

REVIEW

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Medicinal plants utilized for hepatic disorders in Ethiopian traditional medical practices: a review

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Abstract

Background: Ethiopia is among the top floral biodiversity rich countries in the world. More than 7000 species of plants, 15% of them are endemic, are reported in the country. Accessibility, cultural enrichment, and cheapness make 80% of the Ethiopian people use indigenous plants for various health ailments and diseases in their traditional medical practices. Therefore, the current review examined the use patterns of medicinal plants utilized for hepatic disorders in Ethiopian traditional medical practices for further scientific investigations.

Methods: Ethnobotanical and related studies on medicinal plants utilized for hepatic disorders in Ethiopia were reviewed. Ethiopian university websites, Google, Google Scholar, PubMed, Medline, and other online internet search engines were used to access literature articles. The number of plant species and families, used parts, used conditions, modes of preparation, and routes of administration were tabulated and summarized using Excel spreadsheet and descriptive statistics, respectively.

Results: The current review showed that 276 plant species belonging to 89 families were used for hepatic disorders in Ethiopian traditional medical practices. The commonly utilized plant families were *Asteraceae* (10.14%), *Fabaceae* (9.08%), *Euphorbiaceae* (7.61%), *Lamiaceae* (4.35%), *Solanaceae* (3.99%), and *Aloaceae* (2.90%). *Justicia schimperiana* (34.34%), *Croton macrostachyus*, and *Phytolacca dodecandra* (each 20.20%), *Cordia africana*, *Cucumis ficifolius*, and *Rumex abyssinica* (each 10.10%) were among the most utilized plant species. They were mainly distributed in Oromo (58%), southern (36%), and Amhara (35.5%) regions. Herbs (47.10%), shrubs (26.09%) and trees (20.65%) were their primary growth forms, while leaves (34.30%) and roots (33.06%) were their commonly utilized parts. Pounding (24.59%), decoction (19.67%), powdering (9.84%), and concoction (9.13%) were their major modes of preparations. Water was the most utilized solvent (48.26%) for the remedy preparations, which were mainly administered orally (76.35%).

Conclusions: This review showed that many claimed medicinal plants were utilized for the treatment of hepatic disorders in Ethiopian traditional medical practices. Hence, further experimental investigation is recommended to standardize their quality and phytochemistry and validate their safety and efficacy. Documentation and conservation of indigenous herbal knowledge have also been strengthened.

Keywords: Ethnobotany, Ethiopia, Folklore, Hepatic disorders, Herbalism, Medicinal plants, Traditional medicine

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Introduction

The liver is one of the largest and most prominent organs in the body. It is a critical center for diverse physiological processes, including macronutrient metabolism, blood volume regulation, immune system support, endocrine control of growth signaling pathways, lipid homeostasis, and detoxification of xenobiotics, including drugs [1]. Its structure and function are, however, damaged by different disease states. The incidence of hepatic diseases has increased worldwide because of changes in lifestyle and dietary habits, contamination in food or drinking, chemical and drug abuse, and hepatic infections. The most important hepatic diseases include hepatitis, cirrhosis, fatty liver, bile duct obstruction, and jaundice. They are the major cause of morbidity and mortality globally [1–4].

Managements of hepatic disorders are continuously challenged due to the unavailability of effective drugs that target, arrest, or reverse disease progression, their adverse effects, and their costs, especially in the developing world [5–7]. Plant-derived compounds from indigenous cultural practices are an effective alternative for the sources of new hepatoprotective remedies [3, 8]. Scientific findings have shown that phytochemicals with antioxidant, anti-inflammatory, and antiviral properties are effective hepatoprotective agents [9].

