Medicinal plants used by traditional healers for hemorrhoid treatment in Borneo island: Ethnopharmacological study

RISTOJA

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Abstract. Borneo is known as the third largest island in the world, which has enormous biodiversity. For generations, the locals used to utilize surrounding plants to treat diseases and maintain their health. Hemorrhoids is one of the diseases which is often treated using medicinal plants. An ethnopharmacological study (RISTOJA) was conducted to find potential plants to be developed in Borneo island by interviewing selected local traditional healers. Identification of medicinal plants was performed, followed by descriptive and literature studies. The most important medicinal plants were defined using the calculation of frequency of citation (FC), use value (UV), and choice value (CV). In order to establish scientific evidence, a literature review was conducted focused on the benefit and toxicity using electronic search engines Pubmed, DOAJ, Scopus, and Google Scholar. The evidence was collected from empirical use to in-vitro, animal, or clinical studies. There were 49 species under 31 families used in herbal formula for hemorrhoids. Based on FC, UV, CV, and literature review, Curcuma longa L., Graptophyllum pictum (L.) Griff., Melastoma malabathricum L., and Cocos nucifera were confirmed to have enough scientific evidence regarding its safety and efficacy. Accordingly, those plants have the potential to be further developed.

1. Introduction

Borneo island is known as the third biggest island in the world. Expanding along the equator, it has an abundant diversity of flora and fauna. Therefore, traditional healers have many choices in using natural resources for their practice. Until now, traditional healers still exist because they are considered essential in ethnic societies [1]. The selection of medicinal plants is solely based on inherited knowledge and customs within the community [2]. The ingredients of the herbal formula are often gathered by traditional healers from the natural world, including the surrounding forest. Hemorrhoids have been known since the time of the ancient Egyptians. In Indonesia, hemorrhoids were estimated to affect 12.5 million people in 2015 (Basic Health Research). The prevalence of hemorrhoids in Indonesia is believed to be only 5.7 percent [3]. However, there can be significant interference with the patient’s daily life due to the condition caused by this disease [4]. Hemorrhoids have been treated in the community since ancient times using traditional medications derived from plants and herbs. This practice is still in existence now. They choose herbal medicine because they are uncomfortable with the potential side effects of surgery.

The World Health Organization (WHO) encourages the development of herbal medicines based on traditional knowledge [5]. However, to be approved by contemporary medicine in the modern period,
the use of medicinal plants must be supported by scientific data [6,7]. Center for Research and Development of Medicinal Plants and Traditional Medicines (MPTMRDC) conducted an ethnopharmacology study named RISTOJA in 2015 and 2017. On the island of Borneo, traditional healers utilize a variety of herbal medicinal formulas to cure hemorrhoids. Each formula contains one or more medicinal plants as an ingredient. In order to establish strong scientific evidence, it is required to conduct a literature review and confirm the pharmacological and toxicological effects of medicinal plants.

2. Methods

2.1. Description of the study area
Borneo is part of the Malay Archipelago’s Greater Sunda Islands group. The island is surrounded by the South China Sea, Sulu Sea, Celebes Sea, and the Java Sea. On the Indonesian side, the island is divided into five provinces: Central Kalimantan, East Kalimantan, North Kalimantan, South Kalimantan, and West Kalimantan. Borneo is mountainous, with some flats. The Kapuas and Mahakam rivers run through Kalimantan. The climate is equatorial, hot, and humid, with two distinct seasons: a rainy monsoonal period from October to March and a dry, calmer summer the rest of the year. Borneo is covered in the deep jungle, and its floral and faunal communities are very diverse.

2.2. Ethnopharmacology survey
In 2015 and 2017, ethnopharmacology research of RISTOJA was conducted in five provinces in Borneo. The study focused on traditional healers in the ethnics. The ethnics in this study were chosen by a purposeful sample technique based on several factors, including the minimum number of ethnic population (1000), a long history of existence, and a wealth of local wisdom information. The informants were chosen from traditional healers who were respected by the local community for their knowledge and abilities. We used established guidelines to interview the informants to acquire data on the use of plant species as hemorrhoids treatment. Local names, plant parts used, and how the plants were critical points in the guideline [8]. After the interview, plant samples were collected from the location they usually take.

2.3. Identification of medicinal plant species
Herbariums were made from plant samples that were acquired and used in traditional medical formulae. Biology experts identified the specimens in terms of specifications and identity by comparing them to herbarium exsiccated and literature. The specimens were kept in the Tawangmangu Ensis herbarium at the Medicinal Plants and Traditional Medicines Research and Development Center.

