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Ethno-botanical medicines used for urinary stones in the Urmia, Northwest Iran

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ABSTRACT

Introduction: Ethnomedicinal studies are one of the important routes to find potential medicinal plants for drug discovery purposes. In this study, we aimed to consider ethnopharmacological remedies used for urinary stones in Urmia, northwest Iran.

Methods: This work was based on interviews and questionnaires with traditional healers. All the mentioned medicinal herbs were collected and identified with the help of traditional healers in the city and suburb.

Results: There were 47 traditional healers working in the spice shops (*Attari*) in Urmia and 35 of them agreed to cooperate with us. 16 medicinal herbs from 13 families were mentioned by traditional healers. Brassicaceae, Fabaceae and Rosaceae were the predominant families with 2 plants most commonly reported. The most commonly used part was the aerial parts (41.1%). Also, the main method of preparation was decoction (72.7%). Five plants were mentioned by more than 70% of traditional healers as treatment for urinary calculi. *Alhagi camelorum* Fisch had the highest Frequency of Citation (FC) percentage 88% while the least FC percentage was exhibited by *Alyssum desertorum* Stapf. and *Ruta graveolens* L. which was 20%.

Conclusion: Pharmacological activities of reported plants in this study were searched in published works all around the globe. Findings show that most of examined *in-vitro*, *in-vivo* or human to prevent or treat urinary calculi. Also, for some plants, although no direct evidence exists for urinary calculi, it is likely that they may have an effect on urinary stones because of their active ingredients.

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1. Introduction

Urinary calculi is one of the most widespread urinary tract disorders. Its prevalence is reported to be between 1 and 5 percent worldwide and is increasing worldwide [1–3]. The ratio of male to female is 2:1 [4]. Nephrolithiasis is the third most prevalent urinary disease after urinary infectious and prostatic pathologic disorders [5]. In the US alone, 0.9 percent of hospitalized persons have urinary calculi and in 1993, the cost of this disease was reported as 1.83 billion US \$ in America [6]. Recent studies show that despite shifting treatments from inpatient to outpatient, the

cost of urolithiasis is increasing, and reached to 2 billion US \$ in 2005 due to the increasing prevalence of stone diseases [7,8]. More recently estimates suggested that the cost for urolithiasis is 6500 US \$ per year [9].

Forming stones is dependent on multiple factors including genetics, age, sex, weather conditions, living place, amount of water consumption, minerals of water, diet, etc. Current strategies for management of urinary calculi include increasing consumption of water and using diuretics and analgesics. Also, dissolving stones by chemicals, some invasive methods such as surgery, breaking stones by ultrasound waves, etc. are applied for bigger stones that cannot be exerted naturally. But these medical procedures are not completely successful and about 50% are recurrent. Also, the spread of this disease is increasing [1,2].

Therefore, finding new low cost treatment approaches or preventing agents is important and as one of the common trends in this disease. Natural products, ethnobotanical knowledge and also traditional and complementary systems of medicine are important

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sources in the search for new treatments based on ancient knowledge [10].

Iran is one of the countries located on the Asian stone-forming belt (the area from Sudan in Africa to Philippines in eastern Asia that all age groups are affected by urolithiasis) [4] which has a deep and remarkable history of medicine dating back thousands of years to ancient times [11]. In the early medieval period, medical sciences flourished under the Persians during the 9th–12th century AD. This period is called the Islamic Golden Age because of Persian physicians' influential works on medicine [12,13]. Persian medicine (humoral theory) was a global paradigm of medicine during ancient and medieval times. Some of the great Persian manuscripts such as the Canon of Avicenna or the Royal Book of Holy Abbas were taught and learned in the west until the 17th century [14,15]. Regarding ethno-medicine, due to its strong tradition it has become quite common and is practiced by traditional healers in Iran [16]. For example, a study in Isfahan (in the center of Iran) showed that 62.5% of urban population in this region used at least one traditional and complementary method [17].