Human beings use plants for the treatment of different ailments, including hepatic disorders, since ancient times [10]. Approximately 14% to 28% of higher plant species worldwide are used medicinally for some sort of ailments and diseases in the world [11, 12]. Approximately 80% of the world's population, especially in the developing world, utilized plant-derived drugs for primary healthcare demands. Nearly 50% of modern drugs are based on natural products [13–15]. Because of gaining in their popularity and importance, traditional medical practitioners are now given great attention in developed countries as well [16]. Only about one-tenth of the flowering plant species occurring globally are investigated for their pharmaceutical potential [17]. However, most of these plants have not been explored chemically and pharmacologically [18]. Nearly 45,000 plant species are estimated in Africa, but only 11% of them have documented medicinal use [19]. Medicinal plants have been shown to be effective for the correction of different hepatic ailments [20]. Hence, nature provides a right solution for every ailment, including hepatic disorders, in the form of such plants [17].

Because of cultural entrenchment, accessibility, and affordability, nearly 80% of the Ethiopian population depends on traditional indigenous medicine as a primary source of healthcare. The practice is mostly implemented using herbs, spiritual healing, bone-setting, and minor surgical procedures. The practice is vastly

complex and diverse among different ethnic groups [21, 22]. More than 95% of traditional Ethiopian medicinal preparations are made from plant origin. Ethiopia is considered one of the richest genetic resource centers in the world in terms of plant diversity. Approximately over 7000 higher plant species distributed in about 245 families are found in the country that make the sixth and twelfth plant biodiversity rich countries in Africa and the world, respectively. Approximately 15% of these plants are endemic to the country, with their healing potential that makes the country one in six countries in the world. In addition, Ethiopia has a wide range of climates, cultures, and diversified populations [23, 24].

Indigenous cultural practices on medicinal plants are inconsistently documented throughout the world, especially in developing one including Ethiopia [25]. Medicinal plants, both endemic and widespread, their resources and knowledge about their usage must be preserved because these plants could be a renewable source for new drugs [26] and for the benefit of humankind in general [27], before they lose forever due to environmental and anthropogenic factors [28–30]. Consistent documentation of ethnobotanical and ethnopharmacological information on indigenous knowledge of medicinal plants is, therefore, a vehicle for preserving cultural heritage, ethnopharmacological bases of drug research, and preservation of biological diversity [27, 31]. This is also vital for smooth and consistent investigations on their safety, efficacy, and quality [32–34]. Therefore, the aim of the current review was to prepare a compiled checklist of medicinal plants used traditionally for the management of hepatic disorders from various ethnobotanical, ethnopharmacological, and related studies in Ethiopia.

Methods

Search strategy

A website-based search strategy was employed in research literature articles related to medicinal plants used traditionally for the treatment of hepatic disorders in Ethiopia. Google search engines and local university research repository websites were used to access and collect unpublished research reports (MSc theses and PhD dissertations), while published journal articles were searched and accessed using global scientific databases including Google Scholar, Medline, PubMed, Scopus, Web of Science, and related online internet search engines. The resource materials were collected between June and August 2017. A literature search was done using keywords consisting of traditional medicine, ethnobotany, ethnomedicine, ethnopharmacology, phytopharmacology, phytomedicine, hepatoprotective plants, and Ethiopia, accompanied by liver diseases, liver

ailments, hepatic disorders, liver problems, hepatitis, jaundice, hepatic cirrhosis, and liver infections.

Selection criteria

Both published and unpublished ethnobotanical, ethnopharmacological, and ethnomedicinal surveys reporting on the use of plants for hepatic disorders and conducted at any time in Ethiopia were included in the review, while plants from review, non-open accessed and abstract-only articles, historical documents, and experimental studies as well as plants of unknown locations and scientific names were excluded from the review. Availability of plants was also checked and confirmed using various volumes (1–8) of the Flora of Ethiopia and Eritrea. In addition, missing information in some studies, particularly local names and habit of the plants, and misspelled scientific names were retrieved from the Natural Database for Africa and Google search engines.

Data extraction

Valuable information on medicinal plants, including species and family of the plants, their specific uses, parts used, conditions and modes of preparation, routes of administration, and their regional distribution were thoroughly explored, extracted, and tabulated using an excel spread sheet. The collected data were analyzed using descriptive statistics to evaluate the frequency and percentage of different aspects.