2.4. Medicinal plants analysis
The medicinal plants were sorted according to the constituents in traditional hemorrhoid medicine recipes. The frequency of citation (FC), use-value (UV), and choice value (CV) were calculated to measure the importance and level of confidence of plants. The citation frequency (FC) for each medicinal plant in this study was calculated using the formula:

\[
FC = \frac{\text{the number of times the medicinal plant was mentioned}}{\text{the number of medicinal plant species mentioned}} \times 100
\]

The use-value (UV) is a quantitative measure for determining the importance of a species in a specific area [10]. Use value interpreted population interaction with local plants to treat a particular disease. The calculation uses the formula:

\[
UV = \frac{U}{n}
\]

‘U’ is the number of species mentioned by the informant/total number of interviewed informants.
The choice value (CV) is a valuable tool for measuring related plant species to treat hemorrhoids. The CV was calculated as in the following equation:

\[
CV_{\text{species}} = \frac{P_{\text{cs}}}{S_{\text{c}}} \times 100
\]

Pcs: the percentage of informants who mentioned certain plant species for hemorrhoid therapy.
Sc: the total number of species mentioned by all informants for disease therapy. Choice values range from 0 to 100, with 100 signifying total preference and fewer possibilities.

2.5. Study of literature
The literature review was carried out in a methodical manner using scientific publications released before May 2021. Pubmed, DOAJ, Scopus, and Google Scholar were among the electronic search engines used. The study looked at medicinal plants' efficacy and safety which have a score of FC more than 1.5 percent, UV more than 0.020, and CV more than 0.03. Folk hemorrhoids, ethnopharmacology hemorrhoids, traditional technique hemorrhoids, effects and toxicity of each plant, and other terms connected to medicinal plants were utilized as keywords.

3. Results and discussion

3.1. The demography of traditional healers
There were 25 traditional male healers recruited as informants, which was more than half compared with females. The majority of the informants were between the ages of 41 and 60. The education levels of the interviewees were diverse, with eight informants not accepting formal education, 18 informants graduating from elementary to junior high school, and 16 informants graduating from senior high schools or higher education institutions. According to the data, at least 18 of the 42 informants had been in practice for 11 to 20 years. According to Table 1, the average number of patients seen in a month is 89.4 patients on average.

| Variable                  | Number of traditional healers |
|---------------------------|-------------------------------|
| Gender                    |                               |
| Male                      | 25                            |
| Female                    | 17                            |
| Experience (year)         |                               |
| < 5                       | 5                             |
| 5 – 10                    | 11                            |
| 11 – 20                   | 18                            |
| > 20                      | 8                             |
| Average patients in one month | 89.4                      |
| Education                 |                               |
| No formal education       | 8                             |
| Elementary – Junior high school | 18                        |
| Senior high school        | 12                            |
| University                | 4                             |
| Age (year old)            |                               |
| < 40                      | 10                            |
| 41 – 60                   | 20                            |
| > 60                      | 12                            |

According to this study, most participants have been practicing for at least ten years before participating in the study. How long a traditional healer has been practicing influences his capacity to diagnose and treat diseases. It is clear from the number of patients seen in just a single month that those traditional healers are highly respected. There will be a greater validity to ethnopharmacology study if the
traditional healers are of higher quality [1,2]. There is also a correlation between the age of traditional healers and their experience and trustworthiness. The finding was also consistent in several studies [69]. The educational backgrounds of the majority of the informants were classified as low to moderate. People living in Indonesia’s rural areas face many challenges when it comes to gaining access to education. However, traditional healers are used to getting their traditional medicine knowledge from their ethnic elders, who have a wealth of experience in the field. They were confident that the knowledge they had gained would be enough to treat their patients. Therefore, higher education is undoubtedly out of their priority.

3.2. Medicinal plants and herbal formulas used for hemorrhoids treatment

According to the information gathered by RISTOJA, not all informants in Borneo have a herbal formula for hemorrhoids. Conversely, several informants reported having more than one remedy for hemorrhoids. The data revealed that the informants utilized 45 different herbal medicine formulae. At least 16 formulae contained at least two medical plants, while the remaining formulas contained only one medicinal plant as a component. Herbal formulations utilized by the informants in Borneo were defined in this study based on the relative importance of plant components, associated plants included in the formula, production procedures, and administration routes.

