Article

Ethnobotanical Study of Local Wisdom in the Utilization and Conservation of Medicinal Plants for Children's Health Around Mount Muria, Central Java

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Abstract
Children of growing age are susceptible to various diseases because their immune systems are still developing. In many rural areas in Indonesia, including Colo Village, Mount Muria, people still use traditional medicine to treat diseases in children. This study documents the knowledge and conservation efforts of the Colo Village community regarding medicinal plants used to treat children's diseases. Data were collected qualitatively through semi-structured interviews with forty residents from four hamlets. The findings showed that the community used fifty-six plant species to treat various children's diseases. The results showed that the Colo Village community used 56 plant species to treat diseases in children, such as the Zingiberaceae family, such as turmeric (Curcuma domestica Val.), black ginger (Curcuma aeruginoasa Robx), ginger (Zingiber officinale Rosc.), and others. Diseases that can be treated are: cough, fever, worms, colds, mumps, diarrhea, mouth ulcers, loss of appetite, mouth ulcers, convulsions, and wounds. Plant organs utilized include leaves (45%), rhizomes (18%), fruits (14%), tubers (9%), seeds (7%), stems (3%), and flowers (4%). Drug processing is done by pounding (56%), boiling (11%), grating (24%), slicing (7%), and brewing (2%). Most plants are obtained through cultivation (55%), followed by obtaining from nature (29%) and purchasing at the market (16%). The Colo Village community preserves medicinal plants by cultivating them in their yards and gardens and utilizing other traditional methods. Strengthening ethnobotanical knowledge, especially among the younger generation, is key to maintaining local wisdom and biodiversity in this village.

Keywords
childhood diseases, conservation, ethnobotany, medicinal plants, mount muria

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INTRODUCTION

Children in their infancy have a developing immune system, making them vulnerable to various diseases. Factors such as infection, malnutrition, and suboptimal health access and treatment are the main causes of high morbidity and mortality rates in children (Prendergast & Humphrey, 2014; Victora et al., 2021). Therefore, people make various efforts to maintain the health of their children, one of which is by utilizing traditional medicine based on medicinal plants, which is part of the local wisdom that has been passed down from generation to generation.

Recent studies highlight the vulnerability of children to various diseases due to their developing immune systems. Malnutrition significantly impairs the body's immune function, increasing its susceptibility to infections, and contributes to high rates of morbidity and mortality among children. According to Morales et al., (2024)and it is usually associated with an inflammation status, which can subsequently imply a different health status, as the risk of infection is increased, along with a deterioration of the immune system. Children's immune systems are generally more susceptible to problems than adults. In the situation of malnutrition, because malnourished children's immune systems are compromised, they are more likely to die. However, little is known about the underlying mechanism of altered immune functioning and how it relates to starvation. Nutritional interventions have been reported as cost-effective strategies to prevent or treat the development of malnourishment, considering the link between food intake and health, especially in children, and also the susceptibility of this population to diseases and how their health status during childhood might affect their long-term physiological growth. The ingestion of specific nutrients (e.g., vitamins or oligoelements, children experiencing malnutrition exhibit a greater susceptibility to infections due to a compromised immune response. Furthermore, research indicates that undernutrition continues to represent a significant public health challenge in developing countries, particularly within regions such as South Asia and Sub-Saharan Africa. Diets deficient in macronutrients and micronutrients lead to protein-energy malnutrition and specific micronutrient deficiencies, further exacerbating health challenges among children.

In response to these challenges, communities are increasingly turning to traditional medicine, utilizing medicinal plants to address health problems in children. This approach utilizes local knowledge and available natural resources to manage and prevent diseases, especially in areas with limited access to conventional health services (James et al., 2023; R. Wibowo & Wahyono, 2017).

Like rural communities in various parts of Indonesia, the people of Colo Village, Dawe Subdistrict, and Kudus District, still rely on traditional medicine as an alternative in treating diseases in children. This is inseparable from the limited health facilities available and the abundance of natural resources that can be utilized as medicine. The local community possesses hereditary knowledge of various types of plants that can be used to treat ailments such as coughs, fever, worms, colds, diarrhea, and other health complaints.

Colo Village is located in the Mount Muria region at an elevation of approximately 700 meters above sea level. Although most of the population earns a living as factory workers (58%) and only a small proportion work as farmers or agricultural laborers (4%), the village has a large number of residents who work as factory workers (Wahidah et al., 2021; H. A. Wibowo et al., 2012). The practice of using medicinal plants remains sustainable in daily life. The utilization of these medicinal plants is part of local wisdom that reflects the close relationship between culture, ecology, and public health.

Nevertheless, the processes of modernization and Lifestyle shifts have contributed to a decline younger generation's interest in acquiring and preserving this knowledge. If not documented, the utilization of medicinal plants as cultural heritage is at risk of extinction. Therefore, ethnobo-

tanical studies are needed to document local knowledge about medicinal plants, including the types of species used, plant parts utilized, their benefits, processing methods, and sources of acquisition.

This research is expected to contribute to the preservation of traditional knowledge while also supporting efforts to conserve medicinal plants. Furthermore, the findings of this study can serve as a foundation for developing strategies that promote the sustainable use of medicinal plants to enhance the welfare of the Colo Village community.