Results

Diversity of medicinal plants

Indigenous knowledge pertaining to plant distribution, management, and traditional medicinal use requires standard procedures for botanical identification, reliable documentation, and further preservation. The current review included a total of 100 original ethnomedicinal studies (74 were journal articles while others were theses and dissertations). A total of 276 medicinal plants from 89 families were used traditionally for the treatment of different hepatic disorders in Ethiopia. Further information for each plant species is provided in Additional file 1. They were mainly categorized under *Asteraceae* (10.14%), *Fabaceae* (9.08%), *Euphorbiaceae* (7.61%), *Lamiaceae* (4.35%), *Solanaceae* (3.99%), *Aloaceae* (2.90%), and *Rubiaceae* (2.17%) families, as shown in Fig. 1.

Many medicinal plant species ($n = 160$) have been reported from the Oromia region [35–68] followed by southern nations, nationalities, and people ($n = 100$) [69–83], Amhara ($n = 98$) [84–105], Tigray ($n = 52$) [106–116], Afar ($n = 19$) [117, 118], Addis Ababa ($n = 11$) [119–121], Dire Dawa ($n = 10$) [122, 123], Harari ($n = 7$) [124–127], Benshangul-Gumuz ($n = 6$) [128, 129], and Somali ($n = 2$) [130] national regional states. Types of hepatic disorders managed by these plants were

hepatitis (42.33%), jaundice (29.26%), infections (3.13%), cirrhosis (3.13%), and nonspecific (22.16%). Note that the summation of percent is more than 100% because of the sharing of medicinal plants among regions.

Frequently used medicinal plants

The most frequently utilized plant species were *Justicia schimperiana* (34.34%), *Croton macrostachyus* (20.20%), *Phytolacca dodecandra* (20.20%), *Cordia africana* (10.10%), *Cucumis ficifolius* (10.10%), and *Rumex abyssinica* (10.10%), as shown in Fig. 2.

Growth forms and utilized parts

Herbs (47.10%), shrubs (26.09%), trees (20.65%), climbers (3.62), and others (including succulents, lianas, and twigs; 2.54%) were the growth forms, while leaves (34.30%), roots (33.06%), and bark (8.88%) were the common parts of medicinal plants utilized, as shown in Fig. 3.

They were used in the form of fresh (30.97%), dry (6.78%), either fresh or dry (15.63%), and not available (46.61%).

