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Indigenous Knowledge on Medicinal Plants for Treatment of Some Urological and Urogenital Diseases in Ethiopian Traditional Medicine

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Abstract

Background: Ethiopia is recognized as one of the richest biodiversity in Africa. This paper presents a review of relevant medicinal plants used for treatment of some urological and urogenital diseases in Ethiopia.

Methods: This study is based on a review of the literature published in scientific journals, books, theses, proceedings, and reports. SPSS Version 20 and an Excel spreadsheet were used to summarize relevant ethno-botanical/medicinal information using descriptive statistics, frequency, percentage tables, and graphs.

Results: A total of 146 medicinal plants, distributed in 127 genera and 64 families, are reported in the reviewed literature. The highest family in terms of species number was Cucurbitaceae (7.51%), Asteriaceae (7.51%), Euphorbaceae (6.20%) and Apiaceae (4.80%). A higher diversity of medicinal plants was reported from Southern nations and nationalities (44.5%), Oromia (41.1%), and Amhara (27.4%) regional states. Analysis of ethno-medicinal recipes indicated that mainly herbs (46.8%), followed by shrubs (32.6%) were growth form, while root (36.2%) and leaves (35.3%) were the most used parts. Decoction (26.1%), concoction (16.5%), and pounding (11.9%) were found to be the most frequently employed herbal remedy preparation methods and were administered orally.

Conclusion: The review showed that many claimed medicinal plants were used for the treatment of urological and urogenital disorders across the regions of Ethiopian. Most of the medicinal plants are not scientifically experimented and yet are at a higher risk to loss mainly by different activities. Therefore, phytochemical studies are recommended mainly on frequently utilized medicinal plants, which can serve as a basis for future investigation in order to produce natural drugs.

Keywords

Ethnobotany • Ethiopia • Urological diseases • urogenital problems • medicinal plants • traditional medicine

Literature Review

Urinary diseases have affected humankind since ancient times and can persist, with serious medical consequences throughout the world. Kidney is one of the most prominent organs in our body and is the major excretory organ in animals and humans. It is a critical center for diverse physiological processes; like balancing of electrolytes and regulation of water, production of erythrocytes by stimulating the function of erythropoiesis, regulation of the acid base balance, regulation of blood calcium level, and it involves the process of gluconeogenesis [1-6]. Urological disorders remain serious human health problems and are caused by different factors, like changes in lifestyle and dietary habits, contamination in food, chemical, drugs and infections.

The most common urological diseases include hyperplasia, benign prostate hyperplasia (BPH), urinary tract infections, urethral and kidney stones, enuresis (urinary incontinence) and renal failure. They are the major cause of morbidity and mortality worldwide.

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Urinary tract infections and urogenital (STDs) like syphilis and gonorrhea are prevalent throughout the world as well as in Ethiopia. Urogenital problems are important because of their magnitude, potential complications, and their interaction with HIV/AIDS. Disproportionately, it affects the health and social wellbeing of women by producing a significant impact on their reproductive potential. N. gonorrhea and Syphilis were the leading pathogens that caused vaginal discharge, urethral discharge, and genital ulcers.

Due to unavailability of effective drugs, their adverse effects, and their costs, managements of both urological and urogenital disorders are continuously challenged especially in developing countries. Plant derived compounds from indigenous cultural practices are an effective alternative for the sources of new remedies for those disorders [7-15]. A number of herbal medicines and remedies have been reported for its significant nephroprotective activity, which is probably due to the presence of effective secondary metabolites in those medicinal plants.

Human beings use plants for the treatment of various diseases, including urological and urogenital disorders since ancient times. It was estimated that 25000 to 75000 species of higher plant species worldwide are used medicinally for a type of ailments and diseases in the world Approximately 80% of the world's population, especially for millions of people in the vast rural areas of developing countries, uses plant-derived drugs for primary healthcare demands. About 50% of modern drugs are based on natural products including plants, microorganisms, fungi, and animals [16-27]. Favoring traditional medicinal plants in developing countries is mainly due to the inaccessibility of modern medical systems, economic, and cultural factors. Even though about one-tenth of the flowering plant species that are used for their pharmaceutical potential existing in the world, most of them have not been evaluated chemically and pharmacologically.