METHOD

This research method uses a qualitative approach with field observations to explore data directly from the local community. The qualitative approach was chosen because it allows researchers to deeply understand the behavior, habits, and local knowledge related to the use of medicinal plants. The study was conducted in Colo Village, situated near Mount Muria in the Dawe District of Kudus Regency, Central Java. This village comprises four hamlets: Dukuh Colo, Dukuh Pandak, Dukuh Panggang, and Dukuh Kombang, each with distinct social and cultural characteristics.

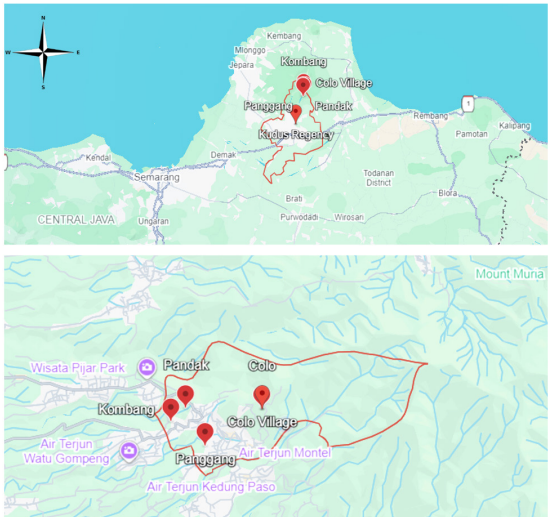

Figure 1. The research location is Colo Village, Dawe Subdistrict, Kudus Regency, Central Java.

This study primarily aimed to explore the utilization of medicinal plants by the local community in the traditional treatment of childhood diseases. This research also aims to analyze conservation efforts made by local communities to maintain the sustainability of medicinal plant use. By understanding how people utilize medicinal plants, this research seeks to provide an overview of the contribution of local culture in preserving ethnobotany and how medicinal plant conservation can contribute to maintaining local wisdom and biodiversity sustainability.

The data collection technique was conducted using semi-structured interviews with 40 residents selected by purposive sampling. The informants selected were native villagers or those who were accustomed to using medicinal plants in their daily lives. Semi-structured interviews provide flexibility for researchers to obtain data on the different medicinal plants used, processing methods, and people's views on the benefits of these plants. The selection of informants based on these criteria is expected to provide relevant and in-depth data about traditional medicine practices that take place in Colo Village.

In addition to interviews, data collection techniques were also carried out through direct observation of plants used by the local community. This observation is conducted to record the types of medicinal plants used as well as how these plants are planted, cared for, and processed. In addition, documentation through photography was also carried out to capture images of medicinal plants and the process of making medicinal herbs, which can then become reference material in this study. This visual documentation also serves as empirical evidence that supports the results of interviews and field observations.

After the data is collected, the analysis is done by categorizing plant species based on their benefits. This categorization aims to group plants based on diseases that can be cured or symptoms that can be alleviated. In addition, descriptive quantitative analysis was conducted on the frequency of use of plant parts and processing methods applied by the Colo Village community. This analysis

aimed to determine patterns of medicinal plant utilization by the local community, as well as to identify traditional processing methods.

Through this analytical approach, the present research endeavors to achieve a comprehensive understanding of the utilization and preservation of medicinal plants in the Colo Village area. By examining the patterns associated with the use of medicinal plants and the conservation efforts undertaken by the community, it is anticipated that the findings of this study will contribute to the preservation of local wisdom and enhance the body of knowledge concerning ethnobotany and natural resource conservation in Indonesia.

RESULT AND DISCUSSION

Setting Colo Village

Colo Village is located in the Muria mountain range, which is in the northern region of eastern Central Java. Administratively, the village falls within Kudus Regency in the south, bordering Jepara Regency in the northwest and Pati Regency in the east. The region is known for its high plant diversity and rich culture, mainly due to Mount Muria, which is part of the region.

Mount Muria is not only famous for its natural wealth but also for its historical value. At the top of Mount Muria is a legendary guesthouse, which historically was the place where Kanjeng Sunan Muria spread Islam in Java. This is where Sunan Muria was buried, and his tomb is still a pilgrimage destination for local and non-local tourists. Various traditions and myths have developed in the community around Sunan Muria, one of which is about traditional medicine using medicinal plants that have been passed down to the people around Mount Muria.

By the teachings of Sunan Muria, the people around Mount Muria believe that any plant can thrive and have benefits, including health. The practice of traditional medicine, which uses medicinal plants, has become a part of community life in this village. Although many modern medicine options and health service centers such as hospitals, pharmacies, midwife clinics, and Community Health Centers (PUSKESMAS) exist, many people in Colo Village still rely on traditional medicine. Most of them still utilize medicinal plants, either by making their concoctions or with the help of village healers, whose role is very important, especially for those who work as farm laborers.

Colo Village, which is located in the Muria mountains, has preserved natural resources, one of which is plant diversity. The people of Colo Village have a close relationship with nature, especially with the plants around them. They utilize plants for various purposes, including health, in a way that has been inherited through generations. Their knowledge of how to care for, maintain, and utilize the plants around them is part of the field of ethnobotanical studies. Since long ago, the people of Colo Village have had their own culture in obtaining a healthy life through traditional medicine. They rely on medicinal plants easily found around their houses, gardens, and rice fields, which are adjusted to the type of disease suffered. The knowledge of the Colo Village community regarding medicinal plants is quite diverse and continues to be preserved.

