Cynoglossum coeruleum* was the highest-ranked plant for treating stomachaches, with a total score of 149, making it the most favored option. This high preference indicates the widespread trust and reliance on this plant in local communities for stomach-related issues, likely due to its effectiveness and availability. Following closely, *Plantago lanceolata* received a score of 145, confirming it as another well-respected remedy in the local tradition (Martin, 1995).

On the other hand, *Ruta chalepensis* received the lowest score of 70, suggesting that it is less preferred for treating stomachaches in comparison to other plants. This lower ranking could be due to various factors, such as perceived lower efficacy or availability, or personal preferences influenced by cultural or environmental factors (Heinrich et al., 1998).

This preference ranking exercise highlights the variation in the community's reliance on different plants for stomachache relief and provides valuable insights into local healthcare practices. The results can guide further scientific investigations into the pharmacological properties of these plants, particularly those highly favored by local healers and communities (Cotton, 1996).

Table 4: Preference ranking of medicinal plants used to treat a stomachache.

Major medicinal plant species	Respondents														Total	Rank
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}	R_{11}	R_{12}	R_{13}	R_{14}		
Cucumis pustulates	6	9	5	8	3	3	2	9	9	1	1	1	7	8	72	12^{th}
Cymbopogoncorsius	13	13	10	10	12	8	5	9	3	13	12	11	9	10	129	4^{th}
Cynoglossum coeruleu	12	9	5	2	14	12	10	9	14	14	12	13	10	13	149	1^{st}
Lamium purpureum	7	3	9	3	3	2	14	12	14	12	12	12	10	9	122	5^{th}
Plantago lanceolata	13	8	14	12	14	12	11	9	9	9	9	12	5	8	145	2^{nd}
Nigella sativa	1	5	13	9	5	4	3	6	6	7	6	3	5	6	79	10^{th}
Thymus capitatus	6	8	9	2	2	12	5	4	1	1	8	10	7	1	76	11^{th}
Ruta chalepensis	2	4	11	6	7	3	7	7	8	9	1	2	4	9	70	14^{th}
Acmella caulirhiza	4	2	7	5	1	1	11	9	3	5	5	8	8	8	72	12^{th}
Rumex neppalensis	3	7	8	7	8	4	12	6	8	1	4	13	8	9	98	6^{th}
Allium sativum	12	13	6	8	7	12	13	11	12	10	9	9	14	7	143	3^{rd}
Erythrina abyssinica	12	5	7	2	13	4	5	12	4	5	6	1	9	1	86	8^{th}
Citrus sinunsis	13	9	8	7	1	5	8	1	1	11	3	4	9	2	82	9^{th}
Lepidium sativum	1	9	1	14	7	2	10	7	6	13	6	8	12	14	97	7^{th}

R:- Respondent

Paired comparison

Paired comparison was used to assess preferences among four medicinal plants used for malaria treatment. Ten informants compared these plants to determine which were considered most effective based on traditional practices (Nemarundew et al., 2002).Before presenting pairs of medicinal plants to a group of informants and recording their opinions, a detailed list of all possible pairings was prepared. Informants ranked these pairs based on their experiences, and the scores were compiled to determine the overall preferences. The findings revealed from table (5) that *Allium sativum* was the most favored plant for treating malaria, while *Nigella sativa* was the least preferred. This indicates that *Allium sativum* is the primary choice for malaria treatment in the area.

Table5:-Paired comparison of medicinal plants used to treat malaria in the study area.

Major medicinal plant species	Respondents										Total	Rank
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}		
Croton macrostachyus	3	2	2	1	3	4	1	2	2	3	21	3rd
Withania somnifera	1	1	2	1	1	2	3	4	4	3	22	2nd
Nigella sativas	1	1	1	1	2	1	1	2	3	2	15	4th
Allium sativum	4	3	4	4	2	4	4	3	4	3	35	1st

Direct matrix ranking

As illustrated in Table 6, the versatility of seven different medicinal plants was assessed using a direct matrix ranking method. The plants were rated on a scale from 0 to 5, where 5 indicated "Excellent" and 0 meant "No use showed."

