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No	Item	Tanggal	Halaman
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2	Review Process (Manuscript Revision)	10 September 2019	2
3	Acknowledgement of Manuscript Revision	24 September 2019	16
4	Acceptance of Manuscript	30 September 2019	17
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1. Submission article

Manuscript Received Successfully & Peer Review Acceptance 4

Yahoo/Email M... ☆



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Kepada: susi_novaryatiin@yahoo.com

Sen, 19 Agu 2019 jam 17.15 ☆

Dear Dr. Susi Novaryatiin,

Thank you very much for your submission to Pharmacognosy Journal. We have successfully received your article titled “**Medicinal Plants Used in Anjir Pulang Pisau, Central Kalimantan-Indonesia**

”. The article is now under our PRELIMINARY EVALUATION and we will keep you updated on the article status accordingly.

Upon article acceptance, corresponding authors are required to pay article processing charge of 700 USD. Please confirm your acceptance. Article processing charges (APCs) are associated with only accepted articles to cover the costs of making the final version of the manuscript freely available via open access.

The charges are to cover the cost of the following:

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Archiving, where appropriate, in an internationally recognized, open access repositories.

We thank you for submitting your valuable work to the Pharmacognosy Journal.

Do let me know if you have any questions.

Have a great day.

Best regards,
Managing Editor
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2. Review Process (Manuscript Revision)

Author Revision Notification 3

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Pharmacognosy Journal <editor.phcogi@gmail.com>
Kepada: susi novaryatin

Sel, 10 Sep 2019 jam 12.16 ☆

Susi Novaryatin:

We have reached a decision regarding your submission to Pharmacognosy Journal, "The Medicinal Plants Used in Anjir Pulang Pisau, Central Kalimantan-Indonesia".

Our decision is: Revisions Required

We request you to provide us the following:

- 1) Graphical abstract: A graphical abstract is a graphical or visual equivalent of a written abstract. Please prepare a figure summarizing your abstract and send us.
- 2) About authors: Send us the biography of all authors associated with the article along with the recent photographs of authors. The biography should be as concise as possible (max words: 100).

Awaiting your response.

Regards,

Emily Flora

Comments to the Author

- The rationale and significance of the issue are not clear. The author should provide further explanation about the novelty of this study.
- The author should give detailed information about the study area.
- The author should give a deep discussion on the obtained result, and compare it to previous studies about medicinal plants used in the study area.
- The quality of the Figure needs to be improved.

The Medicinal Plants Used in Anjir Pulang Pisau, Central Kalimantan-Indonesia

ABSTRACT

Background: The use of medicinal plants in Anjir Pulang Pisau Village has been carried out for a long time through knowledge that is passed down through generations to family members. But there is no documentation of local knowledge about medicinal plants. **Objective:** This study was aimed to investigate the use of medicinal plants in Anjir Pulang Pisau Village, Central Kalimantan-Indonesia. **Methods:** The data were collected through individual interviews using semi-structured interviews. Information regarding the local names of the plant, medicinal uses, parts used, methods of preparation, and administration route were documented. **Results:** A total of 28 medicinal plants were identified. The family Anacardiaceae, Lamicaeae, Poaceae, and Myrtaceae had the highest proportion of medicinal plants used (7% each). The most frequently utilized medicinal plant parts were roots (47%). The plant species used to treat the high percentage of disease was *Curcuma zedoaria* (Christm.) Roscoe. (16%). In terms of frequency of medicinal plant uses, the highest percentage of plant species (21%) was used to treat wound. Majority of the plant remedies in this study were prepared by decoction (40%), and most medicinal plant preparations were taken orally (75%). **Conclusion:** Further research is needed to identify unidentified family and plant species. Pharmacognostical and pharmacological studies are also needed for the identification of chemical compounds and proving the efficacy of medicinal plants used by local people.

Key words: Ethnomedicine, traditional knowledge, Pulang Pisau, Kahayan Hilir, *Curcuma zedoaria*

INTRODUCTION

Indonesia is a country with a mega biodiversity. Indonesia has 30,000 plant species, of which about 9,600 species are known to have medicinal properties and only 200 species have been utilized as raw materials in traditional medicine industries. This biodiversity richness needs to be explored, developed and utilized for the improvement of health and economic goals while maintaining its sustainability.¹ Indonesia is not only rich in its biodiversity but it is also well known as a country with high diversity of ethnicities. Each ethnic group has extensive experienced in the utilization and conservation of biological and ecological diversity. This biocultural richness provided ethnobotanical researchers with endless research opportunities.²

Kalimantan is the largest island in Indonesia that is famous for its biodiversity. Beside that, there are knowledge of traditional medicine using plants that are passed on orally from generation to generation on indigenous ethnic in Kalimantan. These biodiversity are scattered all over Kalimantan island, one of which is in Central Kalimantan Province. Central Kalimantan with an area of 15,380,410 hectares where about 70% is considered as forested area is the home of medicinal plant biodiversity.³⁻⁴

People in Anjir Pulang Pisau Village still use plants as a traditional medicine to cure diseases. Usefulness they know from the narrative of the parents, exchange ideas with other members of the community and the results of his own experience. This knowledge is hereditary delivered orally and generally passed down to family members. The advancement of science and technology was not able to simply eliminate the meaning of traditional medicine.

Treatment in traditional ways is increasingly popular both domestically and abroad. The use of medicinal plants has traditionally been favored because it is believed to have no side effects as well as dangerous chemicals.

The growing development of natural-made medicinal products by pharmaceutical companies, causing research is being conducted in many countries with the aim of increasing the use of traditional medicine for the welfare of the human populations.³ There is no ethnomedicinal study in Anjir Pulang Pisau Village. Hence, the present study was initiated to investigate the medicinal plants usage in Anjir Pulang Pisau Village, Central Kalimantan-Indonesia.

MATERIALS AND METHODS

Study area

The study of an ethnomedicinal survey for medicinal plants was conducted in Anjir Pulang Pisau Village which located in Kahayan Hilir District of Pulang Pisau Regency, Central Kalimantan-Indonesia (Figure 1). Pulang Pisau Regency is part of Central Kalimantan Province, located between 10° to 0° South Longitude and 110° to 120° East longitude. East border of Pulang Pisau Regency is Kapuas Regency, the west bordered by Katingan Regency and Palangka Raya City. At north is bordered by Gunung Mas Regency meanwhile at south is bordered by Java Sea. Total area of Pulang Pisau Regency is 8.997 km² or 899.700 Ha (5,85 % from total area of Kalimantan Tengah Province), while total area of Kahayan Hilir District is 360 km² (4 % from total area of Pulang Pisau Regency).

Selection of informant

A total of 54 local peoples of different ages (18-65 years) were selected, and interviewed as key informants. The selected local peoples used medicinal plants for traditional health care in their daily activities.

Data collection

Ethnomedicinal data was collected through individual interviews using semi—structured interviews. Information regarding the plant's local name, medicinal uses, parts used, methods of preparation, and administration route were documented. Descriptive statistics were used to analyze the collected ethnomedicinal data.

