Pharmacogn J. 2022; 14(5): 542-547
A Multifaceted Journal in the field of Natural Products and Pharmacognosy
www.phcogj.com

Research Article

Ethnobotanical Study of Plants Used for the Treatment of Urolithiasis in Morocco

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History

- Submission Date: 19-08-2022;
- Review completed: 15-09-2022;
- Accepted Date: 26-09-2022.

DOI : 10.5530/pj.2022.14.133

Article Available online

http://www.phcogj.com/v14/i5

ABSTRACT

Urolithiasis (UL) is a frequent pathology which affects between 5 and 20% of the population according to the countries and areas. The aim of this study was to determine the medicinal plants used traditionally by patients with UL in the Kenitra and Sidi Kacem cities (Morocco). From January 2012 to February 2015, 50 herbalists and 166 patients with urolithiasis who live in the area under study were interviewed by using structured questionnaire. The following data were recorded: name of the patients or herbalists with their age, sex name of the plant (s) (vernacular name), parts used mode of preparation and administration. A total of 42 plant species belonging to 24 families, mostly from the *Apiaceae* (16.66%) *Lamiaceae* (11.9%) were used to treat the UL in the area. All the plants were prepared by decoction which are taken orally for a period of one week. *Herniaria hirsuta* (Hh) and *Ziziphus lotus* (Zl) were repeatedly mentioned by the patients and herbalists as most used for the management of UL in this area. It's concluded that the traditional remedies are the first line to treat the UL in this area. Hh and Zl were the most commonly used plants in this treatment which a study of antiurolithiatic characteristics seem to be necessary to evaluate its use in therapy.

Key words: Urolithiasis, Medicinal plants, Questionnaire, Traditional medicine, Morocco.

INTRODUCTION

In Morocco, the traditional pharmacopoeia disposes of a richness of plants used for the treatment of a large spectrum of diseases, because of the diversity of its environment and flora. Many studies have demonstrated that traditional medicines are still used, and they should be scientifically studied. Many authors have shown that the percent of uses of plants, oscillated between 55 and 90% according to the region where the survey was undertaken.[1-3]

Many authors have studied the traditional pharmacopoeia in different areas of Morocco[4,5] have scientifically studied the traditional pharmacopoeia in Oriental Morocco.

Urolithiasis is one of the major diseases which affects millions of people in the world 60% are unknown as etiology idiopathic, it's a complex disease that consist of a some of stages occurred in the kidney with reoccurrence rate of up to 50%.[6]

The nephrolithiasis in adults is predominant in men and can affect at any age, with a maximum frequency between 30 and 50 years. The majority of stones were composed of calcium oxalate. Moreover, the majority of people who are suffering from lithiasis do not have other associated pathologies of their disease, lithiasis),

Morocco is a Mediterranean country which is crisscrossed from east to west and from south-west to north-east by four mountain ranges, the Rif, the Middle Atlas, the High Atlas and the Anti-Atlas. The Mediterranean Sea in the north, the Atlantic Ocean in the west and the desert in the south have a strong climatic influence which divides the country into many bioclimatic strata.

In Morocco, as in many less developed areas, phytotherapy is a common method of primary health care because pharmaceutical products are expensive and the folk pharmacopoeia provides apparently effective remedies for many diseases. Some of the medicinal plants have been described in older Moroccan pharmacopoeia.[2,7]

Medicinal plants in the Mediterranean area constitute a big diversity allowed to some geographic and climatic characteristics. Morocco is a Mediterranean country which is crisscrossed from east to west and from south-west to north-east by four mountain ranges, the Rif, the Middle Atlas, the High Atlas and the Anti-Atlas. The Mediterranean Sea in the north, the Atlantic Ocean in the west and the desert in the south have a strong climatic influence which divides the country into many bioclimatic strata.

Several studies have been performed in the use of medicinal plants in Morocco, but until now, no data about urolithiasis patients in Gharb chrarda bni hssen area was published.