In the study, *Hagenia abyssinica* and *Ritchie halbersii* were identified as the most versatile plants, with scores of 18 and 23, respectively. These plants serve multiple functions beyond their medicinal properties. For instance, *Hagenia abyssinica* is known to be used as firewood, in traditional construction, and for making charcoal (Bussmann et al., 2006). Similarly, *Ritchie halbersii* has various applications including as a spice and building material, which increases its economic value and contributes to its overharvesting (Woldemariam et al., 2002). On the other hand, *Hordeum vulgare* received the lowest versatility rating with a score of 8. While it is primarily known for its use as a food crop, it also has limited traditional applications beyond its primary role (Nabhan et al., 2002).

Table 6:- The average score for direct matrix ranking of Traditional Medicinal Plant with use diversity.

Main uses	*Allium sativum*	*Croton macrostachyus*	*Ritchie halbersii*	*Hagenia abyssinica*	*Hordeum vulgare*	*Ruta chalepensis*	*Ensete ventrcosum*
Fire	0	4	5	5	0	0	2
Spices	4	0	0	0	0	5	0
Construction	0	3	4	4	0	0	1
Charcoal	0	5	4	3	0	0	0
Medicine	5	4	3	4	3	4	4
Forage	4	0	3	2	5	3	5
Edible fruit	0	0	4	0	0	3	2
Total	13	16	23	18	8	15	14
Rank	6^{th}	3^{rd}	1^{st}	2^{nd}	7^{th}	4^{th}	5^{th}

Fidelity level index

To evaluate the effectiveness of medicinal plants, the Fidelity Level (FL) method was used. This measure helps determine how reliably each plant is used to treat specific health conditions. Fidelity level index helps to quantify the importance and efficacy of various plants based on their consistent use for particular ailments (Friedman et al., 1986).The results revealed from table (7) that *Allium sativum* and *Euphorbia abyssinica* scored the highest, with a 100% rating, indicating their strong reputation and frequent use for treating infections and abdominal issues. This aligns with findings from other studies which have documented its use in treating gastrointestinal ailments and infections (Giday et al., 2003).Following them was *Acmella caulirhiza*, which scored 85%, showing its notable importance in traditional medicine.

Table 7:-Fidelity level values of medicinal plants cited by 14 informants for being used against a given major ailment category.

Medicinal plant	**Major ailments category**	**Ip**	**Iu**	FL	**FL%**
Allium sativum	Infectious (malaria, common cold, stomachache)	14	14	1	100
Cucurbita pepo	Sexual disease(Gonorrhea,Syphills)	10	14	0.71	71
Acmella caulirhiza	Non infectious (tonsillitis, mouth infection)	12	14	0.85	85
Euphorbia abyssinica	Abdominal(Ameboic dysenty, Ascaisis,Tape worm)	14	14	1	100

Informant consensus factor (ICF)

An informant consensus value helps determine how often a plant is used to address various health issues or treat a specific condition. To ensure the data's reliability, the information from informants was double-checked during two separate visits without prior notice. Any conflicting or inconsistent details were considered unreliable.Informant consensus factorquantifies the level of agreement among informants regarding the plants used for particular ailments. A higher ICF value suggests that a plant is more commonly recognized and accepted for treating a specific condition, while a lower ICF value indicates greater variability or disagreement among informants (Heinrich et al., 1998).

In the present study, diseases were grouped based on where they occur, how severe they are, and how similar they are to local treatments. To measure how well the informants agreed on the effectiveness of different plants for treating specific ailments, we calculated the informant consensus factor (ICF). This factor helps us understand how much agreement there is on which plants are used for particular health issues and shows the distribution of disease categories in the study area. The ICF is calculated using the formula: ICF = (Nur - nt) / (Nur - 1), where Nur is the total number of use citations and nt is the number of species used. A higher ICF value indicates a stronger consensus among informants.

From the results in table (8), it was clear that there was a strong agreement among informants on how to treat toothaches and tonsillitis, with these conditions having the highest ICF value of 0.96. On the other hand, treatments for elephantiasis had the lowest ICF value of 0.77, indicating fewer consensus uses on how to handle this condition. These results align with previous studies that have highlighted variations in plant use for different diseases, often reflecting cultural preferences, knowledge dissemination, and the availability of medicinal plants (Phillips & Gentry, 1993).