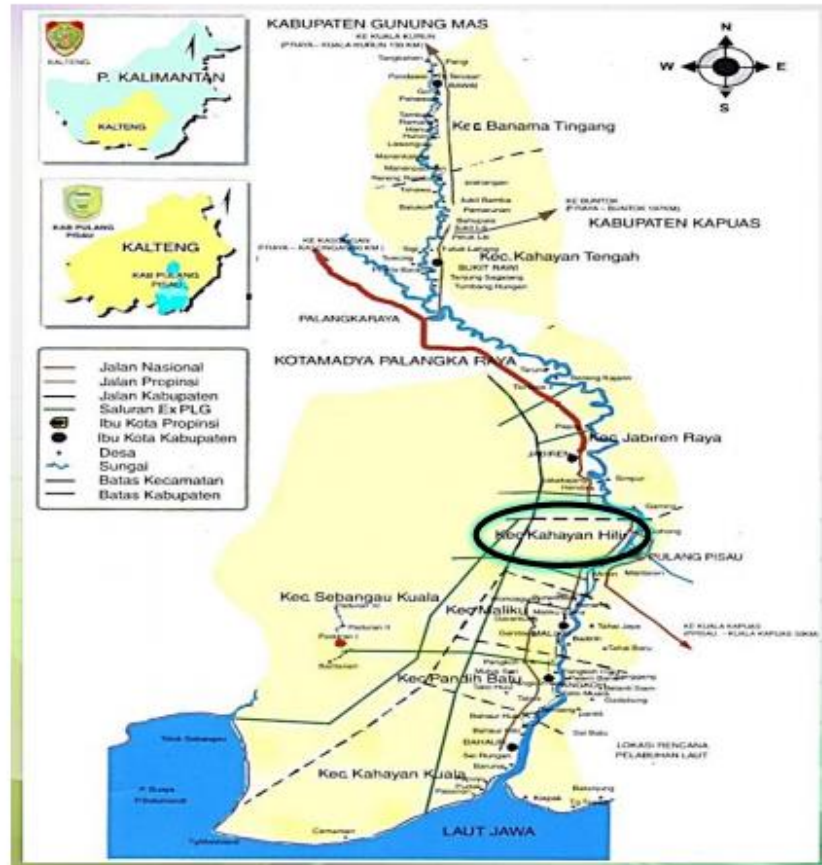


Figure 1: Location of the study area.

RESULTS AND DISCUSSION

During the field survey in the study area, informant reported ethnomedicinal data of 28 species of medicinal plants. The 19 medicinal plant species distributed across 17 families, while families of 9 medicinal plant species unidentified. A total of 28 medicinal plants were recorded as being used to treat 19 different types of diseases as shown in Table 1. The family Anacardiaceae, Poaceae, Lamicaeae and Myrtaceae had the highest proportion of medicinal plants used (7% each), followed by other families with only one plant species per family (4% each), and families of other unidentified plant species (21%) (Figure 2). Further research is needed to identify the families and species of unidentified medicinal plants.

Table 1: Medicinal plants used for treating human disease in Anjir Pulang Pisau Village.

Family and Scientific name	Local name	Medicinal uses	Parts used	Methods of preparation	Administration route
Anacardiaceae					
<i>Bouea macrophylla</i> Griff.	Ramania	Vomit, diarrhea	Bark	Decoction	Oral
<i>Camptosperma</i> sp.	Terentang	Wound, vomit	Bark	Decoction	Oral
Annonaceae					
<i>Annona muricata</i> L.	Sirsak	Stomach ache	Leaves	Crushed or pounded	Topical
		Hypertension	Roots	Decoction	Oral
Asparagaceae					
<i>Coralyline fruticosa</i> (L.) A.Chev.	Sawang	Vaginal discharge	Roots	Concoction	Oral
Blechnaceae					
<i>Stenochlaena palustris</i> (Burm.f.) Bedd.	Kelakai	Wound	Stem	Crushed or pounded, concoction	Topical
Bromeliaceae					
<i>Ananas comosus</i> (L.) Merr.	Nanas madu	Cholesterol	Fruits	Crushed or pounded	Oral
Cannabaceae					
<i>Trema tomentosa</i> (Roxb.) H. Hara	Kalanduyung	Cough, respiratory tract infection	Roots	Infusion	Oral
Dilleniaceae					
<i>Dillenia indica</i> L.	Simpur	Eye ache	Stem	Infusion	Ocular
Euphorbiaceae					
<i>Jatropha multifida</i> L.	Betadine	Wound	Bark	Crushed or pounded	Topical
Lamiaceae					
<i>Orthosiphon aristatus</i> (Blume.) Miq.	Kumis kucing	Urinary tract infection	Roots	Decoction	Oral
<i>Plectranthus</i> sp.	Bungeh tandang	Ear aches	Leaves	Crushed or pounded	Otic
Malvaceae					
<i>Hibiscus rosa-sinensis</i> L.	Kembang sepatu	Hemorrhoid	Roots	Decoction	Oral

Family and Scientific name	Local name	Medicinal uses	Parts used	Methods of preparation	Administration route
Meliaceae <i>Sandoricum koetjape</i> (Burm.f.) Merr.	Kecapi	Stomach ache	Bark	Decoction	Oral
Menispermaceae <i>Arcangelisia flava</i> (L.) Merr.	Akar kuning	Liver	Roots	Decoction	Oral
Myrtaceae <i>Psidium guajava</i> L.	Jambu biji	Malaria	Seeds	Crushed or pounded	Oral
<i>Rhodomyrtus tomentosa</i> (Aiton) Hassk.	Mesisin	Diabetes	Roots	Decoction	Oral
Poaceae <i>Bambusa vulgaris</i> Schrad	Bambu kuning	Malaria	Stem	Decoction	Oral
<i>Imperata cylindrica</i> (L.) Raeusch.	Alang-alang	Diabetes	Roots	Decoction	Oral
Rubiaceae <i>Morinda citrifolia</i> L.	Mengkudu	Hypertension	Fruits	Crushed or pounded, infusion	Oral
Solanaceae <i>Solanum torvum</i> Sw.	Terung pipit	Diabetes	Roots	Decoction	Oral
Thymelaeaceae <i>Phaleria macrocarpa</i> (Scheff.) Boerl.	Mahkota dewa	Hypertension Rheumatism	Roots Bark	Decoction Decoction	Oral Oral
Zingiberaceae <i>Curcuma zedoaria</i> (Christm.) Roscoe.	Kunyit putih	Respiratory tract infection, rheumatism, wound	Rhizome	Crushed or pounded, infusion	Oral
Unidentified	Hantangan	Diarrhea	Bark	Decoction	Oral
	Lalangsatan	Breast cancer Wound	Roots Leaves	Infusion Crushed or pounded	Oral Topical
	Kitui Bunu	Wound	Roots	Infusion	Oral

Family and Scientific name	Local name	Medicinal uses	Parts used	Methods of preparation	Administration route
Unidentified	Pukul jampa	Breast cancer	Roots	Crushed or pounded	Topical
	Telayar	Heart disease	Flowers	Infusion	Oral
		Breast cancer	Roots	Crushed or pounded	Topical
	Umar	Vaginal discharge	Roots	Concoction	Oral