The purpose of the present investigation was to evaluate medicinal plants used in the treatment of UL in this area. In this context, we proceeded to establish an inventory of traditional plants and how the plants are used, and its transmission to this underprivileged population.[8]

METHODOLOGY

Study area

The Gharb chrarda Bni Hssen area is situated in North-Western Morocco. It covers an area of 8805 km² and has a population of 1,894,452 (2014 census).[9] This area is characterized by three bioclimatic strata that favors the development and diversity of medicinal plants. Geographically, this area contains three provinces Kenitra, Sidi slimane and Sidi kacem (Figure 1).

Cite this article: Chakit M, El Hessni A, Mesfioui A. Ethnobotanical Study of Plants Used for the Treatment of Urolithiasis in Morocco. Pharmacogn J. 2022;12(5): 542-547.

Figure 1: Map of study area.

METHODS

The present research was done between January 2012 and February 2015, by carrying out an ethnobotanical survey with adult people, who live in the area under study and know and practice the use of medicinal plants. 166 patients with urolithiasis were interviewed in the selected areas; 96% of the interviews was the males, 70% was the females. Also 50 healers were interviewed and the data were collected from traditional healers, herbalists from the three provinces Kenitra, Sidi Slimane and Sidi Kacem.

During the interviews with healers, demographic characteristics of the study participants, and local names, utilized parts and preparation methods of the plants were recorded.

For the patients, the questionnaire contains the information about:

name of the patients or herbalist with their age, sex, cultural level, professional activity

pathology of persons interviewed and frequency of medical consultations;

name of the drug: botanical name and vernacular name;

ecological distribution: local or imported, cultivated species or spontaneous;

parts used: leaves, fruit, aerial part, root, seeds…

the source of provisioning their medical plants; pharmacist, herbal healer, experience of the other (initiated) or fkih (traditional healer);

the reasons of using medicinal plants (more effective, more cheap, or easy acquisition);

the results of phytotherapy (good, average or variable);

the precision of doses (precise, not precise or little or sometimes precise);

the knowledge of toxic plants;

the mode of preparation and administration and the duration of administration.

The questionnaire aims to collect information about the citizen and about the plants used in the treatment of urolithiasis. The dialogue took place in Arabic depending. The identification of the material collected was first made in the field and completed at the laboratory of Biology and Health, Faculty of Sciences of Kenitra, Ibn Tofail University. For the identification of plant species and their families, ethnobotanical documents such as medicinal plants of Morocco[10] and the practical flora of Morocco[11] were used. The information collected concerned the profile of the person questioned (age, sex, level of study, family situation and habitat) and ethnopharmacological data such as the common local name of the plant, the uses, the parts used, the method of preparation. Data collected and noted on the survey forms were then entered and statistically analyzed.

Data analysis

Data were analyzed using the Excel program. Descriptive statistics were calculated with all variables to summarize the data. Differences in sociodemographic and clinical characteristics between medicinal plant users and non-users were assessed using statistical tests, comparisons by χ^2 analyses were used to assess predictors.

RESULTS

Frequency of use of medicinal plants according to the profile of respondents

Urolithiasis patients (Table 1)

According to sex, medicinal plants are used by both women and men. but the majority of patients are females with 65.60% and men after with 34.40% (Table 1).

Table 1: Demographic characteristics of urolithiasis patients.

		Number	Percentage (%)
Sex	Male	96	57.83
	Female	70	42.17
Age	< 20	0	0
	21-30	17	10.24
	31-40	16	9.6
	41-50	40	24.04
	Over 50	93	56
Level of life	Low	30	28.03
	Medium	70	65.43
	High	7	6.54
Profession	Payson	60	56
	Administrative	30	28
	Teacher	7	6.5
	Other	10	9.3
Familial situation	Single	17	10.2
	married	146	88
	divorced	3	1.8
Educational level	Illiterate	115	69.3
	Primary level	31	18.7
	Secondary level	17	10.2
	High education level	3	1.8

Table 2: Demographic characteristics of herbalists.