Mode of preparation and administration

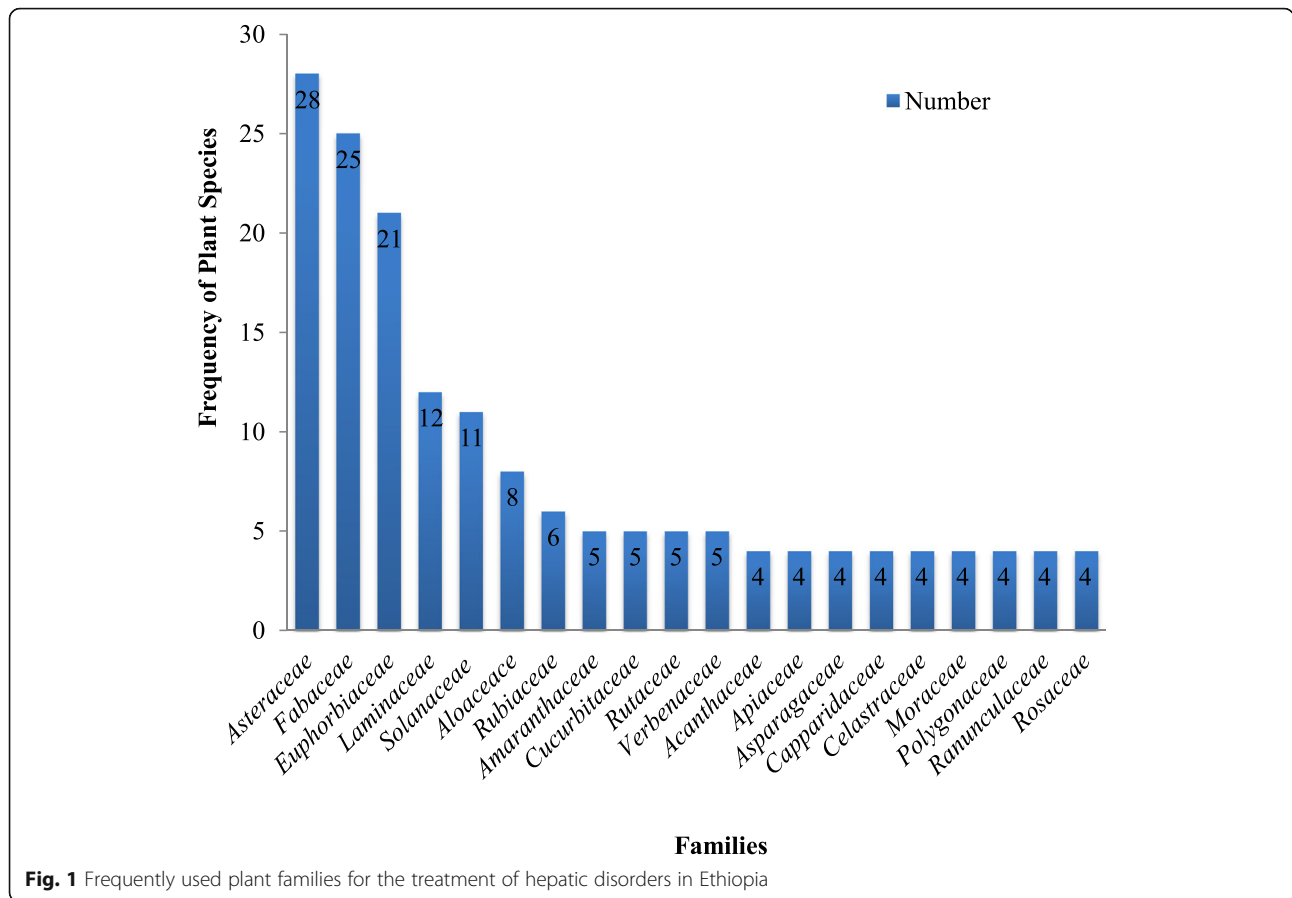
Water was the most frequently (51.38%) used additive for the preparation and administration of herbs, followed by milk products (16.02%), honey (11.60%), and others, as shown in Fig. 4.

The most common techniques used for the preparation and administration of medicinal plants were pounding (24.17%), decoction (19.67%), powdering (9.72%), concoction (9.24%), and others, as shown in Fig. 5.

Oral route was the most common (76.35%) route for the administration of the herbs followed by dermal (6.68%), inhalational (5.14%), nasal (3.34%), body washing (3.57%), and whole body (1.03%), while 4.88% of preparations had not available.

Discussion

Claimed medicinal plants of cultural importance are vital for the origin and basis of pharmacology and therapeutics. Ethnobotany and ethnopharmacology are useful strategies and viable vehicles for pharmaceutical research and drug discovery [13]. Approximately 80% of pharmacologically active plant-derived compounds were discovered after following up on the ethnomedicinal use of plants. The search for new and effective drugs and candidates based on ethnobotanical and ethnopharmacological approaches has proven to be more predictive when compared to random screening approaches. Hence, ethnopharmacological use of plants is a basis for phytochemical and phytopharmacological investigation [130–132].