Because hemorrhoids disease affects the skin’s surface area, there were two administration routes for herbal formulas: oral preparations and topical preparations. According to the data, most informants gave the herbs to the patients orally (83.3 percent). On the other hand, eleven formulae were given topical, and only one formula was used orally and topically. It is estimated that up to 48% of the oral medicines were produced by boiling the herbal mixture. Other oral preparations that are infrequently used include squeezed, steamed, and eating straight. Fifteen topical formulae were created by withering the leaves in the presence of a fire and then applying them to the rectum/anus. In contrast, over 36 percent of topical formulations were created by mashing the ingredients using a grinder or grater before application.

Another ethnopharmacology investigation discovered the use of topical preparations in the treatment of hemorrhoids. Collisions, oils, creams, bath therapy, and rattus are all common preparations. The treatment is typically used for minor hemorrhoids. This finding is consistent with the physician’s treatment guidelines for hemorrhoids. Grade I-II hemorrhoids can be managed with diet and medicine, both oral and topical, whereas grade III-IV hemorrhoids require more advanced treatment, such as surgery [94]. The main reason for using topical preparation is because they are absorbed immediately at the lesion site rather than passing through the internal metabolic system. Accordingly, they have a lower risk of side effects.

Table 2. Top 6 Medicinal plants used for hemorrhoids, taxonomic family groups, parts used, and the value of each plant.

| Plants name                        | Family              | Part used        | Number cited | FC   | UV   | CV  |
|-----------------------------------|---------------------|------------------|--------------|------|------|-----|
| Cordyline fruticosa (L.) A.Chev.  | Asparagaceae        | Leaves, Root, Trunk | 3            | 4.55 | 0.048| 0.09|
| Curcuma longa L.                  | Zingiberaceae       | Rhizome          | 3            | 4.55 | 0.071| 0.09|
| Graptophyllum pictum (L.) Griff.  | Acanthaceae         | Leaves, Root, Trunk | 3            | 4.55 | 0.071| 0.09|
| Melastoma malabarathicum L.       | Melastomataceae     | Leaves, Root, Trunk | 3            | 4.55 | 0.071| 0.09|
| Areca catechu L.                  | Arecaceae           | Root,Fruit       | 2            | 3.03 | 0.048| 0.06|
| Cocos nucifera L.                 | Arecaceae           | Fruit            | 2            | 3.03 | 0.048| 0.06|

The survey discovered 49 species of medicinal plants in 31 families that informants used in their hemorrhoid treatment regimens. The Zingiberaceae, Arecaceae, Euphorbiaceae, Fabaceae, Lamiaceae, Poaceae, and Vitaceae families were all named at least twice, with the Zingiberaceae being the most frequently mentioned. The plants in these families were used in the development of 11 herbal formulations. The most commonly used plants for hemorrhoids were determined by calculating the
citations frequency of citation (FC), the use value (UV), and the choice value (CV). The greater the FC, UV, and CV, the more frequent and significant that plant to be used by informants to treat hemorrhoids. According to the calculations, six medicinal plants with FC more than 1.5, UV more than 0.050, and CV more than 0.03. *Curcuma longa L.*, *Melastoma malabathricum L.*, and *Graptophyllum pictum (L.) Griff.* were the most referenced plants (each receiving three citations), followed by *Areca catechu L.* and *Cocos nucifera L.*, which each received two citations. The leaves were the most frequently used component in the formula (43.1 percent), followed by the rhizome (15.9 percent), the trunk (5.1 percent), and the fruit (4 percent). The leaves are the most commonly used part of the plant in herbal formulas by traditional healers. Their decision to use leaves is not dependent on the percentage of the active ingredient in them. In general, leaves are chosen because they are easy to collect in large quantities, regenerate quickly, are innocuous to plant life, and are simple to dry and determine the dose. Rhizomes, on the other hand, are also commonly used in herbal formulae in Indonesia. In addition, Herbs are utilized for shrub-type plants that are easy to grow in various climates [22].