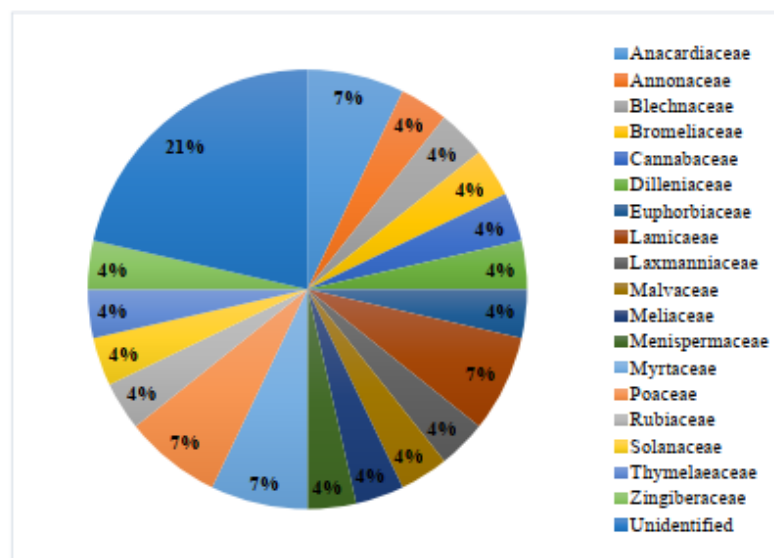


Figure 2: Percentage distribution in families for medicinal plants used treat different health problems.

The most frequently utilized medicinal plant parts were roots (47%), followed by bark (19%), leaves and stem (9% each), flowers (6%), and fruits, seeds, rhizome (3% each) as shown in Figure 3. Most of the plant species were used to treat one disease, while some were used to treat two or more diseases. The most frequent plant species used to cure disease was *Curcuma zedoaria* (Christm.) Roscoe. (16%), while *Annona muricata* L., *Bouea macrophylla* Griff., *Camposperma* sp., *Phaleria macrocarpa* (Scheff.) Boerl., and *Trema tomentosa* (Roxb.) H. Hara were each reported to treat 11% of the diseases (Figure 4). In terms of frequency of medicinal plant uses, the highest percentage of plant species (21%) was used to treat wound, followed by breast cancer, diabetes, and hypertension (11% each). Other diseases were treated with less than 10% of the medicinal plants recorded (Figure 5).

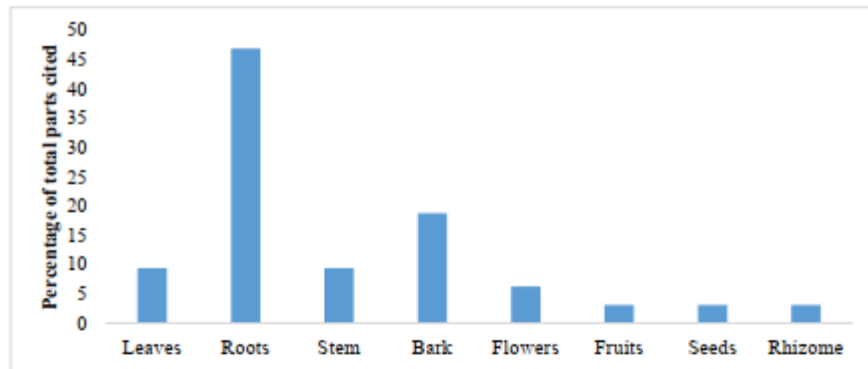


Figure 3: Plant parts used for medicinal purposes.

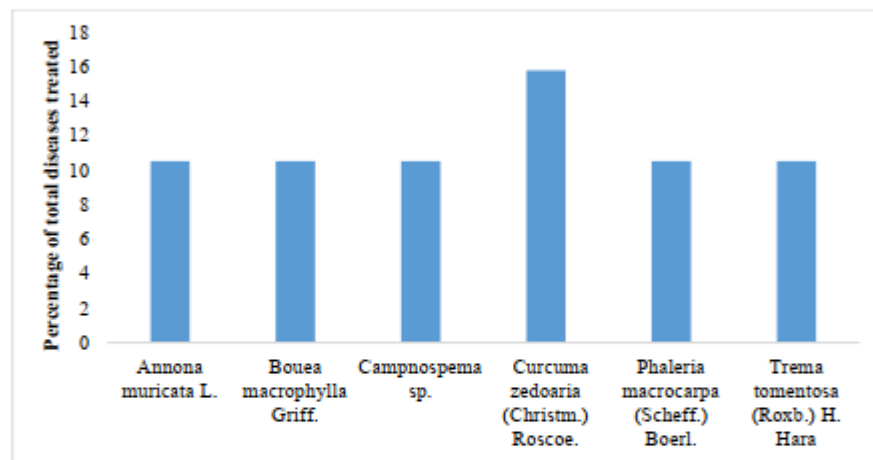


Figure 4: Medicinal plant species with highest percentage of total disease treated.

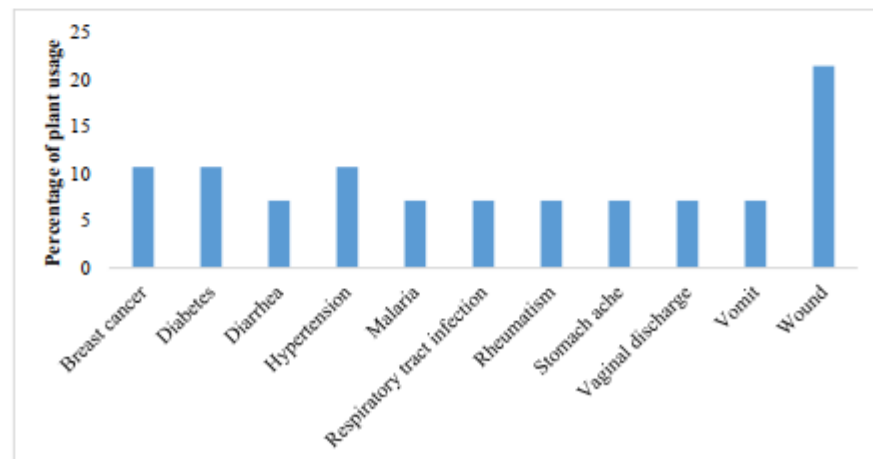


Figure 5: Frequency of medicinal plants uses to cure disease.