		Number	Percentage (%)
Sex	Male	49	98
	Female	1	2
Age (years)	20-30	5	10
	31-40	19	38
	41-50	16	32
	Over 51	10	20
Educational background	Illiterate	8	16
	Primary level	15	30
	Secondary level	25	50
	High education level	2	4
Duration of practice (years)	1-9	11	22
	10-14	8	16
	15-19	10	20
	Over 20	21	42
Acquisition of knowledge	Inheritance	11	22
	Training	25	50
	Books	7	14
	Other	2	4

Table 3: Medicinal plants used to treat urolithiasis.

Scientific name	Vernacular name	Family	Parts used	Preparation	Number of citations	
					By herbalists	By patients
Ailanthus glandulosa	Lsan ter	*Sarubaceae*	all	Infusion, decoction	1	5
Alpinia officinarum	Khdenjel	*Zingiberaceae*	Rhizome	Infusion	13	23
Ammi visnaga (L.)	Bochnikha	*Apiaceae*	Fruit, seed	Infusion, decoction	1	3
Ammodaucus leucotrichus Coss & Dur	L'camoun soufi	*Apiaceae*	Fruits	Infusion	3	17
Apium graveolensL.	L'krafess	*Apiaceae*	Leaf, flower	Decoction	3	8
Artemisia herba alba	Chih	*Compositae*	all	Decoction	3	1
C. sativusL.	Zaâfran lhor	*Iridaceae*	Stigma	Decoction	1	5
Calamintha officinalis	Menta	*Lamiaceae*	Leaf	Infusion or decoction	1	7
Capparis spinosa	Kbar	*Capparidaceae*	Root	Infusion	1	5
Carthamus tinctoriumL.	Zaafran	*Compositae*	Flowers	Decoction		1
Carum carvi L.	Karwiya	*Apiaceae*	Seed	Infusion	1	5
Ceratonia ciliqua L.	Alkhroub	*Fabaceae*	Leaf, fruit	Decoction	2	9
Cinnamomum verum	Korfa	*Lauraceae*	Inner bark	Infusion	1	1
Coriandrum sativum L.	Alkezbor	*Apiaceae*	Flowers	Infusion		4
Cynodon dactylon L.	Njem	*Gramnaceae*	Root	Decoction	9	3
Euphorbia falcata L.	Hayat ennofos	*Euphorbiaceae*	all	Infusion, decoction	10	13
Herniaria hirsuta	Herras lehjr	*Caryophyllaceae*	all	Decoction	38	4
Juncus acutus L.	Zriet smar	*Juncaceae*	Seed	Decoction	4	14
Lavandula officinalis L.	khzama	*Lamiaceae*	Leaf	Infusion	14	30
Lepidium sativum	Hab rechad	*Brassicaceae*	Seed	Infusion	1	15
Marcurialis annua L	Hriga mlsa	*Euphorbiaceae*	all	Infusion, decoction	12	20
Matricaire camomille L.	Babounj	*Asteraceae*	all	Decoction or infusion	9	15
Myrtus communis L.	Rayhane	*Myrtaceae*	Leaf	Infusion	2	11
Nigella sativa L.	Sanouj 7 souda	*Ranunculaceae*	Seed	Crushed	3	7
Opuntia ficus indica -barbarica A.Berger	Handya, Zaaboul	*Cactaceae*	Flowers, fruits	Infusion	20	50
Origanum compactum Bentham.	Zaatar	*Lamiaceae*	Leaf, stem	Infusion or decoction	4	17
P. carasus L	Hab lmlouk	*Rosaceae*	Fruits	Decoction	0	1
Panax ginsing	Jinsing	*Araliaceae*	Root	Infusion	1	0
Petroselinum sativum Hoffman	Maâdanous	*Apiaceae (umbelliferae)*	all	Decoction	21	89
Pimenta officinalis	Nwiwira	*Myrtaceae*	Fruits	Decoction	1	9
Pimpinella anisum	Nafe Rguig	*Apiacées*	Fruits	Infusion	2	3
Piper cubeba	Kbaba	*Piperaceae*	Fruits	Decoction	5	7
Ranunculus bullatus L.	Wden lhalouf	*Ranunculaceae*	Leaf, root	Decoction	2	10
Rosmarinus officinalis L.	Azir	*Lamiaceae*	Leaf	Decoction	3	30
Rubia tinctorum L.	Fowa	*Rubiaceae*	Leaf	Decoction	1	3
Ruta chalepensis L.	L'fijel	*Rutaceae*	Aerial parts	Decoction	0	1
Tetraclinis articulata	Araar	*Cupressaceae*	Leaf	Infusion	3	12
Thymelea lythroides	Mtnan	*Thymelaeacées*	all	Infusion	4	0
Thymus vulgaris L.	Zâitra	*Lamiaceae*	all	Decoction	2	15
Vitis vinifera L	Dalia, laâneb	*Vitaceae*	Leaf	Infusion	1	5
Z. mays L.	Dra	*Graminae*	Stigma	Decoction	20	27
Ziziphus lotus	Sedra, Nbeg	*Rhamnaceae*	Seed	Crushed	24	5