According to Law No. 36/2009 on Health, traditional medicine is defined as materials or ingredients made from plants, animals, minerals, or their mixtures that have been used for generations in medicine and are accepted by the prevailing norms in the community. Currently, about 30% of Indonesia's population remains reliant on traditional medicine, including plant-derived remedies. This shows that medicinal plants have many advantages, such as good nutrition and effectiveness in treatment. The people of Colo Village, with their rich knowledge of medicinal plants, continue to maintain and preserve this medicinal tradition. The awareness of the importance of maintaining the sustainability of nature is in line with the teachings of Sunan Muria, who emphasized harmony between humans and the environment. For them, caring for medicinal plants is not only to fulfill health needs but also a form of worship and respect

for ancestral heritage.

Species of medicinal plants utilized by the Colo Village Community in the vicinity of Mount Muria

Based on interviews with 40 informants from four hamlets—Dukuh Colo, Dukuh Pandak, Dukuh Panggang, and Dukuh Kombang—who utilize plants as medicine for children's illnesses, 56 plant species are used for treatment.

Data on the utilization of medicinal plants by the residents of Colo Village, located in the vicinity of Mount Muria, indicate a diverse array of plant species used in the treatment of childhood illnesses. Fifty-six plant species are used, with various plant parts such as leaves, rhizomes, tubers, and fruits used to treat health problems such as fever, diarrhea, colds, and wounds. This plant diversity reflects the importance of local knowledge in traditional medicine, which local communities have passed down through generations. Plants such as Aloe vera and Ginger even have dual benefits, such as treating diarrhea and fever, demonstrating the versatility of herbal medicines used in this area. Based on the data presented in Table 1, it is evident that the percentage of plant organs used as a medicine for childhood diseases by the people around Mount Muria is as follows:

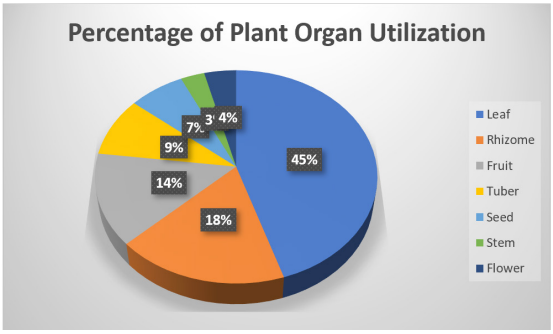

Figure 2. Diagram of the Percentage of Plant Organ Utilization Used as Medicine for Treating Diseases

Based on the Figure 2, leaves constitute the most frequently utilized plant part in traditional medicine, accounting for 45%. Its use is driven by ease of access because leaves can be harvested without damaging the plant, as well as the content of bioactive compounds such as alkaloids, flavonoids, and terpenoids that have medicinal properties. Research around Mount Ungaran shows that local people utilize various types of leaves for traditional medicine (Utami et al., 2019). Mount Muria, like other mountainous regions, is known as a center of biodiversity supported by variations in topography and climate, creating a unique habitat that allows the growth of various plant species useful for traditional medicine (Ramakrishnan, 2005). The bioavailability around Mount Muria, rich in green vegetation with dense leafy plants, makes leaves an easily obtainable resource throughout the year. The use of leaves also reflects the community's local culture, which upholds the principle of sustainability, utilizing resources without damaging the ecosystem. Leaves are frequently employed in treating various ailments, including fever, cough, and skin disorders, by traditional knowledge transmitted through generations. Using leaves as a sustainable health solution reflects the close relationship between traditional communities and their natural environment.

Rhizomes, comprising 18% of the plant material utilized in traditional medicine, play a significant role in communities surrounding Mount Muria. The area is fertile for plants from the Zingiberaceae family, such as ginger (Zingiber officinale) and aromatic ginger (Kaempferia galanga L.), which are quickly grown in yards or gardens. The rhizomes are rich in essential oils with anti-inflammatory and antimicrobial properties, making them practical for common ailments such as fever, diarrhea, and inflammation. Research shows that the essential oil in ginger rhizomes contains bioactive compounds such as gingerol, an anti-inflammatory and antimicrobial agent. In addition, the essential oil of galangal rhizome has been shown to have antibacterial activity, particularly against bacteria that cause oral diseases (Paw et al., 2020). However, the people of Colo village around Mount Muria currently utilize aromatic Ginger rhizomes mainly