Table 8: Informant consensus factor by categories of diseases in the study area.

More prevalent disease category	Total no. of species	Total no. of citation	ICF
Wound	7	71	0.91
Malaria	3	21	0.90
Headache,depression,spiritual	10+2+2+1+1+1=17	35+6+67+56+31+17=212	0.91

disease,dizziness, evil spirit, epilepsy			
Gastritis, Stomachache, abdominal cramp,vomiting	4+15+1+4=24	42+129+3+27=201	0.88
Intestinal parasite, amoeba, abdominal distension, Ascaries, constipation,diuretics,tapeworm, Diarrhea,	2+1+2+1+1+3+5+7=22	36+5+2+24+3+2+143+47=262	0.91
Common cold, Cough, influenza, sinus	4+2+2+1=9	104+79+13+5=201	0.95
Allergic, fever	7+4=11	136+84=220	0.95
Ring worm, skin disease, skin irritation, scabies, itching, external parasite, hair dust	1+1+3+1+2+1+1=10	8+2+7+6+34+1+8=66	0.84
Elephantiasis	2	9	0.77
Tonsillitis, toothache	3+1=4	98+12=110	0.96
Gonorrhea	4	22	0.81
Bone fracture, sore joints	1+1=2	12+3=15	0.86
Goiter, swelling	1+1=2	4+10=14	0.85
Hepatitis, prostate gland hypertrophy, cancer	1+1+1=3	2+9+1=12	0.75
Snake toxin, eye disease, bat urine disease	3+1+1=5	23+17+9=49	0.89

Ranking of the most important medicinal plants

The results showed that ten traditional medicinal plants were the most commonly used and well-known among local people. Around 35% of the informants agreed on these top ten plants. Among them, *Allium sativum* was particularly popular, with 63 people mentioning it. This plant is highly valued for its ability to

treat a variety of ailments, including malaria, stomachaches, eye allergies, and colds. It's often collected from home gardens.

Other notable plants include *Taverniera abyssinica*, which was cited by 49 informants, and *Croton macrostachyus*, mentioned by 42 informants (Table 9). These findings highlight the importance and widespread use of these medicinal plants in the community.

Table 9**:** List of Medicinal plants and the corresponding informants.

Scientific name	**Informants' agreements (%)**
Allium sativum	63
Croton macrostachyus	42
Cynoglossum coeruleu	33
Lamium purpureum	24
Plantago lanceolata	30
Taverniera abyssinica	49
Ocimum gratissimum	41
Asparagus africanus	36
Zehneria anomala	32
Lepidium sativum	40

4.10. Threats and conservation of medicinal plants in the study area

The results of the study showed that medicinal plants face significant threats, primarily from human activities, while natural factors are less of a concern. The main issues include using plants for charcoal, firewood, and construction, as well as clearing land for agriculture. Overgrazing was identified as the leading problem, accounting for 41.22% of the plant damage. This was followed by construction (20.67%) and agricultural expansion (19.78%), as illustrated in Table 10.

According to the results from table (10), Overgrazing is particularly damaging because it impacts plants in home gardens and areas where animals graze freely, leading to the consumption of essential shrubs and herbs. As a result, people must travel farther to find medicinal plants, contributing to the decline of many species. The widespread use of medicinal plants for non-medicinal purposes further underscores the need for their protection. Overgrazing, deforestation, fire, and the collection of charcoal and firewood are the main factors contributing to their decline (Cunningham et al., 1992).

Human activities are significantly affecting the natural habitats of medicinal plants, posing challenges to both conservation and the preservation of traditional knowledge. Although some locals have attempted to grow medicinal plants in their backyard gardens, these initiatives have seen limited success. Of the medicinal plants collected, only about 5.7% were cultivated in home gardens, reflecting the slow progress in conservation efforts (Abdurhman et al., 2010).