As a result of the considerable interest in and popularity of this subject, two related PhD courses have been established in Iranian medical education during the last decade. It is possible for physicians to obtain a Ph.D. degree in Traditional Medicine during a 4 year course. Also, a Traditional Pharmacy (Phytopharmaceuticals) – Ph.D. degree – is available for pharmacists (with PharmD degree). These can be obtained through the schools of traditional medicine in the highest ranked Iranian universities such as Tehran, Shaheed Beheshti, Shahed, Isfahan, Mashhad, etc., Universities of Medical Sciences or departments of traditional medicine and pharmacy in the schools of pharmacy and medicine in Shiraz University of Medical Sciences. These courses are based on Persian Medicine (humoral theory) integrated with the current concepts of medicine. On the other hand, scientific approaches to traditional medicine and ethnopharmacology can reduce the risk of unwanted effects of such traditional methods.

As urinary calculi have always been an important problem in Iran [18], many ethno-pharmacological medicines can be found all around the country. These remedies have a deep root in traditional Persian medicine and have remained throughout history because of their effectiveness. In this regard, by scientific review and evaluating the ethnomedicines using current concepts of medicine, they can be considered as valuable sources to find new drugs, treatments and preventive approaches.

2. Method

2.1. Study area

Urmia is the center of West Azarbaijan province in the northwest of Iran (Fig. 1). This region is mountainous (lowest and highest altitudes of 1420 m and 2280 m, respectively) with cold and semi arid weather. February is the coldest and August is the warmest month of the year. The lowest and highest annual mean temperature is -15.5°C and 33.1°C , respectively. This region is full of medicinal plants [19]. Using ethno-medicines is common and many people practice these traditional methods as treatment of diseases including various types of urinary calculi. For this reason Urmia was chosen as our target to obtain ethno-pharmacological data and compare them with current findings in medicine to reach potential suggestions in prevention and treatment of urinary calculi.

2.2. Data collection

This ethnobotanical study was carried out between November 2013 and December 2013. The methodology of this work was based



Fig. 1. The situation of Urmia in northwest Iran.

on filling out questionnaires and also interviews with traditional healers. A list of traditional healers and also herbal medicines and spice shops (*Attari*) were collected with the help of the Vice Chancellor of Nutrition and Drugs, Urmia University of Medical Sciences. The questionnaire include information about interviewees and ethnobotanicals including their name, usage, part use, route of administration, method of preparation, prescription and instructions on use.

2.3. Collection and identification of plant species

All the mentioned medicinal herbs were collected with the help of traditional healers in the city and suburb. A herbarium specimen of each herb was prepared and sent to herbarium unit of Shahrekord University of Medical Sciences, identified by an herbalist and approved and numbered in the Herbarium Collection.

2.4. Data analysis

All the gathered data were sorted in the Excel 2007 software and analyzed. The ethnopharmacological effects of medicinal herbs were compared with current findings and an attempt was made to present a list of potential natural remedies to find new drugs by future investigations. Also, the frequency of citation of each plant was calculated. It is calculated as percentage of ratio of the number of herbalists referred to each plant as remedy for urinary calculi to the total number of herbalists [20].

3. Results

There were 47 traditional healers (herbalists) working in the spice shops (*Attari*) in Urmia, 35 of whom agreed to cooperate with us. All of them were men, over 18 years old and reported that they saw patients with diabetes who had been diagnosed with a laboratory blood test. A total of 16 medicinal herbs from 13 families were mentioned by traditional healers and numbered in the Herbarium Collection (Table 1). Fig. 2 shows number of plant species per family. As can be seen in the Fig. 3, the most commonly used plant part were the aerial parts and decoction was the main preparation method for use (Fig. 4).

The frequency of citation (FC) for these 16 plants is also shown in Table 2. Five plants including *Alhagi camelorum*, *Rosa canina*, *Muscari neglectum*, *Fraxinus excelsior* and *Xeranthemum*

Table 1
Ethno-medicinal herbs used in Urmia for urinary stones: ethno-medicine and current investigations.