Table 1. Plants Used as Medicine for Children in Colo Village

Species			Utilized Organ	Benefits	Type of plants
Local Name	General Name	Scientific Name			
Adas	Fennel	*Foeniculum vulgare* Mill.	Leaf	Increases appetite.	Spice
Awar-awar	Indian Acalypha	*Ficus septica* Burm. F	Leaf	Medicine for wounds.	Wild Plant
Bawang sabrang/bakong	Eleutherine bulbosa	*Eleutherine Americana* Merr.	Tuber	Reduces fever.	Medicinal Plant
Bawang	Garlic	*Allium sativum* L.	Tuber	Treats mumps.	Spice
Bengkle	Wild Ginger	*Zingiber cassumanar* Roxb.	Rhizome	Medicine for chickenpox.	Spice
Binahong	Heartleaf Madeira Vine	*Anredera cordifolia* (Ten.) Steenis	Leaf	Medicine for diarrhea.	Ornamental Plant
Blimbing wuluh/wulung	Bilimbi	*Averrhoa bilimbi* L.	Bunga dan Fruit	Medicine for diarrhea boosts immunity, and treats ulcers.	Fruit
Brambang	Shallot	*Allium cepa* var. *ascalonicum* (L) Back.	Tuber	Medicine for urinary tract issues.	Spice
Delai	Soybean	*Glysine max* (L.) Merr.	Seed	Fever reducer.	Crop
Dlimo putih	White Pomegranate	*Punica granatum* L.	Leaf	Deworming medicine.	Fruit
Dlingo	Sweet Flag	*Acorus calamus*L.	Root	Medicine for colds and improves nutrition.	Medicinal Plant
Gedhang	Banana	*Musa paradisiaca* L.	Stem	Medicine for animal bites (scorpions and similar).	Fruit
Jahe	Ginger	*Zingiber officinale* Rosc.	Rhizome	Medicine for wounds.	Spice/ Medicinal Plant
Jahe abang	Red Ginger	*Zingiber officinale var. rubrum*	Rhizome	Medicine for tonsillitis.	Spice/ Medicinal Plant
Jagung	Corn/Maize	*Zea mays* L.	Seed	Cough medicine.	Crop
Jambu klutuk	Guava	*Psidium guajava* L.	Leaf	Medicine for colds.	Fruit
Jembojo	Frangipani	*Plumeria acuminata* L.	Leaf	Medicine for ulcers.	Ornamental Plant
Jeruk	Orange/Citrus	*Citrus sinensis* (L.) Osbeck	Fruit	Deworming medicine and fever treatment.	Fruit
Jeruk pecel	Lime	*Citrus aurantifolia* (Christm.) Swing	Fruit	Medicine for constipation and flu.	Fruit
Juwet	Java Plum	*Syzygium cumini* L.	Leaf	Improves nutrition.	Fruit
Kacang ijo	Mung Bean	*Phaseolus radiatus* L.	Seed	Treats colds and constipation.	Crop
Kapulogo	Cardamom	*Amomum compactum* Sol. ex Maton	Fruit	For seizures (traditional belief).	Spice
Kates	Papaya	*Carica papaya* L.	Leaf and fruit	Medicine for tonsillitis.	Fruit
Kecembang	Indian Black Pepper.	*Embelia ribes* Burm. f.	Leaf	Treats mumps.	Spice
Keji beling	Strobilanthes crispus	*Strobilanthes crispus* Bl.	Leaf	Nosebleeds, wart treatment, and toothache medicine.	Medicinal Plant
Kencur	Aromatic Ginger	*Kaemferia rotunda* L.	Rhizome	Increases appetite, deworming, and helps with children's sleep problems.	Spice/ Medicinal Plant
Kentang	Potato	*Solanum tuberosum* L.	Tuber	Medicine for worms, ulcers, and increases appetite.	Crop
Kemangi	Lemon Basil	*Ocimum sanctum* L.	Leaf	Reduces heat and improves nutrition.	Spice
Kemadohan	Stinging Nettle.	*Laportea stimulans* Miq.	Stem (Getah)	Medicine for canker sores and tonsillitis.	Wild Plant
Klopo	Coconut	*Cocos nucifera* var. *viridis*.	Fruit	Improves nutrition.	Fruit
Kopi robusta	Coffee	*Coffea canephora* Linden. ex. De Wildem.	Seed	Medicine for wounds.	Crop
Kunir	Turmeric	*Curcuma domestica* Val.	Rhizome	Increases appetite.	Spice/ Medicinal Plant
Kumis kucing	Cat's Whiskers	*Orthosiphon aristatus* (Bl.) Miq.	Leaf	Medicine for wounds.	Medicinal Plant
Labu siam	Chayote	*Sechium edule* (Jacq.) Sw.	Fruit	Reduces fever.	Fruit
Laos	Galangal	*Alpinia galangal* L.	Rhizome	Treats mumps.	Spice