According to the available literatures, some of the reported medicinal plant species were found to have some phytochemical and biological activities. *Bouea macrophylla* Griff. can be used to treat vomit and diarrhea. This plant has numerous contents and one of them is flavonoid that function as antibacterial and antioxidant. Previous studies indicates that the total content of flavonoids in *Bouea macrophylla* Griff. leaf is higher than in *Bouea macrophylla* Griff. bark. Flavonoid are included in the largest group of phenol compounds that have very active properties to slow the growth of viruses, bacteria, and fungi.⁶ The root part of *Cordyline fruticosa* (L.) A.Chev. used by local people for vaginal discharge treatment. The plant of the genus *Cordyline* are very well known as source of steroidal saponins and cholestane glycosides. Steroidal saponins was known for their biological actions, particularly cytotoxic, antimicrobial, antifungal, and in vivo antitumoral activities.⁷

Previous study about *Ananas comosus* (L.) Merr. revealed that ethanol extract of *Ananas comosus* (L.) Merr. leaves possess significant hypocholesterolemic activity. The acute toxicity also showed that the extract has a high safety profile as neither death nor symptoms associated with toxicity was observed at high dose level (5gm/kg) in high cholesterol fed albino rats.⁸ Extract ethanol of *Orthosiphon aristatus* (Blume.) Miq. leaf produced the strong antimicrobial effect, inhibiting the growth of *Candida albicans*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Klebsiella pneumonia*, *Staphylococcus epidermidis*, *Proteus mirabilis*. Some of these microorganism are the cause of urinary tract infections.⁹⁻¹⁰

The local people used *Arcangelisia flava* (L.) Merr. to cure liver. Higher dose of *Arcangelisia flava* (L.) Merr. extract shows hepatoprotective activity by preventing the elevation of serum transaminases and transferase levels. Eventually, no damage in the acetaminophen-induced rat's liver was observed. This plant modulates the expression of caspase 3 protein in dose-dependent manner.¹¹ Ethnobotanical studies have recorded the use of *Psidium guajava* L. via infusion and decoction of leaves, roots, and seeds to treat malaria. The pharmacological effect of this plant has investigated, both its in vitro and in vivo potential.¹² The aqueous extract of the leaves of *Bambusa vulgaris* Schrad. Demonstrated important antiplasmodial activity against the Plasmodium parasites wit the chloroquinesensitive 3D7 *P. falciparum* being more susceptible. However, the antiplasmodial activity of stem of *Bambusa vulgaris* Schrad. still not found.¹³

Rhodomirtus tomentosa (Aiton) Hassk. has been reported to contain various phytochemical compositions in many part of the plant, including steroids, flavonoids, and alkaloid compounds. Flavonoid and alkaloids are widely used in the form of the drug to treat diabetes, skin disorders and anti-inflammation.¹⁴ *Curcuma zedoaria* (Christm.) Roscoe. have been shown to contain bioactive molecules that possess pharmacological properties like antimicrobial, antiallergic, antihypertensive, antinociceptive and analgesic, hemagglutinating, antimutagenic and antioxidant, antiulcerogenic, antiproliferative, antifungal, larvicidal and pupicidal, cytotoxicity, anti-inflammatory, antiplatelet aggregation.¹⁵

Dillenia indica L. was known to contain antioxidant and antibacterial compounds, so it can be efficacious as an eye sore.¹⁶ *Annona muricata* L. and *Sandoricum koetjape* (Burm.f.) Merr. were known to have antibacterial compound,¹⁷⁻

¹⁸ and both plant species were used to treat stomach ache by local people. Leaf part of *Amnona muricata* L. also used by Ayta Communities in Dinalupihan, Bataan, for treat stomach ache.¹⁹ *Jatropha multifida* L. and *Stenochlaena palustris* (Burm.f.) Bedd. were used by local people to cure wound. The antibacterial assay of *Jatropha multifida* L. showed an *in vitro* growth inhibition of *P. aeruginosa* and *S. aureus* in dose-dependent manner.²⁰ *Stenochlaena palustris* (Burm.f.) Bedd. was known as antioxidant and antimicrobial, so it can be efficacious to cure wound.²¹⁻²² Various studies reported that *Amnona muricata* L., *Morinda citrifolia* L., and *Phaleria macrocarpa* (Scheff.) Boerl. can lower blood sugar levels.²³⁻²⁵

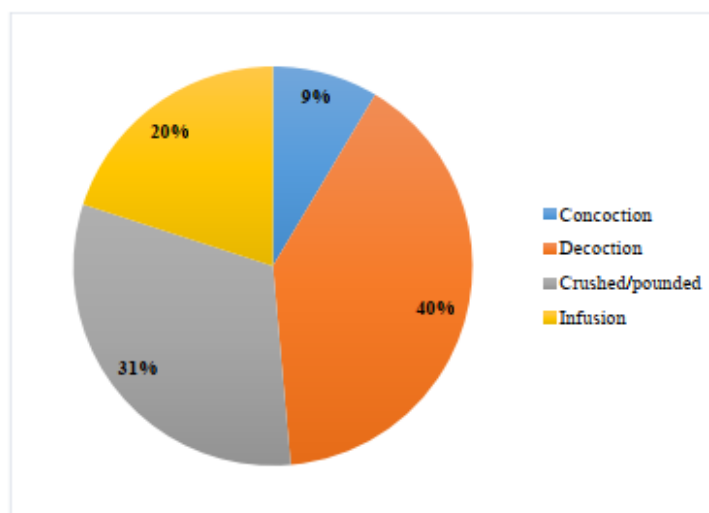


Figure 6: Medicinal plants preparation method.

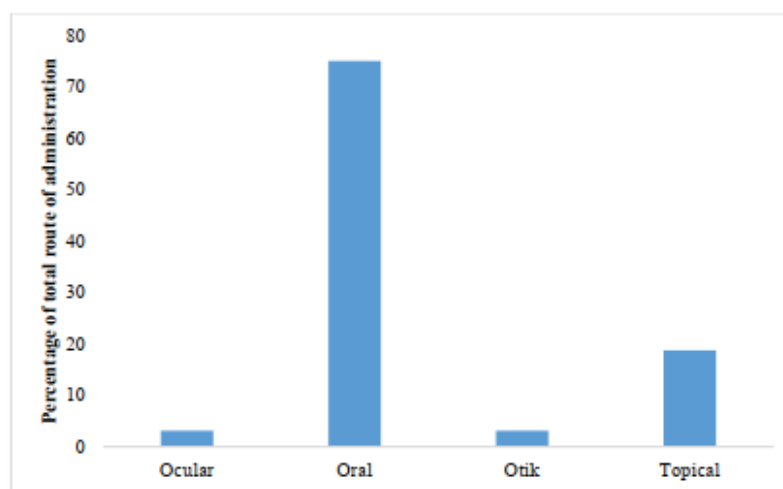


Figure 7: Route of administration of medicinal plant.

Majority of the plant remedies in this study were prepared by decoction (40%), then by crushed or pounded (31%), infusion (20%), and concoction (9%) (Figure 6). Some herbal preparations were taken by mixing with lime paste. Most medicinal plant preparations were taken orally (75%), while 19% were used topically for disease such as wounds, breast cancers, and stomach ache (Figure 7). Various ethnomedicinal studies conducted elsewhere also reported that oral as the predominant route of administration.²⁶⁻²⁸

CONCLUSION

With this ethnomedicinal study, 28 medicinal plants were determined to be used for different medicinal purposes by local people. This study is the first on determination of medicinal plants used in Anjir Pulang Pisau Village. So, it is very important to preserve traditional culture on traditional medicine and survive for future generations. Further research is needed to identify unidentified family and plant species. Pharmacognostical and pharmacological studies are also needed for the identification of chemical compounds and proving the efficacy of medicinal plants used by local people.

ACKNOWLEDGEMENT

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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GRAPHICAL ABSTRACT



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Indah Indah: Diploma graduate at the Department of Pharmacy, Faculty of Health Science, Universitas Muhammadiyah Palangkaraya, Central Kalimantan, Indonesia.