Concerning the academic level of people who use medicinal plants, the results obtained show that 84.21% are illiterate, while 7.90% have a primary level and 6.73% have a secondary level. Academics, on the other hand, use medicinal plants very little 1.16%.

Family situation: Medicinal plants are used much more by married people (92.21%) than by single people (7.79%).

According to age, the results show that the majority of patients used medicinal plants was an age between 30 and 40. People aged 40 to 49 have a frequency of use of medicinal plants of 11%. The age groups [50-59], [60-69] and [30-39] come then with a percentage of 7.80%, 5.35% and 70.77% respectively. People aged over 70 present a percentage of 4.28%. Whereas for very young people (<30 years), the percentage is very low (2.03%).

Herbalists (Table 2)

The majority of interviewed herbalists are males (98%), most herbalists have an age between 30 and 40 years (38%) The age groups [20-30], [31-40] and [41-50] come then with a percentage of 10%, 38% and 32% respectively. herbalist aged over 51 present a percentage of 20%. The educational level is generally middle (more than 50% of herb seller have a secondary level). The majority have an experience in the medicinal plants (78% of herbalists are up to 10 years) and are acquired their knowledge by training (50% of herbalists).

The medicinal plants

The ethnobotanical survey made it possible to draw up the following list of medicinal plants used (Table 3); the species are presented in

alphabetical order. For each plant listed, we give the scientific name, the family, the common name, the part used, the mode of preparation adopted by the local population, as well as the frequency of use.

Floristic analysis

The survey shows a total of 42 plant species belonging to 24 families. The *Apiaceae* family predominates with 7 species used (16.66%), followed by the *Lamiaceae* family with 5 species (11.9%), the *Compositae*, the *Myrtaceae*, and the *Rununculaceae* families with 2 species (4.8% for each family), The other remaining botanical families have only one species (23 species used, i.e. 57.2%).

Method of preparation

In herbal medicine, there are several methods of preparing plants, depending on the type of use. In our study area, the local population uses, for the treatment of urolithiasis, the plants in decoction 55.8%, followed by infusion 44%, and by the powdered preparation with a percentage of 4% (Figure 3).

Part used

Each part of the plant has therapeutic properties. In our study, medicinal plants can be used whole (23%), or in part (leaf, stem, root, bark, fruit) the use of the leaf and flower parts is predominant with a percentage of 27% (Table 1).

Groups of plants

The survey shows that the interviewed population use mostly two groups of plants for the treatment of urolithiasis (Table 4), *Herniaria hirsuta*, *Ziziphus lotus* and *Zea mays L.* (68.75%) followed by *Herniaria hirsuta, Ziziphus lotus* and *O. ficus indica* (31.25%).