Lempuyang	Greater Galangal	*Zingiber zerumbet* (L.) J. E. Smith.	Rhizome	Medicine for chickenpox.	Spice
Lidah buaya	Aloe Vera	*Aloe vera* (L.) Burm. F.	Leaf	Medicine for diarrhea.	Ornamental Plant
Mlandingan/pepet	White Lead Tree	*Leucaena leucocephala* L.	Leaf	Medicine for diarrhea, boosts immunity, and treats ulcers.	Wild Plant
Nanas	Pineapple	*Ananas comosus* (L.) Merr.	Fruit	Medicine for urinary tract issues.	Fruit
Pace	Noni	*Morinda citrifolia* L.	Fruit	Fever reducer.	Fruit
Pedagan	Gotu Kola	*Centella asiatica* L. Urban	Leaf	Deworming medicine.	Wild Plant
Pohong	Cassava	*Manihot esculenta* Crautz.	Tuber	Medicine for colds and improves nutrition.	Crop
Pulosari	Reinwardst Alyxia	*Alyxia reinwardtii* Blume	Leaf	Medicine for animal bites (scorpions and similar).	Medicinal Plant
Randu	Kapok Tree	*Ceiba pentandra* (L.) Gaertn.	Leaf	Medicine for wounds.	Fiber Plant
Semanggi	Marsilea/Water Clover	*Marsilea crenata* Presl	Leaf	Medicine for tonsillitis.	Wild Plant
Sembukan	Coral Tree	*Erythrina crista-galli* L.	Leaf	Medicine for cough.	Leguminous Tree
Sengketan	Chinese amaranth (Ox knee)	*Achyranthes bidentata* Blume	Leaf	Medicine for colds.	Medicinal Plant
Sengkoyo	Soursop	*Annona muricata* L.	Leaf	Medicine for ulcers.	Fruit
Sosor bebek	Life Plant/Air Plant/ Mother of Thousands	*Kalanchoe pinnata* (Lamk)Pers.	Leaf	Deworming medicine and fever treatment.	Medicinal Plant
Suroh	Betel Leaf	*Piper betle* L.	Leaf	Medicine for constipation and flu.	Spice
Temu ireng	Black Zedoary	*Curcuma aeruginaosa* Robx	Rhizome	Improves nutrition.	Spice/ Medicinal Plant
Temulawak	Javanese Turmeric	*Curcuma xanthorrhiza* Roxb.	Rhizome	Treats colds and constipation.	Spice/ Medicinal Plant
Temu kunci	Fingerroot	*Boesenbergia pandurata* (Roxb.) Schlecht	Rhizome	For seizures (traditional belief).	Fruit
Tomat	Tomato	*Solanum licopersicum* L.	Fruit	Medicine for tonsillitis.	Fruit/ Vegetable
Wolawaliyan /parahulu	Wild ginger	*Amomum aculeatum* Roxb.	Leaf	Treats mumps.	Medicinal Plant
Yodium	Castor Plant	*Jatropha multifida* L.	Leaf and petiole	Nosebleeds, wart treatment, and toothache medicine.	Medicinal Plant

to increase appetite and treat insomnia in children, reflecting local wisdom in using natural ingredients for health. This suggests that the community is not yet fully aware of the broader benefits of aromatic ginger, such as its potential to treat various other infectious diseases that have been proven in scientific research. More optimal utilization can be achieved through education and dissemination of information on the benefits of this plant.

Other parts of plants, such as fruits (14%) and tubers (9%), are utilized for addressing digestive disorders and nutritional needs, while seeds (7%), flowers (4%), and stems (3%) are employed for more specific treatments. The selection of these plant parts is influenced by their availability and the cultural knowledge of local communities, who have developed an understanding of the relationship between plant properties and their health benefits. Research conducted in Kırşehir, Turkey, identified the utilization of various plant parts in traditional medicine, highlighting the significance of cultural knowledge and practices in the effective use of plant resources (Emre et al., 2024). Similarly, research conducted in the Palas Valley highlighted the significance of indigenous knowledge in selecting and applying various plant components for medicinal purposes (Kayani et al., 2024). Mount Muria, as a region rich in biodiversity, provides a wide array of natural ingredients that support traditional medicinal practices that have been preserved to this day. The region's diverse flora offers a variety of plant parts that have become an important part of local health practices (Ishtiaq et al., 2024).

The Table 2 indicates that the most commonly utilized plants for medicinal herbs in children's disease treatment are from the Zingiberaceae family, namely turmeric used as ingredients for children who

have difficulty sleeping, sawanan, thin babies (lempungen), children lack appetite, ulcers, diarrhea, colds and as a potion to treat coughs. Turmeric commonly called kunir in the Rhizomenya organ contains many compounds such as essential oils, arabinose, curcuminoids, fructose, glucose, starch, tannin, dammar, iron, phosphorus, and calcium (Hidayat & Napitupulu, 2015). Essential oils contained in Rhizome turmeric such as sesquiterpenes, turmeron, tumeon 60%, zingiberen 25%, felandren, sabinen, borneol, and sineil. In addition, Rhizome Turmeric comprises 1-3% fat, 3% carbohydrates, 30% protein, 8% starch, 45-55% vitamin C, and mineral salts. In addition, curcumin, the main active compound found in turmeric, has been widely researched for its ability to regulate immune response, reduce inflammation, and act as an effective antimicrobial agent (Gupta et al., 2013; Hewlings & Kalman, 2017). Rhizome turmeric also contains caffeic acid (Setzer et al., 2021; Zhang & Kitts, 2021). From Table 2, the percentage of processing methods for medicinal herbs for diseases in children by the Colo Village community can be obtained as follows:

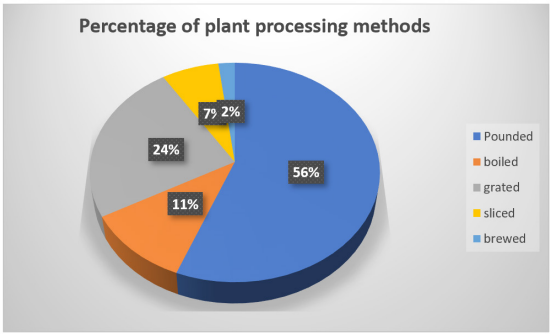

Figure 3. Percentage diagram of plant processing methods used for treating childhood diseases

The data obtained from this study show that the people of Colo Village, around Mount Muria process medicinal plants with various methods, such as mashing, grating, boiling, splitting, and brewing. The most commonly used method is pounded (56%), which extracts juice or active compounds from plants such as rhizomes and leaves. In addition, grated (24%) produces a smooth texture that is easy to apply or consume, while boiled (11%) is applied to plants that require extraction with heat. Meanwhile, sliced (7%) and brewed (2%) are used to a lesser extent, depending on the type of plant being processed.