3. Acknowledgement of revision

Response to the reviewer:

1. The novelty of this study was placed in the introduction of the manuscript.
"The growing development of natural-made medicinal products by pharmaceutical companies, causing research is being conducted in many countries with the aim of increasing the use of traditional medicine for the welfare of the human populations.³ There is no ethnomedical study in Anjir Pulang Pisau Village. Hence, the present study was initiated to investigate the medicinal plants usage in Anjir Pulang Pisau Village, Central Kalimantan-Indonesia."
2. Detailed information about the study area was added to the manuscript.
"Pulang Pisau Regency is part of Central Kalimantan Province, located between 10° to 0° South Longitude and 110° to 120° East longitude. East border of Pulang Pisau Regency is Kapuas Regency, the west bordered by Katingan Regency and Palangka Raya City. At north is bordered by Gunung Mas Regency meanwhile at south is bordered by Java Sea. Total area of Pulang Pisau Regency is 8.997 km² or 899.700 Ha (5,85 % from total area of Kalimantan Tengah Province), while total area of Kahayan Hilir District is 360 km² (4 % from total area of Pulang Pisau Regency)."
3. The previous studies about medicinal plants used in the study area were provided in the discussion part.
"According to the available literatures, some of the reported medicinal plant species were found to have some phytochemical and biological activities. *Bouea macrophylla* Griff. can be used to treat vomit and diarrhea. This plant has numerous contents and one of them is flavonoid that function as antibacterial and antioxidant. Previous studies indicates that the total content of flavonoids in *Bouea macrophylla* Griff. leaf is higher than in *Bouea macrophylla* Griff. bark. Flavonoid are included in the largest group of phenol compounds that have very active properties to slow the growth of viruses, bacteria, and fungi.⁶ The root part of *Cordyline fruticosa* (L.) A.Chev. used by local people for vaginal discharge treatment. The plant of the genus *Cordyline* are very well known as source of steroidal saponins and cholestane glycosides. Steroidal saponins was known for their biological actions, particularly cytotoxic, antimicrobial, antifungal, and in vivo antitumoral activities.⁷
Previous study about *Ananas comosus* (L.) Merr. revealed that ethanol extract of *Ananas comosus* (L.) Merr. leaves possess significant hypocholesterolemic activity. The acute toxicity also showed that the extract has a high safety profile as neither death nor symptoms associated with toxicity was observed at high dose level (5gm/kg) in high cholesterol fed albino rats.⁸ Extract ethanol of *Orthosiphon aristatus* (Blume.) Miq. leaf produced the strong antimicrobial effect, inhibiting the growth of *Candida albicans*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonas aeruginosa*, *Eschericia coli*, *Klebsiella pneumonia*, *Staphylococcus epidermidis*, *Proteus mirabilis*. Some of these microorganism are the cause of urinary tract infections.⁹⁻¹⁰
The local people used *Arcangelisia flava* (L.) Merr. to cure liver. Higher dose of *Arcangelisia flava* (L.) Merr. extract shows hepatoprotective activity by preventing the elevation of serum transaminases and transferase levels. Eventually, no damage in the acetaminophen-induced rat's liver was observed. This plant modulates the expression of caspase 3 protein in dose-dependent manner.¹¹ Ethobotanical studies have recorded the use of *Psidium guajava* L. via infusion and decoction of leaves, roots, and seeds to treat malaria. The pharmacological effect of this plant has investigated, both its in vitro and in vivo potential.¹² The aqueous extract of the leaves of *Bambusa vulgaris* Schrad. Demonstrated important antiplasmodial activity against the Plasmodium parasites wit the chloroquinesensitive 3D7 *P. falciparum* being more susceptible. However, the antiplasmodial activity of stem of *Bambusa vulgaris* Schrad. still not found.¹³
Rhodymyrtus tomentosa (Aiton) Hassk. has been reported to contain various phytochemical compositions in many part of the plant, including steroids, flavonoids, and alkaloid compounds. Flavonoid and alkaloids are widely used in the form of the drug to treat diabetes, skin disorders and anti-inflammation.¹⁴ *Curcuma zedoaria* (Christm.) Roscoe. have been shown to contain bioactive molecules that possess pharmacological properties like antimicrobial, antiallergic, antihypertensive, antinociceptive and analgesic, hemagglutinating, antimutagenic and antioxidant, antiulcerogenic, antiproliferative, antifungal, larvicidal and pupicidal, cytotoxicity, anti-inflammatory, antiplatelet aggregation.¹⁵
Dillenia indica L. was known to contain antioxidant and antibacterial compounds, so it can be efficacious as an eye sore.¹⁶ *Annona muricata* L. and *Sandoricum koetjape* (Burm.f.) Merr. were known to have antibacterial compound,¹⁷⁻¹⁸ and both plant species were used to treat stomach ache by local people. Leaf part of *Annona muricata* L. also used by Aya Communities in Dinalupihan, Bataan, for treat stomach ache.¹⁹ *Jatropha multifida* L. and *Stenochlaena palustris* (Burm.f.) Bedd. were used by local people to cure wound. The antibacterial assay of *Jatropha multifida* L. showed an *in vitro* growth inhibition of *P. aeruginosa* and *S. aureus* in dose-dependent manner.²⁰ *Stenochlaena palustris* (Burm.f.) Bedd. was known as antioxidant and antimicrobial, so it can be efficacious to cure wound.²¹⁻²² Various studies reported that *Annona muricata* L., *Morinda citrifolia* L., and *Phaleria macrocarpa* (Scheff.) Boerl. can lower blood sugar levels.²³⁻²⁵
4. Figures quality was improved in the whole manuscript.

 **susi novaryatiin** <susi_novaryatiin@yahoo.com>
Kepada: editor.phcogi@gmail.com

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Dear editor,
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4. Acceptance of manuscript

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 Sen, 30 Sep 2019 jam 17.38 ☆

Susi Novaryatiin:

We have reached a decision regarding your submission to Pharmacognosy Journal, "The Medicinal Plants Used in Anjur Pulang Pisau, Central Kalimantan-Indonesia".

Our decision is to: Accept Submission

I would like to thank the authors for this innovative and informative work. Please inform authors my deepest gratitude for clearly written and thought-provoking innovative and informative work. I truly appreciate all your hard work, dedication and commitments towards this research. This paper is well described clearly and it is accepted to publish without any revisions.

Publication charges – 700 USD: Please let me know your mode of remittance 1) Wire/Bank transfer or 2) Credit Card. Invoice will be raised accordingly.

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Congratulations and have a great day!

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--

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The Medicinal Plants Used in Anjir Pulang Pisau, Central Kalimantan-Indonesia

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The Medicinal Plants Used in Anjir Pulang Pisau, Central Kalimantan-Indonesia


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Abstract:
Background: The use of medicinal plants in Anjir Pulang Pisau Village has been carried out for a long time through knowledge that is passed down through generations to family


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The Medicinal Plants Used in Anjir Pulang Pisau, Central Kalimantan-Indonesia

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ABSTRACT

Background: The use of medicinal plants in Anjir Pulang Pisau Village has been carried out for a long time through knowledge that is passed down through generations to family members. But there is no documentation of local knowledge about medicinal plants. **Objective:** This study was aimed to investigate the use of medicinal plants in Anjir Pulang Pisau Village, Central Kalimantan-Indonesia. **Methods:** The data were collected through individual interviews using semi-structured interviews. Information regarding the local names of the plant, medicinal uses, parts used, methods of preparation, and administration route were documented. **Results:** A total of 28 medicinal plants were identified. The family Anacardiaceae, Lamiales, Poaceae, and Myrtaceae had the highest proportion of medicinal plants used (7% each). The most frequently utilized medicinal plant parts were roots (47%). The plant species used to treat the high percentage of disease was *Curcuma zedoaria* (Christm.) Roscoe. (16%). In terms of frequency of medicinal plant uses, the highest percentage of plant species (21%) was used to treat wound. Majority of the plant remedies in this study were prepared by decoction (40%), and most medicinal plant preparations were taken orally (75%). **Conclusion:** Further research is needed to identify unidentified family and plant species. Pharmacognostical and pharmacological studies are also needed for the identification of chemical compounds and proving the efficacy of medicinal plants used by local people.