Because of cultural diversity and acceptability, psychological comfort, economic affordability, and perceived efficacy against certain types of diseases compared to modern medicine, nearly 80% of Ethiopian population based on traditional indigenous medicine as a primary source of healthcare. More than 95% of traditional preparations in the country are of plant origin. Ethiopia is considered one of the richest genetic resource centers in the world in terms of plant diversity and one of the six plant biodiversity rich regions.

Indigenous cultural practices on medicinal plants documented throughout the world, especially in developing countries including Ethiopia. Medicinal plants, both endemic and prevalent, their resources and knowledge about their usage have to be preserved before they lose forever because of population growth, agricultural expansion, deforestation, environmental degradation and expansion of modern education [28]. Consistent documentation of ethno botanical and ethnopharmacological information on indigenous knowledge of medicinal plants is, therefore, a vehicle for preserving cultural heritage, ethnopharmacological base of drug research, and preservation of biological. Therefore, the aim of this review was to prepare compiled information on medicinal plants used traditionally for the management of some urological and urogenital diseases from different ethnobotanical and ethnomedicinal studies in Ethiopia.

Methods

The traditional uses of medicinal plants used to treat urological and urogenital diseases in Ethiopia were collected from available literature published in scientific journals, books, theses, proceedings, and reports. Literature was searched in different electronic databases (Web of Science, Medline, Science Direct, and Google Scholar) and accessed between March and September 2020 using key terms consisting of traditional medicine, ethnobotany, ethnomedicine, ethnopharmacology, phytomedicine, ethnobiology, medicinal plants, nephroprotective plants, Indigenous knowledge, traditional healer, traditional medicine practitioner, medico-cultural, all with the term "Ethiopia" convoyed by urological and urogenital diseases, urological ailment, kidney problem, kidney stone, benign prostate hyperplasia (BPH), urinary tract infections, renal failure and urogenital disorders.

Screening and criteria

Screening of search outputs was performed by identifying the title and abstract of journal articles/theses and was downloaded and critically inspected for inclusion in the review. Literature screening was based on inclusion and exclusion criteria [29-35]. Ethnobotanical, ethnopharmacological, and ethnomedicinal surveys reporting on the use of plants for urological and urogenital disorders and conducted at any time in Ethiopia were included in the review, while data from the review, historical documents and experimental studies as well as plants of unknown location and scientific name were excluded from the review.

Data extraction and review process

After the retrieval from the electronic databases, we extracted the following data from each eligible document on medicinal plants. Family and species of the plants, growth form, their specific uses, parts of the plant used conditions and mode of remedy preparation, routes of administration, and their regional distribution and analyzed. SPSS version 20 and an Excel spreadsheet were used to analyze the data. Descriptive statistics was used to summarize the result and presented using charts and tables.

Results

Taxonomic Diversity of Medicinal Plants

This study recorded 146 plant species that are used traditionally for the treatment of different urological and urogenital disorders in Ethiopia. These medicinal plants were distributed among 121 genera and 64 families (Table 1). Among the families that contributed more medicinal species were the Cucurbitaceae, represented by 11 species (7.51%), Asteriaceae 11 (7.51%), Euphorbaceae 9 (6.20%), Apiaceae 7 (4.80%), Fabaceae 7 (4.80%), Lamiaceae 6 (4.11%), and Solanaceae 6 (4.11%)

According to the present review, the eligible studies on medicinal plants used to manage urological and urogenital disorders were reported mainly from the Southern nations, nationalities, and people (SNNPR) region regional state Oromia regional state Amhara regional state and Tigray regional state (Table 1). There are various types of urological and urogenital disorders forms were reported to be managed by medicinal plants in Ethiopia [36-41]. Urine retention

(23.4%), kidney problem (12.4%), kidney infection (7.3%), nephropathy (3.2%), bloody urine (2.3%), urinary tract infections (1.8%), and gonorrhea (31.2%), impotency (9.2%), syphilis (3.7%) and genital infections (0.5%), respectively, were reported frequently. The most frequently cited species were: Foeniculum vulgare (17), Croton macrostachus (6), Phytolacca dodecandra (5), Ferula communis (4), Catha edulis (4), Acokanthara shimperi (4) and Lycopersican escolentum (4). shown in (Figure -1).