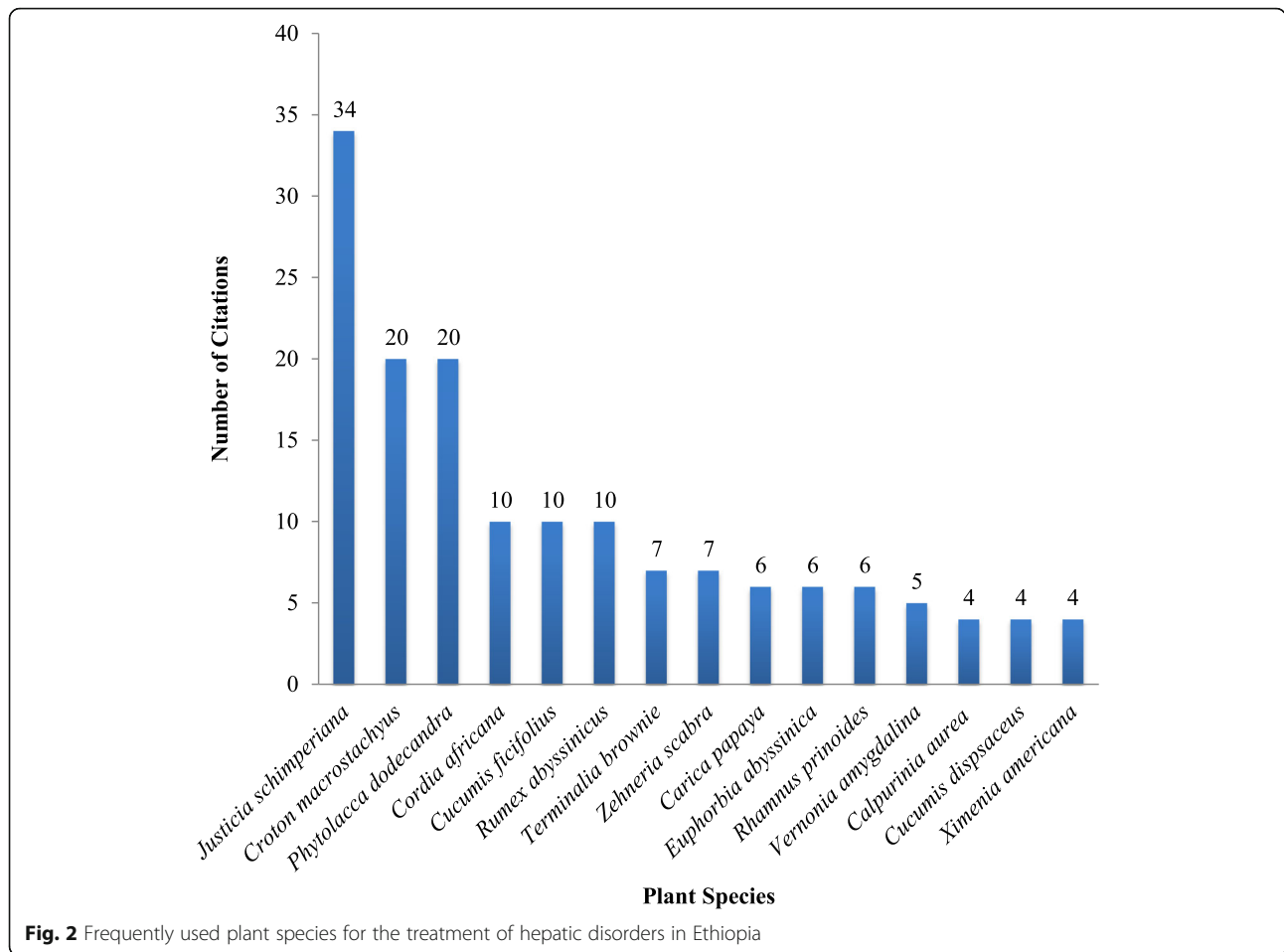
Reviews on ethnomedicinal uses are vital and starting points for the selection and identification of commonly used medicinal plants. Frequently used or cited medicinal plants by indigenous people have been shown more pharmacologically active than plants used at ones or not at all. In addition, these reviews are vital for the documentation and preservation of indigenous ethnomedicinal practices. Such evidence is pertinent for prioritizing future phytochemical, pharmacological, and toxicological research agendas [133–135].

The current review identified a total of 276 plant species that were utilized for the treatment of hepatic disorders in Ethiopia. These plants make up 3.94% of higher plant species in the country. This indicates that African flora, especially Ethiopian’s holds enormous potential for the development of phytomedicines [136]. They are mainly distributed in the Oromia region, being the largest region in terms of area and population density as well as diversity of cultural practices. The southern nations, nationalities, and people region is the second region because of the existence of diversified ethnic groups and cultural practices, while Amhara is the third region due to extensive ethnomedicines

practitioners by the Ethiopian Orthodox Church (like “Mergetas” and “Debteras”) [137].