Key words: Ethnomedicine, Traditional Knowledge, Pulang Pisau, Kahayan Hilir, *Curcuma zedoaria*.

INTRODUCTION

Indonesia is a country with a mega biodiversity. Indonesia has 30,000 plant species, of which about 9,600 species are known to have medicinal properties and only 200 species have been utilized as raw materials in traditional medicine industries. This biodiversity richness needs to be explored, developed and utilized for the improvement of health and economic goals while maintaining its sustainability.¹ Indonesia is not only rich in its biodiversity but it is also well known as a country with high diversity of ethnicities. Each ethnic group has extensive experienced in the utilization and conservation of biological and ecological diversity. This biocultural richness provided ethnobotanical researchers with endless research opportunities.²

Kalimantan is the largest island in Indonesia that is famous for its biodiversity. Beside that, there are knowledge of traditional medicine using plants that are passed on orally from generation to generation on indigenous ethnic in Kalimantan. These biodiversity are scattered all over Kalimantan island, one of which is in Central Kalimantan Province. Central Kalimantan with an area of 15,380,410 hectares where about 70% is considered as forested area is the home of medicinal plant biodiversity.^{3,4}

People in Anjir Pulang Pisau Village still use plants as a traditional medicine to cure diseases. Usefulness they know from the narrative of the

parents, exchange ideas with other members of the community and the results of his own experience. This knowledge is hereditary delivered orally and generally passed down to family members. The advancement of science and technology was not able to simply eliminate the meaning of traditional medicine. Treatment in traditional ways is increasingly popular both domestically and abroad. The use of medicinal plants has traditionally been favored because it is believed to have no side effects as well as dangerous chemicals.

The growing development of natural-made medicinal products by pharmaceutical companies, causing research is being conducted in many countries with the aim of increasing the use of traditional medicine for the welfare of the human populations.⁵ There is no ethnomedicinal study in Anjir Pulang Pisau Village. Hence, the present study was initiated to investigate the medicinal plants usage in Anjir Pulang Pisau Village, Central Kalimantan-Indonesia.

MATERIALS AND METHODS

Study area

The study of an ethnomedicinal survey for medicinal plants was conducted in Anjir Pulang Pisau Village which located in Kahayan Hilir District of Pulang Pisau Regency, Central Kalimantan-Indonesia (Figure 1). Pulang Pisau Regency is part of Central Kalimantan Province,

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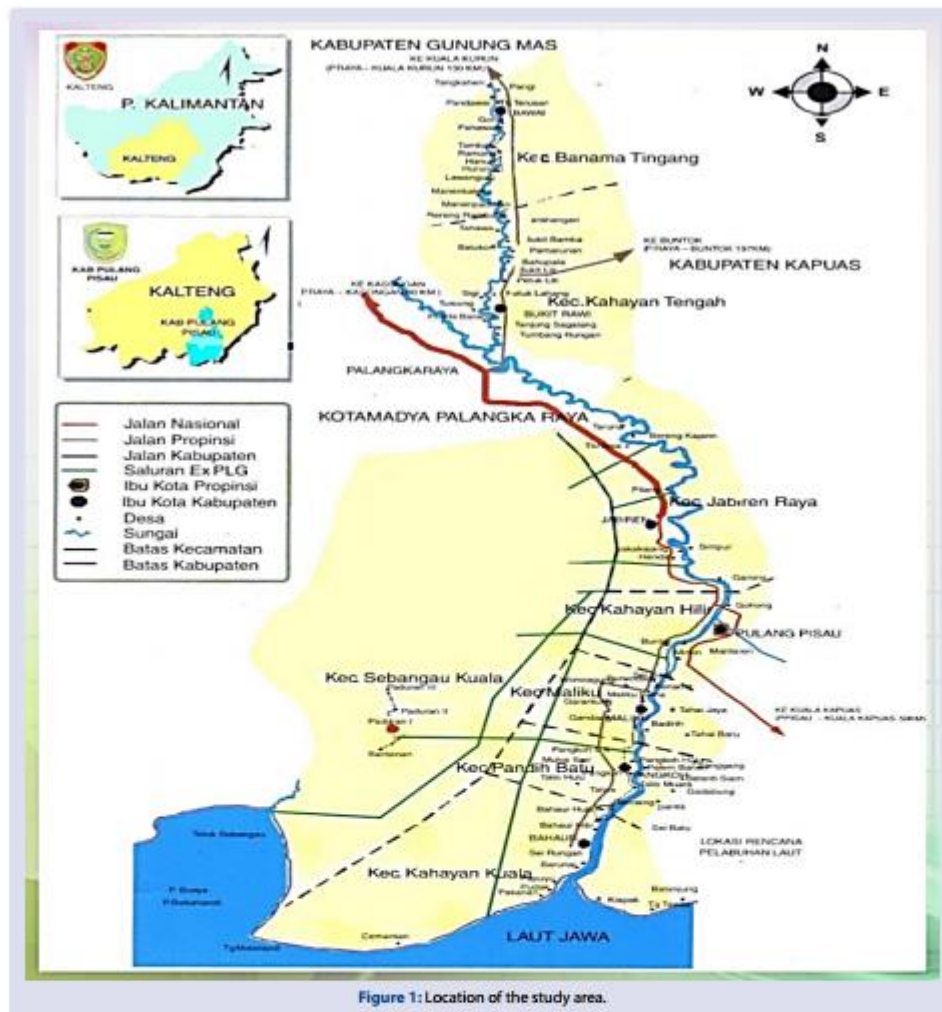


Figure 1: Location of the study area.

located between 10° to 0° South Longitude and 110° to 120° East longitude. East border of Pulang Pisau Regency is Kapuas Regency, the west bordered by Katingan Regency and Palangka Raya City. At north is bordered by Gunung Mas Regency meanwhile at south is bordered by Java Sea. Total area of Pulang Pisau Regency is 8.997 km² or 899.700 Ha (5,85 % from total area of Kalimantan Tengah Province), while total area of Kahayan Hilir District is 360 km² (4 % from total area of Pulang Pisau Regency).

Selection of informant

A total of 54 local peoples of different ages (18-65 years) were selected, and interviewed as key informants. The selected local peoples used medicinal plants for traditional health care in their daily activities.

Data collection

Ethnomedicinal data was collected through individual interviews using semi-structured interviews. Information regarding the plant's local name, medicinal uses, parts used, methods of preparation, and

administration route were documented. Descriptive statistics were used to analyze the collected ethnomedicinal data.