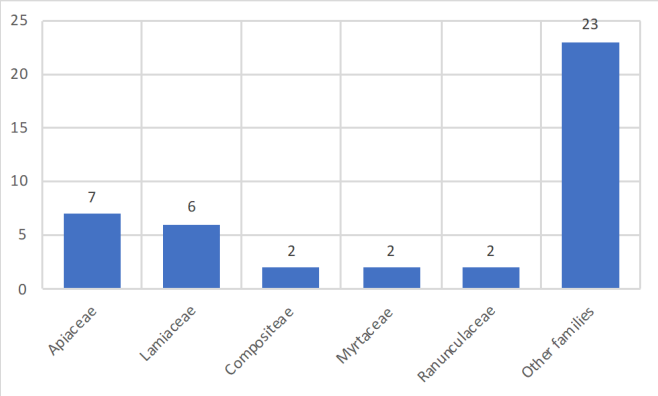

Figure 2: Frequency of botanical families.

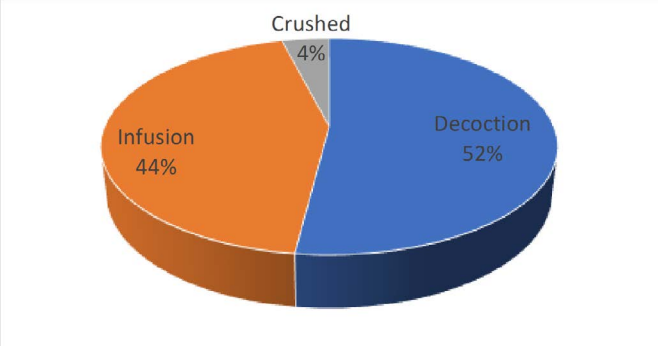

Figure 3: Method of preparation of medicinal plants.

Table 4: Medicinal plant groups used to treat urolithiasis.

Associations	Number	Percentage
Herniaria hirsuta + Ziziphus lotus + O. ficus indica Mill.	5	31.25%
Herniaria hirsuta + Ziziphus lotus + Z. mays L.	11	68.75%

DISCUSSION

Analysis of the profiles of the people who participated in the survey showed that people over 50 years of age present the most dominant percentage (56%), Other ethnobotanical studies undertaken in various regions of Morocco have shown the same results.[12] These older people provide more reliable information, because they hold much of the ancestral knowledge that is part of the oral tradition. In addition, the virtues of plants are ancestral knowledge that is transmitted from generation to generation.[13] The results reinforces the role of knowledge and practices in their relationship with selected medicinal plants in the phytotherapy.

Among the 24 families listed in the region, the most represented families are *Apiacae* (7 species or 16%), The importance of this family in therapeutics has been repeatedly emphasized. It is the most widely used plant family in Mediterranean.[14]

A comparison of medicinal plants used in different parts of Morocco shows that *Herniaria hirsuta* and *Ziziphus lotus* are commonly used in different parts and cities for the treatment of urolithiasis.[15-17] The most used plant parts revealed by the present study are in line with those other studies.[18,19] The efficacy of antilithiatic activity of these plants has been investigated in different studies.[20-23]

Traditional knowledge and the use of plant-based medicines remain important in the prevention and treatment of urolithiasis in our study area and in other rural areas of Morocco.

CONCLUSION

It's concluded that the traditional remedies are the first line to treat the UL in this area. *Herniaria hirsuta* and *Ziziphus lotus* were the most commonly used plants in this treatment by the population of Gharb Chrarda Bni Hssen area. In Morocco, medicinal plants are still used and widespread in rural areas.

The data gathered in this survey could assist in identifying plant species and extraction methods to develop herbal drugs against urolithiasis. The most widely used plants for the treatment of urolithiasis reported in this study should be prioritized for further research. *In vitro* and *in vivo* experimentation, based on this and other ethnobotanical study results, could be important in validating the traditional use of herbal remedies and for providing leads in the search for new active principles.

FUNDING

No specific grant was received by this study from any commercial, not-for-profit sectors, or public funding agency.