The use of these various plant processing methods reflects the deep understanding of the people of Colo regarding the different potentials of each plant part. Each method is applied according to the characteristics of the plant and how best to extract its healing properties. This indicates a deep philosophy of respect for nature, where medicinal plants are seen as physical materials and entities with healing powers that need to be respected and utilized wisely.

The simple and natural methods of processing also illustrate the principle of harmony between humans and nature. The people of Colo Village prioritize local plants that grow around them, relying on traditional medicine methods that have proven effective over generations. This demonstrates an awareness of the importance of natural sustainability and resource conservation. Thus, this traditional medicine philosophy reflects the belief that health is achieved not only through medicine but also by maintaining the balance between nature and humans. This approach, which acknowledges the interconnectedness between people and the natural environment, aligns with the findings of other studies, which highlight the sustainable use of local plants for medicinal purposes in rural communities (Husain et al., 2020; Wahidah & Husain, 2018), as well as research by Ramazanu et al., (2022), which examined the role of traditional knowledge in supporting sustainable health practices in Southeast Asia.

The following data presents the percentage results of a research study conducted on the acquisition of plants utilized as therapeutic treatments for diseases affecting children, as reported by the residents of Colo Village:

Table 2. Medicinal Plants and Their Processing Methods for Treating Children's Diseases

Disease	Potions	Preparation and Usage
Cough	Potion 1: cardamom & galangal, rock sugar	Grate & Squeeze, Drink 1-2 Spoons 3x A Day
	Potion 2: ginger, galangal, lime, rock sugar	Crush & Squeeze, Add Boiling Water , Drink 1 Teaspoon 3x A Day
	Potion 3: starfruit blossom	Boil, Drink 1 Spoon 2x A Day
	Potion 4: lime, soy sauce	Squeeze, Drink 1 Spoon 2x A Day
	Potion 5: noni, honey	Blend & Strain , Drink ½ Spoon 2x A Day
Fever	Potion 1: cardamom, earthworm, pulosari fennel, awar-awar leaves	Wash & Boil, Strain , Drink 2x A Day, ½ Tablespoon
	Potion 2: basil leaves	Crush & apply on the forehead
	Potion 3: mung beans	Boil & drink or eat
	Potion 4: Zingiber cassumunar, Shallots, Telon Oil	Crush & apply on the crown of the head
	Potion 5: siam pumpkin	Crush & apply on the forehead
Worms	Potion 1: cardamom, earthworm, reinwardst alyxia, fennel, awar awar leaves	Wash & Boil, Strain , Drink 2x A Day, ½ Tablespoon
	Potion 2: black ginger, zingiber cassumunar	Wash & Grate, Squeeze, Drink 1x A Day
	Potion 3: Curcuma xanthorrhiza	Wash & Grate, Squeeze, Drink 1x A Day, 1 Tablespoon
	Potion 4: laos, turmeric, red ginger, common ginger	Wash & Crush, Squeeze, Strain, Drink 2x A Day, 1 Tablespoon
Have a cold	Potion 1: cardamom	Grate & Squeeze, Drink 2x A Day , ½ Tablespoon
	Potion 2: shallots, coconut oil, telon oil	Apply on the back & stomach child
	Potion 3: ginger, kencur, lime, rock sugar	Crush & Squeeze, Add Boiling Water, Drink 3x A Day, 1 Teaspoon
	Potion 4: centella leaves	Crush & Squeeze, Drink 2x A Day, 1 Tablespoon
	Potion 5: sembukan leaves	Crush & apply on back & abdomen
Constipation	Potion 1: randu leaves	Crush & Squeeze, Strain, Boil, Drink 2x A Day, 1 Teaspoon
	Potion 2: papaya fruit	Peel & eat or juice
	Potion 3: Sembukan leaves	Crush & apply on the stomach
Flu	Potion : Jeringau and Bengle	Wash & crush finely, apply on temples
Toothache	Potion 1: garlic	Garlic bites, insert into cavity teeth
	Potion 2: Betel leaves	Wash & chew
Animal Bites	Potion 1: garlic	Mash smooth & apply on animal bite wounds
	Potion 2: Aloe Vera plant	Wash & slice, take sap, apply to animal bite wounds
Diarrhea	Potion 1: turmeric	Grate & Squeeze, Add Salt & Sugar, Drink 1x A Day , 1 Teaspoon
	Potion 2 : young guava leaves	Crush & Squeeze, Add Salt, Strain, Drink 1x A Day
	Potion 3: white pomegranate leaves	Crush & squeeze, strain, drink ½ tablespoon
	Potion 4: coffee powder	Add salt & warm water, drink
	Potion 5: banana stem	Strain The Water & Drink 1x A Day , 1 Tablespoon
Indigestion	Potion 1: turmeric & javanese ginger	Wash & Grate, Squeeze, Drink 1x A Day, 2 Spoons Tea
	Potion 2: cassava	Peel & Grate, Squeeze, Leave For 1-2 Nights, Take The Sediment, Drink 2x A Day, ½ Glass
	Potion 3: Curcuma xanthorrhiza	Wash & Grate, Squeeze, Drink 1x A Day, 1 Tablespoon
Loss of Appetite	Potion 1: black zingiber	Wash & Grate, Squeeze, Drink 1x A Day
	Potion 2: galangal, rice	Mash Smooth, Squeeze, Add Salt & Boil, Drink 1x A Day
	Potion 3: Curcuma xanthorrhiza	Wash & Grate, Squeeze, Drink 1x A Day, 1 Tablespoon
Child Difficulty Sleeping	Potion: black zingiber	Wash & Grate, Squeeze, Drink 1x A Day, 1 Teaspoon
Nosebleed	Potion: betel leaf	Wash & roll, apply on nose
Warts	Potion: betel leaf, betel lime, cream soap	Mash smooth, apply on warts
Mumps	Potion 1: shallots, salt	Mash smooth, rub on mumps
	Ingredients 2: kemadoh sap	Take & apply on mumps
	Potion 3 duck's foot, red shallot	Mash smooth, add lime water to the betel leaf, and apply to the swollen area.
	Potion 4: plumeria leaves sap	Apply on swollen mumps
Mouth Ulcer	Potion 1: tomato fruit, washed clean then eat	Eat directly after washing clean
	Potion 2: orange fruit	Eat directly after washed and peeled
	Potion 3: starfruit	Eat directly after washing clean or poked honey/sugar
Fall Injury	Potion 1: Petai leaves China.	Wash Clean, Pound, And Apply The Mashed Leaves To The Wound.