RESULTS AND DISCUSSION

During the field survey in the study area, informant reported ethnomedicinal data of 28 species of medicinal plants. The 19 medicinal plant species distributed across 17 families, while families of 9 medicinal plant species unidentified. A total of 28 medicinal plants were recorded as being used to treat 19 different types of diseases as shown in Table 1. The family Anacardiaceae, Poaceae, Lamicaceae and Myrtaceae had the highest proportion of medicinal plants used (7% each), followed by other families with only one plant species per family (4% each), and families of other unidentified plant species (21%) (Figure 2). Further research is needed to identify the families and species of unidentified medicinal plants.

The most frequently utilized medicinal plant parts were roots (47%), followed by bark (19%), leaves and stem (9% each), flowers (6%), and

Table 1: Medicinal plants used for treating human disease in Anjir Pulang Pisau Village.

Family and Scientific name	Local name	Medicinal uses	Parts used	Methods of preparation	Administration route
Anacardiaceae <i>Bouea macrophylla</i> Griff.	Ramania	Vomit, diarrhea	Bark	Decoction	Oral
<i>Campnosperma</i> sp.	Terentang	Wound, vomit	Bark	Decoction	Oral
Annonaceae <i>Annona muricata</i> L.	Sirsak	Stomach ache	Leaves	Crushed or pounded	Topical
		Hypertension	Roots	Decoction	Oral
Asparagaceae <i>Cordyline fruticosa</i> (L.) A.Chev.	Sawang	Vaginal discharge	Roots	Concoction	Oral
Blechnaceae <i>Stenochlaena palustris</i> (Burm.f.) Bedd.	Kelakai	Wound	Stem	Crushed or pounded, concoction	Topical
Bromeliaceae <i>Ananas comosus</i> (L.) Merr.	Nanas madu	Cholesterol	Fruits	Crushed or pounded	Oral
Cannabaceae <i>Trema tomentosa</i> (Roxb.) H. Hara	Kalanduyung	Cough, respiratory tract infection	Roots	Infusion	Oral
Dilleniaceae <i>Dillenia indica</i> L.	Simpur	Eye ache	Stem	Infusion	Ocular
Euphorbiaceae <i>Jatropha multifida</i> L.	Betadine	Wound	Bark	Crushed or pounded	Topical
Lamiaceae <i>Orthosiphon aristatus</i> (Blume.) Miq.	Kumis kucing	Urinary tract infection	Roots	Decoction	Oral
<i>Plectranthus</i> sp.	Bungh tandang	Ear aches	Leaves	Crushed or pounded	Otic
Malvaceae <i>Hibiscus rosa-sinensis</i> L.	Kembang sepatu	Hemorrhoid	Roots	Decoction	Oral
Meliaceae <i>Sandoricum koetjape</i> (Burm.f.) Merr.	Kecapi	Stomach ache	Bark	Decoction	Oral
Menispermaceae <i>Arcangelisia flava</i> (L.) Merr.	Akar kuning	Liver	Roots	Decoction	Oral
Myrtaceae <i>Psidium guajava</i> L.	Jambu biji	Malaria	Seeds	Crushed or pounded	Oral
<i>Rhodomirtus tomentosa</i> (Aiton) Hassk.	Mesisin	Diabetes	Roots	Decoction	Oral
Poaceae <i>Bambusa vulgaris</i> Schrad	Bambu kuning	Malaria	Stem	Decoction	Oral
<i>Imperata cylindrica</i> (L.) Raesch.	Alang-alang	Diabetes	Roots	Decoction	Oral
Rubiaceae <i>Morinda citrifolia</i> L.	Mengkudu	Hypertension	Fruits	Crushed or pounded, infusion	Oral

Solanaceae <i>Solanum torvum</i> Sw.	Terung pipit	Diabetes	Roots	Decoction	Oral
Thymelaeaceae <i>Phaleria macrocarpa</i> (Scheff.) Boerl.	Mahkota dewa	Hypertension	Roots	Decoction	Oral
		Rheumatism	Bark	Decoction	Oral
Zingiberaceae <i>Curcuma zedoaria</i> (Christm.) Roscoe.	Kunyit putih	Respiratory tract infection, rheumatism, wound	Rhizome	Crushed or pounded, infusion	Oral
Unidentified	Hantangan	Diarrhea	Bark	Decoction	Oral
	Lalngatan	Breast cancer	Roots	Infusion	Oral
		Wound	Leaves	Crushed or pounded	Topical
	Kitui Bunu	Wound	Roots	Infusion	Oral
Unidentified	Pukul jampa	Breast cancer	Roots	Crushed or pounded	Topical
	Telayar	Heart disease	Flowers	Infusion	Oral
		Breast cancer	Roots	Crushed or pounded	Topical
	Umar	Vaginal discharge	Roots	Concoction	Oral

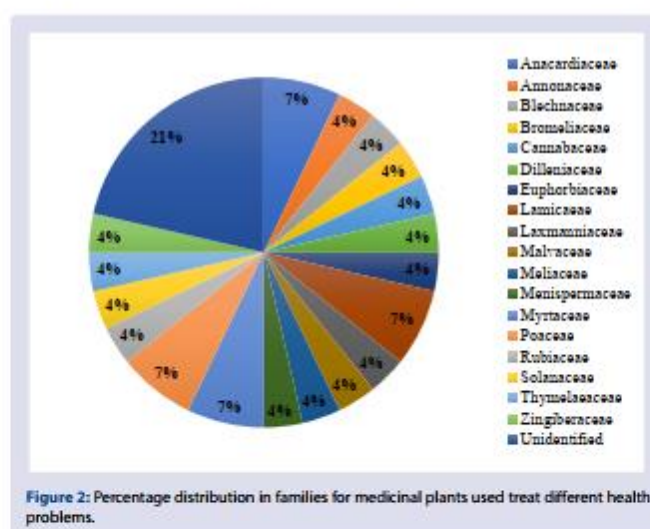


Figure 2: Percentage distribution in families for medicinal plants used to treat different health problems.

fruits, seeds, rhizome (3% each) as shown in Figure 3. Most of the plant species were used to treat one disease, while some were used to treat two or more diseases. The most frequent plant species used to cure disease was *Curcuma zedoaria* (Christm.) Roscoe. (16%), while *Annona muricata* L., *Bouea macrophylla* Griff., *Camptosperma* sp., *Phaleria macrocarpa* (Scheff.) Boerl., and *Trema tomentosa* (Roxb.) H. Hara were each reported to treat 11% of the diseases (Figure 4). In terms of frequency of medicinal plant uses, the highest percentage of plant species (21%) was used to treat wound, followed by breast cancer, diabetes, and hypertension (11% each). Other diseases were treated with less than 10% of the medicinal plants recorded (Figure 5).

According to the available literatures, some of the reported medicinal plant species were found to have some phytochemical and biological activities. *Bouea macrophylla* Griff. can be used to treat vomit and diarrhea. This plant has numerous contents and one of them is flavonoid that function as antibacterial and antioxidant. Previous studies indicates that the total content of flavonoids in *Bouea macrophylla* Griff. leaf is higher than in *Bouea macrophylla* Griff. bark. Flavonoid are included in the largest group of phenol compounds that have very active properties to slow the growth of viruses, bacteria, and fungi.⁶ The root part of *Cordyline fruticosa* (L.) A.Chev. used by local people for vaginal discharge treatment. The plant of the genus *Cordyline* are very well known as source of steroidal saponins and cholestane glycosides.