CONFLICTS OF INTEREST

The authors declare no financial competing interests.

INFORMED CONSENT

Informed consent was obtained from all individual participants included in the study.

ACKNOWLEDGEMENTS

We are proud for the regional direction of healthy in Kenitra and for the personnel of provincial Hospital Center El Idrissi, Kenira, Morocco.

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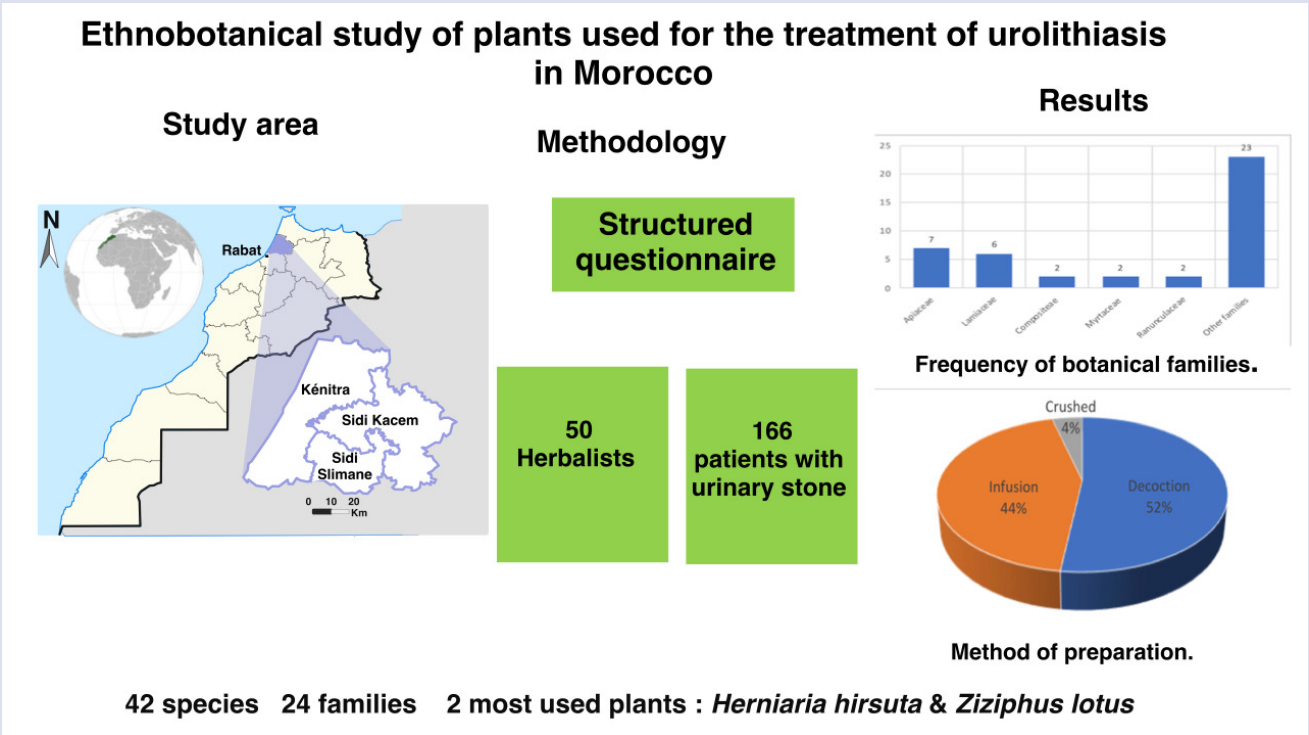
GRAPHICAL ABSTRACT



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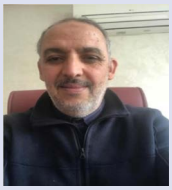

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Cite this article: Chakit M, El Hessni A, Mesfioui A. Ethnobotanical Study of Plants Used for the Treatment of Urolithiasis in Morocco. Pharmacogn J. 2022;12(5): 542-547.