The most frequently utilized medicinal plants were from the *Asteraceae* and *Fabaceae* families. This was in agreement with other reviews [137–143]. These families contain several phytochemicals that possess strong antioxidant, free radical-scavenging, and antilipoperoxidant activities, including flavonoids, terpenoids, polyphenols, alkaloids, saponins, vitamins, enzymes, polysaccharides, lignin, xanthenes, and pigments. These herbal products may cure different hepatic disorders by protecting the cells from damage caused by free radicals [144–146]. Frequent citation of particular plant species or families could indicate potentially higher bioactive hepatoprotectants [133].

Herbs constituted the largest growth habit, followed by shrubs and trees. This was in agreement with other reviews [133, 139, 147–150]. Their extensive use in the preparation of herbal medicines might be linked to their easy propagation, availability, and accessibility in the country. Because of their easy accessibility to various microorganisms, insects, and animals, they defended themselves by producing diverse offensive and defensive phytochemicals. These phytochemicals might have



diverse biological effects, including therapeutic benefits, when exposed to other life forms. However, harvesting herbaceous plants for medicinal purposes is not sustainable as it threatens the survival of the plants. But herbs might not exist in dry seasons; hence, cultivation of medicinal plants, including medicinal plants gardens and lands are vital to sustain their availability throughout the year. Leaves were the dominant plant parts used, followed by roots and barks and this was in agreement with others [133, 139, 140, 148–151]. Frequent use of the leaf part of the plant might be its site of secondary metabolite production and easily formulation into different dosage forms. But their aggressive use of these plant parts might threaten and endanger the life of the plant.

The popular method for preparation was pounding, followed by decoction, powdering, and concoction. The current review was similar to other reviews [133, 138, 140, 141, 147]. Pounding is the preliminary method for the preparation of medicinal herbs, especially in fresh form. This was done by local stones and/or wood. However, there is a great concern that is risk of contamination. In decoction, the plant material was immersed in water in a

pot and then heated. Heating might be required for extraction of the phytochemicals from the plant material. The extracted fluid was drunken after filtration through cloth and cooling. If the plant material is not easily available, powdering is the commonly used technique to preserve plant material for a long period of time.

Water was the common solvent used for the preparation and administration of herbal remedies. Water has a high capability to extract different phytochemicals from plant materials because it highest solvent properties and captures heat. The other additives used were honey, milk, butter, *Eragrostis tef* flour, local alcoholic drinks, sugars, salts, and spices. These additives were used for masking off objectionable tastes, smells, and colors of the remedies. They also used as antidotes for the poisonings of the herbs. The prepared remedies were generally administered orally. This was similar to other studies [138, 139]. This is the simplest, convenient, and inexpensive route that might make the common route for the administration of herbs.

Most reviewed articles had some important and critical information gabs, including herbal preparation,