Additionally, younger generations are increasingly moving away from traditional medicine, showing less interest in learning or passing on this knowledge. When traditional healers pass away without sharing their expertise, there is a risk of losing both the plants and the valuable wisdom associated with them. Medicinal plants are further threatened by habitat destruction caused by agricultural development, fire, construction, overgrazing, urbanization, and overharvesting. Globally, about 15,000 medicinal plants are at risk, with significant losses occurring every two years. In the study area, the main threats include overgrazing, firewood collection, deforestation, and agricultural expansion. These findings are consistent with similar studies, such as the impact of deforestation and agricultural growth in Sekoru district (Yieger et al., 2007) and overgrazing in Gozamin Woreda (Amsalu et al., 2018).

The decline in indigenous knowledge about medicinal plants is partly due to industrialization, inadequate methods for passing down traditional knowledge, and the reluctance of elders to share their expertise openly. Studies have shown that there is often a high level of secrecy surrounding the transmission of traditional knowledge within families (Giday et al., 2003; Sintayehu et al., 2011). Increasing community awareness and preserving traditional knowledge are essential for protecting medicinal plant resources and preventing their extinction.

There are significant gaps in knowledge about medicinal plants across different social groups. Generally, men possess more knowledge than women, and older individuals (over 60 years old) know more than younger

(20–35 years old) and middle-aged (36–50 years old) people. Those with primary education also tend to have better knowledge than those who are illiterate.

The widespread use of medicinal plants for purposes beyond their medical value underscores the need for their careful protection. Major factors contributing to the decline of these plants include overgrazing, deforestation, fire, and the collection of charcoal and firewood (Cunningham et al., 1992).

Table 10:- Causes of Threats to Medicinal Plants in the Study Area

Major threats on Medicinal Plants	Estimation of one respondents selected from nine kebele (percentage)									Average	Rank
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9		
construction	22	21	28	23	28	22	14	15	13	20.67%	2nd
Agricultural expansion	20	26	8	20	15	24	28	18	19	19.78%	3rd
Firewood	9	4	1	5	4	4	5	6	2	4.44%	5th
Overgrazing	36	42	48	41	36	39	37	45	47	41.22%	1st
Charcoal	2	1	6	7	3	6	2	3	4	3.78%	6th
Cutting	11	6	9	4	14	5	14	13	7	9.22%	4th
Total	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100%	

Human activities are significantly impacting the natural habitats of medicinal plants, leading to problems with their conservation and the preservation of traditional knowledge associated with them. Despite some efforts by locals to grow medicinal plants in their backyard gardens, these initiatives have not been very

successful. Among the medicinal plants collected, only about 5.7% were cultivated in home gardens, highlighting the limited progress in conservation efforts (Abdurhman et al., 2010).

To achieve sustainable use of natural resources, it is crucial to implement effective management practices, as highlighted by Yieger et al. (2008). Proper production, management, and conservation of medicinal plants require collective action from all sectors of society. Public support, stakeholder involvement, and continuous awareness campaigns are vital for ensuring the conservation and sustainable use of these plants (Schippmann et al., 2002). Understanding the main risks to medicinal plants and how local communities manage them will help develop effective conservation strategies (Woldeab et al., 2018).

5. CONCLUSION AND RECOMMENDATIONS

The study revealed that Kersa Mellima Woreda is incredibly rich in medicinal plant diversity, with 77 different species used by locals and deeply rooted in their traditional practices. The community still holds on to their traditional knowledge about these plants, including how to use, prepare, and apply them. While most of these plants are collected from the wild, some are also grown in household gardens for various uses. In traditional medicine, leaves are the most commonly used part of the plants, followed by bushes and trees.

In terms of preparation and administration, plants are mainly administered orally or applied to the skin. Pounding is the most common method of preparation, with squeezing coming in second. These plants are often mixed with food, water, coffee, butter, and other herbs, though some are used on their own. The study found that *Allium sativum* is frequently used for a wide range of ailments, while *Ritchie halbersii* is notable for its versatility. Besides their medicinal value, these plants are also used for construction, charcoal, and firewood.

Unfortunately, the number of medicinal plants is declining due to agricultural development, overgrazing, and other threats. This decline in plant numbers is accompanied by a loss of traditional knowledge, largely because of a generational gap. Elders, especially those over 40, tend to have more knowledge about these plants, while younger generations are less familiar with traditional uses. If this trend continues, we risk losing valuable traditional knowledge.