Herbarium voucher numbers	Scientific name	Family	Persian name	English common name	Part use	Ethno- preparation	Current findings/type of study	Ethno-pharmacological uses
443	<i>Alhagi camelorum</i> Fisch	Fabaceae	<i>Khār Shotor</i>	Persian mannaplant	Aerial parts	Infusion, decoction	Excretion of Kidney stones/human study [21] Diuretic/ <i>in-vivo</i> [22] Renal stones and pain relief by Spasmolytic and ureter relaxing action <i>in-vivo</i> [23]	Exertion of Kidney Stones
444	<i>Alyssum desertorum</i> Stapf.	Brassicaceae	<i>Ghoddumeh</i>	Desert madwort	Seed	Infusion, decoction and inhalation (as cense)	-	Exertion of Kidney Stones
445	<i>Amaranthus blitoides</i> S.Wats.	Amaranthaceae	A kind of <i>Taj Khorus</i>	Prostrate amaranth	Aerial parts	Infusion, decoction	Antioxidant/human study [24]	Exertion of Bladder Stone
446	<i>Capsella bursa-pastoris</i> (L.) Medik.	Brassicaceae	<i>Kiseh Keshish</i>	shepherd's-purse	Leaf	Decoction	-	Exertion of Kidney Stones
447	<i>Cerasus microcarpa</i> (C.A.Mey.) Boiss.	Rosaceae	<i>Albalou</i>	A kind of wild cherry	Fruit	Decoction and fresh fruit	-	Exertion of Kidney and bladder Stones
448	<i>Equisetum arvense</i> L.	Equisetaceae	<i>Dom Asb</i>	Common horsetail	Aerial parts	Decoction	Preventive effect on Urolithiasis by saponins/ <i>in-vivo</i> [25] Prevention of forming Calcium Oxalate in kidney tissue/ <i>in-vivo</i> [26]	Exertion of Kidney Stones
449	<i>Fraxinus excelsior</i> L.	Oleaceae	<i>Zaban Gonješk</i>	Ash	Leaf	Decoction	-	Exertion of Kidney Stones
450	<i>Ruta graveolens</i> L.	Rutaceae	<i>Sodab</i>	Rue	Aerial parts	Infusion, decoction	Anti oxidant/ <i>in-vivo</i> [27] Diuretic/ <i>in-vivo</i> [28]	Exertion of Kidney Stones
451	<i>Lamium album</i> L.	Lamiaceae	<i>Gazaneh Sefid</i>	White nettle	Floral branches	Decoction (oral and topical)	Diuretic, antioxidant, kidney problems/ <i>in-vitro</i> [29]	Exertion of Kidney Stones
452	<i>Ononis spinosa</i> L.	Fabaceae	<i>Angosht Arus</i>	Spiny restharrow	Petals, root	Decoction	Anti oxidant/ <i>in-vitro</i> [30]	Exertion of Kidney and bladder Stones
453	<i>Polygonum aviculare</i> L.	Polygonaceae	<i>Alaf Haft Band</i>	Common knotgrass	Aerial parts	Decoction	Anti oxidant/ <i>in-vitro</i> [31]	Exertion of Kidney and bladder Stones
454	<i>Rosa canina</i> L.	Rosaceae	<i>Nastaran</i>	Dog rose	Fruit	Decoction	Decrease risk factors of calcium oxalate urolithiasis/ <i>In-vivo</i> [32] Anti oxidant/ <i>In-vitro</i> [33] preventive agent against the formation of CaOx kidney stones/ <i>In-vivo</i> [34]	Exertion of Kidney and bladder Stones
455	<i>Rosa foetida</i> Hermam	Rubiaceae	<i>Nastaran Zard</i>	Persian yellow rose	Petals	Decoction	Anti oxidant/ <i>In-vitro</i> [35]	Exertion of Kidney and bladder Stones
456	<i>Muscari neglectum</i> Guss. ex Ten.	Liliaceae	<i>Kalaghak</i>	Grape Hyacinth	Bulb	Decoction	Anti oxidant/ <i>in-vitro</i> [36]	Exertion of Bladder Stone
457	<i>Tribulus terrestris</i> L.	Zygophyllaceae	<i>Kharkhasak</i>	Bindii	Aerial parts	Decoction	Diuretic/ <i>in-vivo</i> [37] Diminution of oxalate induced renal tubular epithelial cell injury and inhibition of calcium oxalate crystallization/ <i>in-vitro</i> [38]	Exertion of Kidney and bladder Stones
458	<i>Xeranthemum longipapposum</i> Fisch. & C.A.Mey.	Asteraceae	<i>Arus Sahra</i>	-	Aerial parts	Decoction	-	Exertion of Kidney Stones