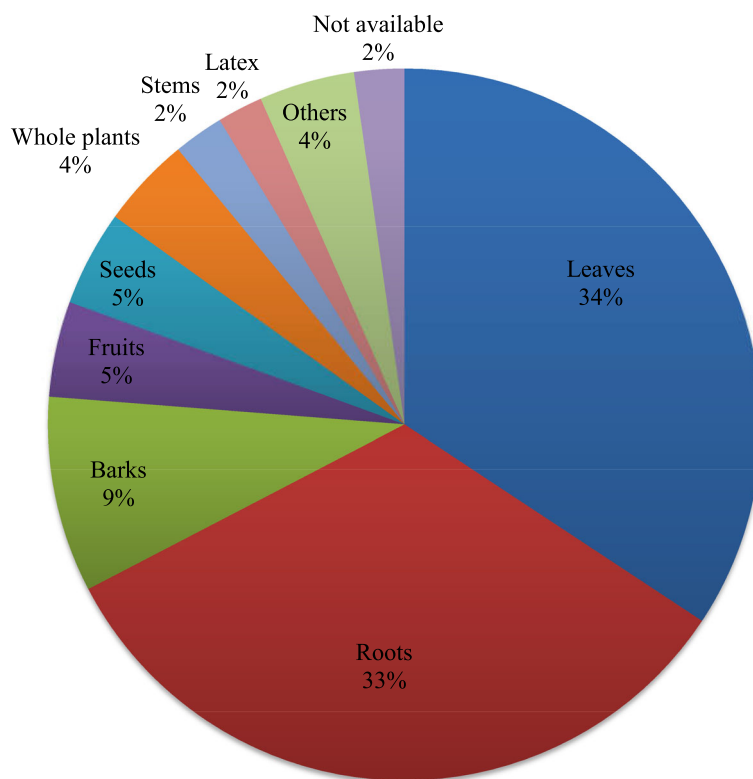


Fig. 3 Percentage of plant parts used for the treatment of hepatic disorders in Ethiopia

dosage regimens (for adults, elders, pregnant women, children), adverse effects, precautions, contraindications, antidotes, and the current risk status of medicinal plants. Complete information and standardized reporting systems are needed for future ethnomedicinal studies on indigenous medicinal plants in Ethiopia. In addition, study quality inconsistencies were noted with regard to sampling and the number of knowledgeable informants.

African traditional medical practices, especially Ethiopian's is currently challenged with problems of continuity and sustainability. Medicinal plants are the backbones of such practices. However, these plants are adversely affected by anthropogenic and natural forces. They are mostly obtained from wild habitants, which are currently threatened by deforestation, overgrazing, drought, commercialization, diseases, pests, agricultural expansion, firing, charcoal, population overgrowth, urbanization, construction, pollution, and climate change. Many medicinal plants have become endangered, threatened, at risk, and even extinct. These plants and indigenous practices might be lost forever without proper documentation and preservation. In addition to medicinal use, they are also used as food, clothing, shelter, fuel, fiber, income generation, and the fulfilling of cultural and spiritual needs throughout the world. These

practices further threaten these plants [133, 152, 153]. Hence, synthetic cultivation of medicinal plants and further conservation and documentation are recommended.

Some medicinal plants used for hepatic disorders showed promising pharmacologic activities; even though, the pharmacologic screening was at a preliminary stage. Some of their reported pharmacologic activities include hepatoprotective (*Nigella sativa* [154], *Ocimum lamifolium* [155], and *Stephania abyssinica* [156]), antioxidant (*Carica papaya* and *Vernonia amygdalina* [157, 158], *Ajuga integrifolia* [158], *Ocimum lamifolium* and *Lepidium sativum* [159], and *Rhamnus prinoides* [160]), anti-inflammatory (*Carduus schimperi* [161] and *Rumex abyssinicus* [162]), and antioxidant and anti-inflammatory (*Vernonia amygdalina* [163]).

Conclusions

The current review showed that many claimed medicinal plants were utilized for the management of different hepatic disorders in Ethiopia. Therefore, further experimental studies are recommended to assure their safety, efficacy (antioxidant, anti-inflammatory, anti-carcinogenic, antifibrotic, and antiviral activities), phytochemistry, and quality. Documentation and preservation of ethnobotanical indigenous knowledge,