	Potion 2: binahong leaves,	Wash, Crush, And Apply On The Wound.
	Potion 3: iodine leaf sap	Take sap, apply on the wound
	Potion 4: the banana tree Sap	Take sap, apply on the wound
Malnourished Baby (Lempungen)	Potion: Mountain clover leaves, guava leaves, black curcuma rhizome, turmeric rhizome, Greater Galangal, fingerroot, wild zingiber leaves, Centella leaves, Indian Black Pepperleaves, and tape yeast.	Crush ingredients, squeeze, and take the juice. Drink 1 teaspoon twice a day
Urinary tract infection	Potion: Cat's whiskers leaves and leaves.	Wash the sharp shard clean, add water, and boil until it reduces from 3 glasses to 2 glasses. Strain the liquid. Drink ½ glass twice a day.
Smallpox Wound	Potion: Fruit sweet corn	Grate corn, crush smooth, apply on the chickenpox wound
Convulsions	Potion 1: Bengle and Red Onion.	Wash the rhizome and peel the red onion. Pound both until fine. Apply the mixture on the forehead, neck, stomach, and soles. Of feet
	Potion 2: Java plum leaves washed clean Then pounded fine.	Mash leaves, and apply to the crown, neck, stomach, palms hands, and feet
	Potion 3: Disputed leaves, turmeric, fingerroot, onion, leaf beard, fennel pulosari, and bengle.	All material was washed clean, then pounded until fine. Mash ingredients, and stick on the forehead, stomach, soles of feet, palms hand.
Stomach ache	Potion: Young papaya leaves	Mash leaves , squeeze , take water , add honey. Drink ½ glass twice a day.
Dengue Fever	Potion: Papaya leaves	Blend papaya leaves, strain, and drink ½ glass twice a day.
Burns	Potion: Potatoes	Scar potatoes, apply to the wound burn.
Typhus	Potion: Mung beans	Boil mung beans & earthworms, strain, drink ½ glass twice a day.

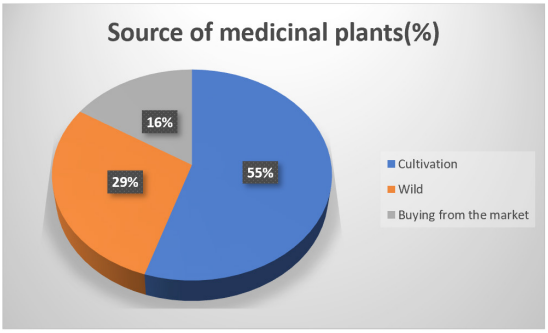

Figure 4. Percentage diagram of the sources of plant species acquisition for childhood disease treatment**.**

The Figure 4 shows that 55% of medicinal plants are obtained through cultivation, while 29% come from the wild, and 16% are bought in the market. This shows that the Colo Village community has independence in fulfilling their traditional medicine needs, especially through cultivation in yards and gardens. Cultivation as the main source reflects the community's awareness of maintaining the availability of medicinal plants, as well as a form of in-situ conservation that supports the preservation of biological resources in their environment. According to a study conducted by (Shukla, 2023), suggests that promoting the cultivation of medicinal plants via agroforestry systems or community-based initiatives has the potential to alleviate pressure on wild populations.

As many as 29% of medicinal plants are obtained from the wild, indicating that the natural ecosystem around Mount Muria is still an important source of traditional medicine. However, this reliance on wild plants can also pose challenges in conservation, especially in the event of overexploitation or ecological changes due to deforestation and land conversion. Therefore, further studies are needed on the sustainability of wild plant utilization, for example by applying agroforestry or community-based conservation approaches to maintain ecosystem balance while maintaining access to traditional medicinal resources.