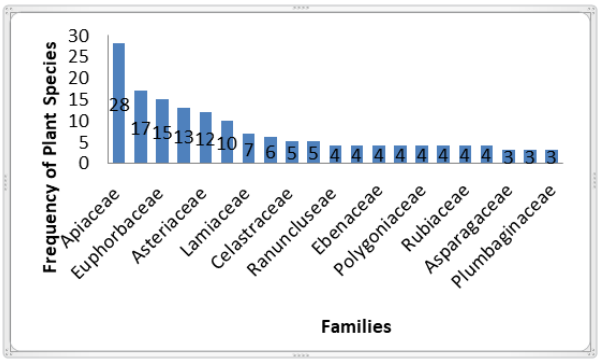

Figure 1: Frequently used plant families for the treatment of urological and urogenital disorders in Ethiopia

Growth Forms, Utilized Parts and preparation of traditional medicine

The result of growth form analysis of medicinal plants shows that herbs constitute the highest proportion being represented by (46.8%), followed by shrubs (32.6%) and trees (13.8%) (Figure-2). Almost all parts of the plants were used to prepare different remedies. The most frequently used medicinal plant parts was roots (36.2%), leaves (35.3%), fruits (6.4%) and barks (4.1%) as shown in Fig. 3. Most of the remedies used for treatment of urological and urogenital disorders are prepared from fresh parts (56.4%) of medicinal plants followed by dried form (32.6%) and 8.7% prepared either from dry or fresh plant parts.(Figure-3)

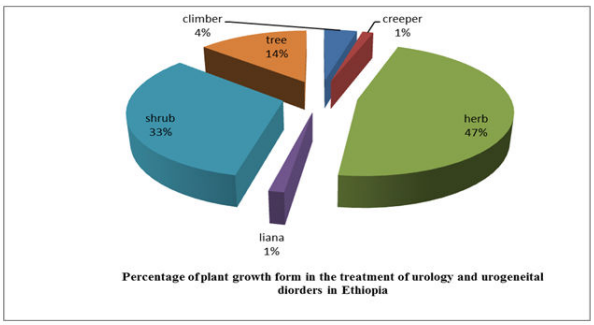

Figure 2: Percentage of plant growth form for the treatment of urological and urogenital disorders in Ethiopia.

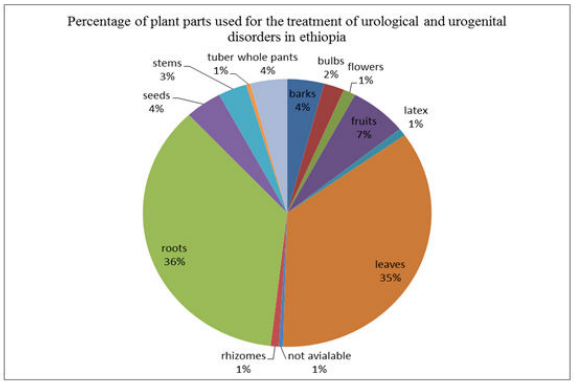

Figure 3: Percentage of plant parts used for the treatment of urological and urogenital disorders in Ethiopia.

Mode of preparation and administration

People living in Ethiopia use different traditional therapeutic methods to prepare plant remedies which depend on the type of plant species [42]. The most common techniques used for the preparation and administration of medicinal plants were decoction (26.1%), concoction (16.5%), pounding (11.9%) and crushing (10.1%), as shown in (Figure-4).

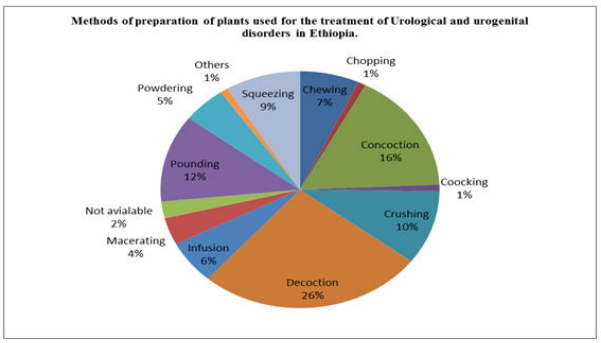

Figure 4: Methods of preparation of plants used for the treatment of urological and urogenital disorders in Ethiopia.