There is also a problem with passing this knowledge down to younger generations. Modernization and a waning interest in traditional practices among the youth are contributing to this issue. Additionally, the knowledge is often passed down orally, with little formal documentation or promotion, which increases the risk of losing it entirely. To address this, the study suggests that formal education should include traditional knowledge to ensure its preservation.

To better conserve and utilize medicinal plants, several steps are needed. Despite the recognized value of these plants, there is a gap in local awareness. The Woreda administration should collaborate with non-governmental organizations to raise awareness. Local community members, supported by organizations like the Woreda Agricultural Office, should be encouraged to grow medicinal plants in their gardens. Conservation efforts should focus on protecting endangered species, and local medical professionals should be motivated to use and promote traditional medicine more effectively.

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Ethics approval and consent participate

Official letters written from Addis Ababa University (AAU) to the administration of Kersa Mellima Woreda was to get permission for the study. After approval from the woreda office was brought; then able to move forward. The time to explain the purpose of the study to all the participants was taken, and they were willing to provide their valuable insights.

Questionnaire

Tick in the box about respondents

1.Age :- 30-40 ☐ 40-55☐ 56-70 ☐ 71-85 ☐ 86-95☐ above 95☐

2. Sex:- Male☐ Female ☐

3. Religious: - Orthodox☐ protestant ☐ Catholic ☐ Muslim ☐

4. Occupation: - Farmers☐ Merchant☐ Employees ☐ Unemployed ☐

5. Level of learning: -None☐ Grade 1-6☐ Grade 7-12☐ Diploma☐ Degree☐

6. Language:- Afan Oromo ☐ Amharigna ☐ Guraghigna☐

7. Family level:- Married ☐ Single ☐ Divorced☐ Widowed☐

8. Use medicinal plants for healing disease. Yes☐ No☐

9. If you say 'Yes' from question number 8, from where you get such knowledge of using medicinal Plants?

Parents ☐ Patients ☐ Friends Relatives☐ Health service ☐ Others ☐

Read the following question and fill the table below according to a givenalternative in each question.

1. Do you know medicinal plants?

A. yes B. no

2. If you say "yes" list the medicinal plants by your local names?

3. What the types of diseases such medicinal plants used to treat?

4. What are the growth forms of such medicinal plants?

A. Herbs D. Climbers

B. Trees E. Twines'

C. Shrubs F.Climbing shrubs

5. Which parts of such medicinal plants are used for treatment of diseases?

A. Leaves C. Roots I. Latexes

B. Stems D. Flowers J. Bulbs

E. Seeds F. Fruits K. Rhizomes

G. Barks H. Whole plants L. Shoot

6. Which the following mode of preparation you use such medicinal plants?

A. Crushing B. Pounding C. Decoction D. Concoction

E. Powdering F. Chewing G. Grinding H. Heating

I. Burning J. Baking K. Infusion L. Exudates' collection

7. Based on question number 6, what method of using such medicinal plants?

A. Homogenizing in water

B. Not homogenizing in water

C. Mixing with food

D. Drunk together with coffee or tella

8. What the routes of application of such medicinal plants?

A. Oral B. Dermal

C. Nasal D. Auricular

E. Dental F. Ocular

G. Nasal and auricular H. Vaginal

9. What are the habitats of such medicinal plants?

A. Farmland D. Road side

B. Forest E. Close to stream/river

C. Fallow land F. Grass lands

G. In and around home gardens

10. Which factors that threats the medicinal plants from your surrounding?

A. Agriculture
B. Deforestation
C. Firewood
D. Drought
E. Grazing
F. Construction

Fill the following table based on the above given alternative question number(2-10) .

Roll number	Name of medicinal plants (question ≠2)	Type of disease treatment (question ≠3)	Growth forms of plant (question ≠4)	Parts used for treatment (question ≠5)	Mode of preparation (question ≠6)	Method of using plants (question ≠7)	Routes of application (question ≠8)	Habitat of plant (question ≠9)
1								
2								
3								
4								
5								
6								
7								