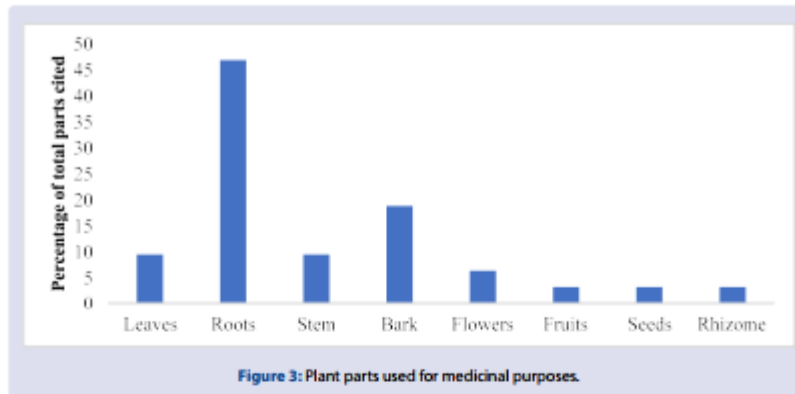


Figure 3: Plant parts used for medicinal purposes.

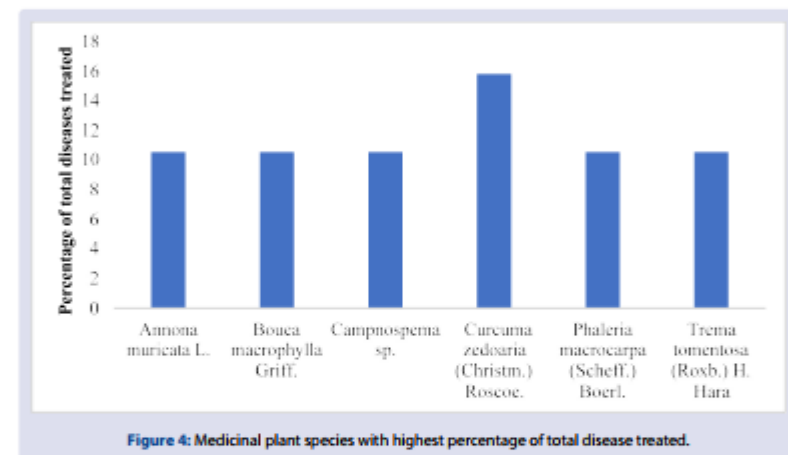


Figure 4: Medicinal plant species with highest percentage of total disease treated.

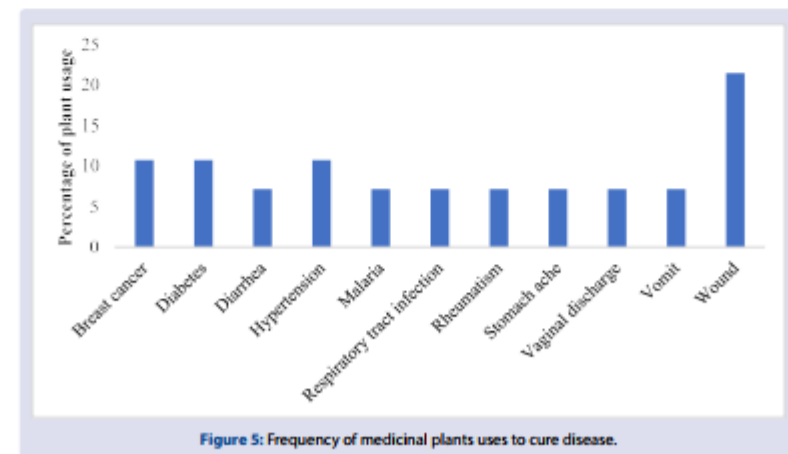


Figure 5: Frequency of medicinal plants uses to cure disease.

Steroidal saponins was known for their biological actions, particularly cytotoxic, antimicrobial, antifungal, and in vivo antitumoral activities.⁷

Previous study about *Ananas comosus* (L.) Merr. revealed that ethanol extract of *Ananas comosus* (L.) Merr. leaves possess significant hypocholesterolemic activity. The acute toxicity also showed that the extract has a high safety profile as neither death nor symptoms associated with toxicity was observed at high dose level (5 gm/kg) in high cholesterol fed albino rats.⁸ Extract ethanol of *Orthosiphon aristatus* (Blume.) Miq. leaf produced the strong antimicrobial effect, inhibiting the growth of *Candida albicans*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus epidermidis*, *Proteus mirabilis*. Some of these microorganism are the cause of urinary tract infections.⁹⁻¹⁰

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Majority of the plant remedies in this study were prepared by decoction (40%), then by crushed or pounded (31%), infusion (20%), and concoction (9%) (Figure 6). Some herbal preparations were taken by mixing with lime paste. Most medicinal plant preparations were taken orally (75%), while 19% were used topically for disease such as wounds, breast cancers, and stomach ache (Figure 7). Various ethnomedicinal studies conducted elsewhere also reported that oral as the predominant route of administration.²⁶⁻²⁸

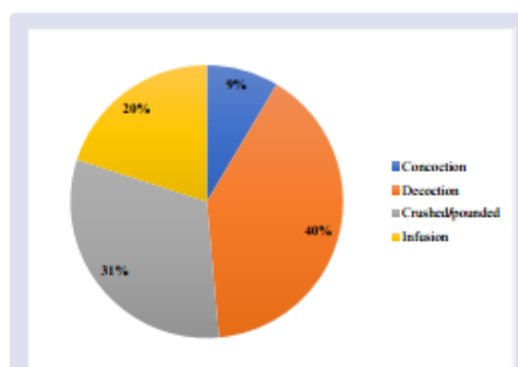


Figure 6: Medicinal plants preparation method.

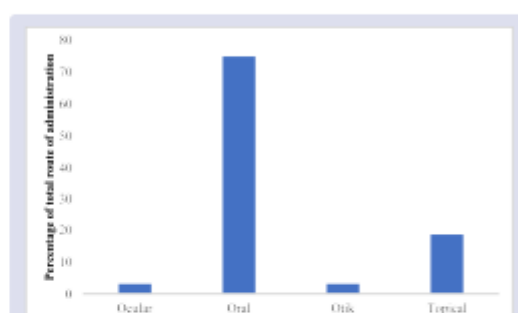


Figure 7: Route of administration of medicinal plant.

CONCLUSION

With this ethnomedicinal study, 28 medicinal plants were determined to be used for different medicinal purposes by local people. This study is the first on determination of medicinal plants used in Anjir Pulang Pisau Village. So, it is very important to preserve traditional culture on traditional medicine and survive for future generations. Further research is needed to identify unidentified family and plant species. Pharmacognostical and pharmacological studies are also needed for the identification of chemical compounds and proving the efficacy of medicinal plants used by local people.

ACKNOWLEDGEMENT

The authors would like to thank local people of Anjir Pulang Pisau Village who helped to collect information for this study.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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GRAPHICAL ABSTRACT



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