Medicinal plant remedies used to treat urological and urogenital disorders were commonly administered through oral route (94.5%), followed by dermal (2.8%), tied (0.9%) and in 1.4% of the cases, the route of administration has not been specified [43-46].

Water (57.3%) is the solvent that is mostly used to prepare medicinal plant remedies. Around 7.3 % of preparations included honey as an additive to the remedy followed by tella (local alcohol) (6.0%) and 20.2% of remedy was prepared without additive as shown in (Figure 5).

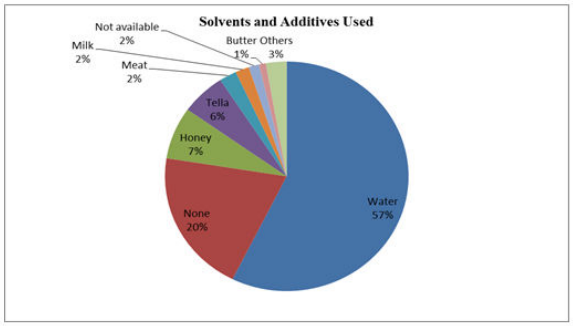

Figure 5: Solvents and additives used for the preparation of plants for urological and urogenital disorders in Ethiopia

Discussion

Ethno-medicinal and ethnobotany studies on plants demand standard procedures for botanical identification and reliable documentation of indigenous knowledge pertaining to plant distribution, management and traditional medicinal use in Ethiopia [47-73]. In Ethiopia today, the folk medicine has been trusted and highly appreciated, and many patients go to herbalists or traditional herbal healers to get benefit from this field. Herbal medicine is considered the most used complementary and alternative medicine, and this part of complementary and alternative medicines are widely used among patients suffering from urinary tract and urogenital diseases throughout the world. Ethnobotany and ethnopharmacology are useful strategies and viable vehicle for pharmaceutical research and drug discovery. The search for new and safe drugs based on ethnobotanical and pharmacological approaches has proven to be more predictive compared to random screening approaches.

The current review identified a total of 146 medicinal plants from 121 genera and 64 families that were used for the treatment of urological and urogenital disorders in Ethiopia. They are mainly distributed in the Southern nations, nationalities and people, Oromia, Amhara, Tigray, Dire dawa, Benishangul Gumuz, Afar, Harari and Somali regional states. This might be related to area of the region, population density, cultural practices, existence of diversified ethnic groups, and religious practices. This regional distribution of anti-urology and urogenital problem medicinal plants indicated that prevalence of the disease in the locality and practiced for treatment using their indigenous knowledge.

There are numerous plant species used for urological and urogenital disorders such as; kidney problems, kidney infection, nephropathy, bloody urine, urinary tract infections, diuretics, kidney stones, urethra infections, dysuria, urinary problems, urination at night, and gonorrhea, impotency , syphilis and genital infections, respectively [74-80]. The most mentioned medicinal plant families were Cucurbitaceae, Asteriaceae, Euphorbaceae, Apiaceae, Fabaceae, Lamiaceae, Solanaceae, Ranuncluseae and Apocynaceae. All these families as well as other families mentioned in this review are already represented in Ethiopia flora. This was in agreement with other reviews.

The assessment on the growth forms of the medicinal plants depicted that herbs constituted the highest, followed by shrubs and trees. This could be due to the fact that naturally there are more herbs than woody plant species. Herbs are overused and in abundance because of their diverse value for humans. This might show that there was an abundance of herbs because the area was rich with average rainfall for most of the regions of Ethiopia. This made conducive for the growth of herbs and collected easily. Therefore, the trend of using more of herbaceous plants could be advantageous as it is easier to cultivate them when they are in short supply and they are annual. Relatively high numbers of herbs and shrubs for medicinal purposes treating different human ailments were also previously reported in Ethiopia.