Sixteen (16) % of medicinal plants were purchased from the market, indicating that not all types of plants can be cultivated or found in the wild by the community. This can be attributed to several factors, including the seasonal nature of the plants, the challenges associated with cultivation, or the limited land resources owned by the community. This dependence on the market can impact the sustainability of traditional medicine practices, especially if the price of medicinal plants increases or their availability decreases so that community access to traditional medicine is limited (Nugroho, 2017).

Conservation Efforts and Traditional Knowledge Transfer

Most medicinal plants the Colo Village community uses are obtained through

cultivation (55%) and collection from the wild (29%). This reflects the inter-generational transfer of knowledge on growing, managing, and utilizing medicinal plants to treat various diseases. Until now, the people of Colo Village are still actively cultivating several types of medicinal plants in their yards as a form of preservation of ancestral heritage. This tradition is in line with Sunan Muria's teachings that emphasize harmony between humans and nature, where caring for medicinal plants is not only considered a health need but also part of worship and respect for cultural values that have been passed down from generation to generation. The transmission of this knowledge encompasses not only the identification of plant species but also the associated processing methods, such as pounding, boiling, or grinding, which are integral to their application. Research conducted in Ethiopia indicates that knowledge regarding medicinal plants is frequently conveyed through oral tradition from parents to their offspring. Specifically, parents serve as the principal source of knowledge transfer, accounting for 56. 8% of cases, followed by firstborn children at 18. 2%, relatives at 11. 4%, and other sources at 4. 5% (Mekonnen et al., 2022)group discussions, and field observation. Besides descriptive statistics, the data were analyzed using some ethnobotanical analysis tools like preference ranking, paired comparison, direct matrix ranking, informant consensus factor, and fidelity level index. A total of 89 species of medicinal plants were identified and collected with 82 genera and 44 families. Out of these, 60 species (67.42%.

Culturing medicinal plants in home yards or community gardens is one effective way of conservation. By planting medicinal plants around their homes, communities support the availability of medicinal materials independently and preserve plant species that play an important role in traditional medicine. This practice is a form of community self-reliance in maintaining the sustainability of local resources and strengthening community health resilience . Research in Turkey highlights the important role of herbal markets in providing medicinal plants and transmitting related knowledge, showing that 62 plant taxa are traded, 26 of which are globally threatened (Pei et al., 2020).

A small proportion of the community (16%) also obtained medicinal plants through purchases at the market. This shows that not all types of medicinal plants can be easily obtained through cultivation or wild sources. Some medicinal plants are in high demand in traditional medicine, but their local production is still limited because people have not cultivated them much. This difficulty in cultivation is due to specific characteristics of medicinal plants, such as the need for specific environmental conditions, long growing times, or low regeneration rates. As a result, people rely more on the market as the main source of certain medicinal plants. This dependence reflects the community's limited access to natural resources and cultivation capabilities, which may be influenced by environmental, economic, or lack of knowledge on effective cultivation techniques. In addition, dependence on the market reflects not only the need for a stable supply but also the market's role as a center for transmitting knowledge about the uses and benefits of medicinal plants. As such, the market contributes to maintaining traditional medicinal practices, although this dependence poses a risk to sustainability if the supply of medicinal plants is disrupted or prices increase. Therefore, strategies are needed to develop local cultivation of medicinal plants to reduce dependence on the market and ensure their sustainable availability. Research in Kenya found that herbal markets serve as key suppliers of medicinal plants and play a crucial role in transmitting associated knowledge, with 62 plant taxa traded, 26 of which are globally threatened (El Mekkaoui et al., 2024).

The Colo community has actively protected biodiversity by applying local wisdom-based cultivation techniques, managing natural resources sustainably, and transmitting traditional medicinal knowledge for generations through social and cultural practices. These efforts reflect their

commitment to medicinal plant conservation, which focuses not only on utilization but also on preserving the ecosystems that support them. Preserving these traditions requires structured documentation of local knowledge, both in written and digital formats, to safeguard cultural heritage from the risk of extinction. A study from the Cook Islands highlights the importance of adopting an interdisciplinary perspective, combining anthropological and ethnobotanical methods to empirically evaluate the impact of healing practices on the dissemination of ethnomedical wisdom and the conservation of medicinal plants (Vougioukalou, 2008). By maintaining a balance between medicinal plant conservation, ecosystem sustainability, and knowledge inheritance, traditional medicinal plant-based medicine practices can continue contributing to public health and biodiversity conservation.

CONCLUSION

The people of Colo Village still actively utilize 56 species of medicinal plants as part of traditional medicine to treat various diseases in children, such as cough, fever, worms, and diarrhea. The most commonly used plant parts are leaves (45%), rhizomes (18%), and fruits (14%), with the main processing methods being pounded (56%), grated (24%), and boiled (11%). Plants from the Zingiberaceae family, such as turmeric, ginger, and black zedoary, are the most dominantly used because of their bioactive content that is beneficial to health. Most medicinal plants are obtained through cultivation in home yards (55%), followed by the use of wild plants (29%) and purchases at the market (16%). Conservation efforts are carried out by cultivating medicinal plants and passing on traditional knowledge from generation to generation, contributing to the sustainability of local wisdom and preserving biodiversity around Mount Muria. By maintaining a balance between medicinal plant utilization, ecosystem sustainability, and knowledge inheritance, this ethnobotanical-based medicine practice can continue supporting public health and preserving biological natural resources in Indonesia.

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