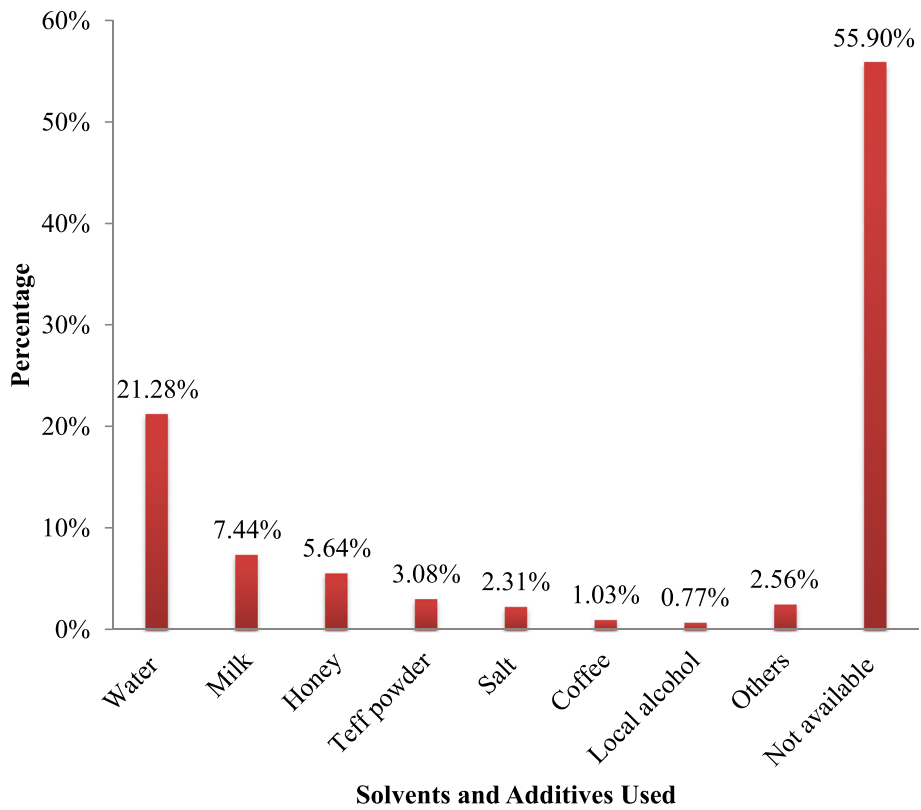


Fig. 4 Solvents and additives used for the preparation of plants for hepatic disorders in Ethiopia

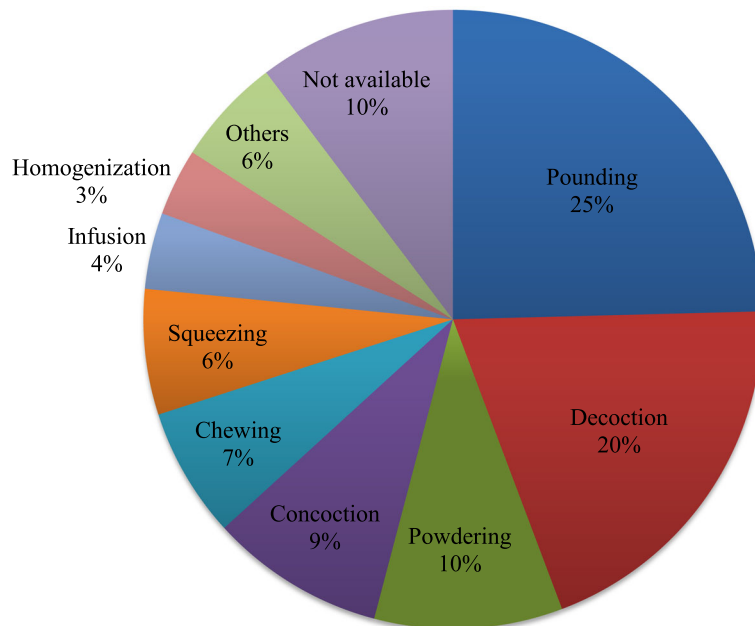


Fig. 5 Methods of preparation of plants used for the treatment of hepatic disorders in Ethiopia

which contributes to drug development, before they are lost due to environmental and anthropogenic factors, are also strengthened.

Supplementary information

Supplementary information accompanies this paper at <https://doi.org/10.1186/s40816-020-00195-8>.

Additional file 1 Supplementary material 1. Ethnopharmaceutical information on medicinal plants utilized for the management of different hepatic disorders in Ethiopian traditional medical practices.

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Authors' contributions

ABM is the guarantor. He contributed substantially to the conception and design of the study, and the acquisition and analysis of the data. The draft and critical revision of the manuscript were made by ABM. The final approval of the manuscript version was done by ABM and MWA.

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Availability of data and materials

All data generated or analyzed during this study are included in this published article and its supplementary information file.

Ethics approval and consent to participate

Not applicable.

Consent for publication

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Competing interests

The authors declare that they have no competing interests.

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