Local people of Ethiopia harvest different plant parts for the preparation of traditional drugs for urological and urogenital treatment Roots were the dominant plant parts, followed by leaves and fruit. Plant root structures, such as tubers and rhizomes, can be rich sources of potentially bioactive chemical compounds. However, utilization of roots for drug preparation is not a good practice as it threatens the survival of the plant species [81-82]. Moreover, studies are indicating that the collection of root parts for remedy preparation poses a threat to medicinal plants as it was observed in many plant species where the roots are utilized. This will significantly affect the sustainability of the medicinal plants unlike the use of aerial parts, such as leaves. It was revealed that most remedies are prepared from fresh plant materials (56.4 %) followed by dried form (32.6%) and 8.7% prepared from either fresh or dry plant parts. This would result in the extensive exploitation of medicinal plants and in the long run and will compromise the sustainability of the medicinal plants [83].

The popular method for preparation was decoction followed by concoction, pounding, and crushing. Decoction was the major method for the preparation of remedies practiced by traditional healers. In the decoction, the plant material was immersed in water in a pot and then heated. Heating might be required for the extraction of phytochemicals from plant materials. 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.

A single herbal preparation was taken by mixing with different ingredients recommended antidotes including drinking milk, eating honey, tef flour, and occasionally drinking water slowly accordingly. Water was the common solvent used for the preparation and administration of herbal remedies [84-86]. Water has a high ability to extract different phytochemicals from plant materials because it has the highest solvent properties and capture heat. The other additives used were tella (local alcohol), butter, sugar, enjera, fat, meat, and oil. They are used in traditional medicine to increase the flavor, taste, and general suitability of orally administered remedies. Anti-urological and anti-urogenital herbal remedies were primarily administered through the oral route, while rarely dermal tied and smear. This is in agreement with the results of various ethnobotanical researchers elsewhere in Ethiopia. Both oral and dermal routes permit the rapid physiological reaction of the prepared medicines to the pathogen and increase its curative power.

Herbal remedy dosage was determined by the edibility of the plant parts used. In case of remedies prepared from nonedible plants/parts, the dose was prescribed based on age, physical strength, and health status of patients [87]. However, full dosage determination varied

from healer to healer. Variations were noted in the measurement units used for dose estimation, and in the frequency and duration of the herbal treatment prescribed. The dosage prescription for children was mostly lower than for adults. Dosages were estimated using lids, spoons, cups, glasses, pinches, or handfuls. The amount of remedy and prescription rates was generally dependent on the degree and duration of the degree and severity of the disease. Generally, the recommendation was made to administer herbal remedies twice or three times per day for one, two, or three consecutive days to many months or until recovery. Lack of precision and standardization is widely acknowledged to be an important drawback of traditional healthcare systems. Regarding the most cited plants which were used for the treatment of urological and urogenital problems, most of them applied in folk medicine in many countries. For instance, the most cited plants for the treatment of urinary retention were Foeniculum vulgare, Lycopersicon esculentum, Catha edulis, Clerodendrum myricoides, Croton macrostachyus and Pavetta oliveriana Hiern. Moreover, the most cited plants for the treatment of kidney infection were Foeniculum vulgare and Grewia ferruginea, which was mentioned in folk medicine for the treatment of this disease and their toxicological effects were not known. The most cited plants which were used for the treatment of gonorrhea and impotency were; Croton macrostachyus, Phytolacca dodecandra, Senna occidentalis, Euphorbia ampliphylle and Ferula communis, Sida schimperiana respectively. Over all, there are quite a few phytopharmaceuticals which can be used effectively for the treatment of urinary tract and urogenital diseases in the pharmaceutical market. For that, further phytochemical and pharmacological screening are required to investigate new drugs from the mentioned plants in this review, especially those which are the most cited and can be used safely.

Nowadays, the world is losing many medicinal plants in relation to the alarming population growth with increasing demand and consumption, and subsequent deforestation for agriculture, firewood, timber, and construction materials. These common human made and natural factors resulted in the loss of plant genetic diversity and threatening the survival of human kind with erosion of some lifesaving medicinal plants of wild genes without proper documentation and preservation. Therein, the loss of medicinal plants associates with the missing advantages gained from them and indigenous knowledge associated with the plants.

Conclusion

The current review highlighted that a rich diversity of indigenous medicinal plants were commonly used for the management of different urological and urogenital problems in Ethiopia. Hence, medicinal plants still play significant role in the health care of system of the rural community as first choice for curing different diseases. Therefore, the main aim for studying indigenous plants is linked with searching safer and effective alternatives to modern drugs and further experimental studies are recommended to assure their efficacy and safety.

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