3.3. Literature study of the most important plants

A review of the literature was carried out with a focus on the six most important medicinal herbs. Several countries have reported the use of *Curcuma longa L.*, *Melastoma malabathricum L.*, *Cocos nucifera L.*, and *Graptophyllum pictum (L.) Griff.* for hemorrhoids treatment (Table 3). These plants have been widely used in Southeast Asia, South Asia, and Africa. *Curcuma longa L.* and *Graptophyllum pictum (L.) Griff.* have specific proofs for their use for hemorrhoid therapy among these herbs. In addition, these plants were also classified as the most often utilized plants for the treatment of hemorrhoids in Java Island [11]. There have been no recorded harmful effects associated with the usage of all medicinal herbs except *Areca catechu L.* Numerous investigations have proven that arecoline in *Areca catechu L.* is a carcinogenic substance. Accordingly, the best recommendation to use it for hemorrhoids treatment is for topical use.

| Species                          | Traditional healers # - number of formula | Use for hemorrhoids treatment in other countries (Ethnopharmacology studies) | Efficacy evidence related to hemorrhoids treatment and other activities (in-vitro and in-vivo studies) | Toxicity and side effect evidence of the plants according to the references |
|----------------------------------|------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Cordyline fruticosa (L.) A.Chev. | 99 – 005                                  | No evidence                                                               | Anti-bacterial [12], analgesic, anti-inflammation, anti-pyretic [13], anti-oxidant [14]          | No aberrant behavior nor death were observed in mice receiving doses of up to 3200 mg/kg extract over a 14-day period. [13]. Oral administration of curcumin of 1-5 g/kg BW had no harmful effects in rats. [21]. |
| Curcuma longa L.                 | 82 – 005                                  | India [15], Thailand [16]                                                 | Anti-inflammation [17], analgesic [18], anti-ulcer [19], vaso-relaxant [20], anti-bacterial [17] |                                                                                   |
| Graptophyllum pictum (L.) Griff. | 83 – 015                                  | Philippines [22], India [23], Thailand [24]                               | Anti-hemorrhoids [25], anti-inflammation [26] Increase elasticity of blood vessels, reduce bleeding [25] |                                                                                   |
| Melastoma malabathricum L.       | 94 – 010                                  | Malaysia [28], Philippines [29]                                           | Anti-inflammation [30], anti-bacterial [31], anti-nociception [32], anti-oxidant [33] [31] | Mice receiving 2000 mg/kg of leaf extract showed neither death nor clinical symptoms of general weakness [29]. |
| Areca catechu L.                 | 86 – 009                                  | No evidence                                                               | Anti-microbial [34], analgesic [35], Anti-inflammation [36], wound healing [37]                | Arecoline affects the sperm of male mice and induces chromosome abnormalities in mouse bone marrow cells, destroys hepatocyte ultrastructure, and elevates blood AST and ALT levels [38]. |
| Cocos nucifera L.                | 84 – 011                                  | Nigeria [39]                                                              | Anti-inflammation, analgesic, anti-bacterial [18], anti-ulcer [19], vaso-relaxant [20]          | There have been no reports of toxicity associated with the use of crude, endocard, or mesocarp extract [40]. |
Areca catechu L. and Cordyline fruticosa (L.) A.Chev. did not have adequate evidence to support their use as an empirical hemorrhoid treatment. However, the evidence of several activities that support the treatment of hemorrhoids can be considered in preparing the herbal remedy. The anti-inflammation, analgesic, antioxidant, anti-bacterial, anti-ulcer, vasorelaxant, wound healing, laxative, and bleeding reduction properties of medicinal plants are beneficial in managing hemorrhoids symptoms and clinical indications, as well as in the prevention of hemorrhoids [41].

The RISTOJA database contains a wealth of information that can be researched further to identify possible medicinal plants for illness therapy. However, there was a data gap on hemorrhoids. According to the study results, the informants could not specify the type of hemorrhoids they treated with their herbal concoction. The primary clinical symptoms of the two types of hemorrhoids are pretty similar. Accordingly, it is difficult for a non-medic person to distinguish the type of hemorrhoids [4]. The informants’ incapacity to provide information regarding the type of hemorrhoids could be due to their insufficient knowledge of medical science. Education is critical in this case, as the majority of informants did not complete senior high school.

4. Conclusion

Curcuma longa L., Graptophyllum pictum (L.) Griff. Melastoma malabathricum L. and Cocos nucifera L. according to the results, are the most potent medicinal herbs to be developed for hemorrhoids therapy. Cordyline fruticosa (L.) A.Chev. is also considered potent because it has sufficient evidence to help alleviate hemorrhoid symptoms. Due to the hazardous impact of Areca catechu L., it is not advised to be used for oral preparation.

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Conflict of interest
The authors declare no conflict of interest in this study

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