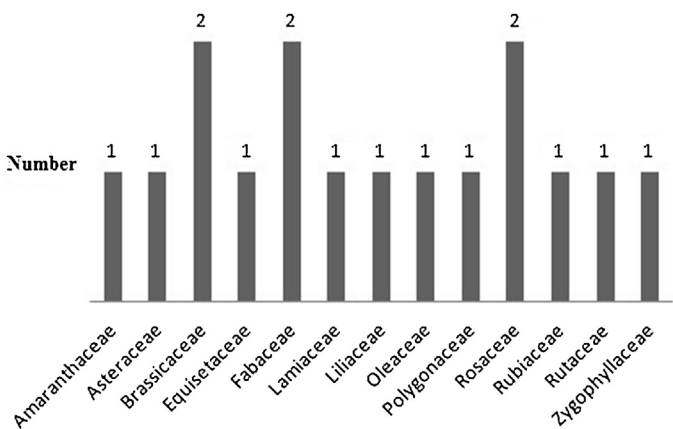


Fig. 2. The plant families and the number of plants in each family.

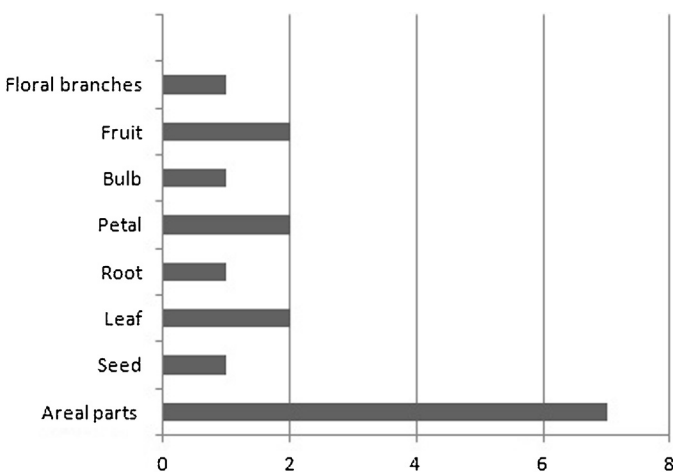


Fig. 3. The number of references to parts of medicinal plant parts used for kidney stone in Urmia.

longipapposum were mentioned by more than 70% of traditional healers as treatment for urinary calculi.

4. Discussion

The list of medicinal plants used for urinary stones in Urmia is shown in Table 1. At least 11 of these plants had scientific research (*in-vitro*, *in-vivo* and human studies) on their pharmacological effects which supported their use for urinary stones. Some of them are strong diuretics. Diuretics (by various mechanisms of actions) are a general group of drugs that help to excrete urinary stones [39]. Also, it is mentioned that membrane injuries can facilitate fixation of the calcium oxalate crystals that lead to growth of kidney calculi. It is mediated by the reaction of lipid peroxidation. So, antioxidants can play an important role to prevent this pathway [40].

Some of the mentioned medicinal herbs in Table 1 are examined *in-vitro*, *in-vivo* or on humans to prevent or treat urinary calculi. *Equisetum arvense* has preventive effect on urolithiasis because of its saponins [25]. Also, it can prevent calcium oxalate forming in kidney tissue [26]. *R. canina* decreases the risk factors of calcium oxalate urolithiasis [29] and plays a role as preventive agent against the formation of CaOx kidney stones due to its high content of vitamin C and flavonoids as anti oxidant agents [34]. *Tribulus terrestris* is a famous medicinal herb in treating kidney stones. Investigations show that it is a strong diuretic [36] and can also inhibit calcium oxalate crystallization [38]. In a human study, *A. camelorum* showed significant effects on the excretion of kidney stones [21].

Among the most frequently cited plants by traditional healers, *Alhagi camelorum* and *R. canina* have current strength support (mentioned in the last paragraph) to exert urinary stones. Also, *M. neglectum* possesses anti-oxidant activity and can be considered to have an effect on urinary calculi. Their popularity among traditional healers as well as scientific support makes them good potential targets for drug discovery. This is a point of convergence between traditional and modern medical systems and can lead to finding the best potential candidates to investigate for discovering new treatments.

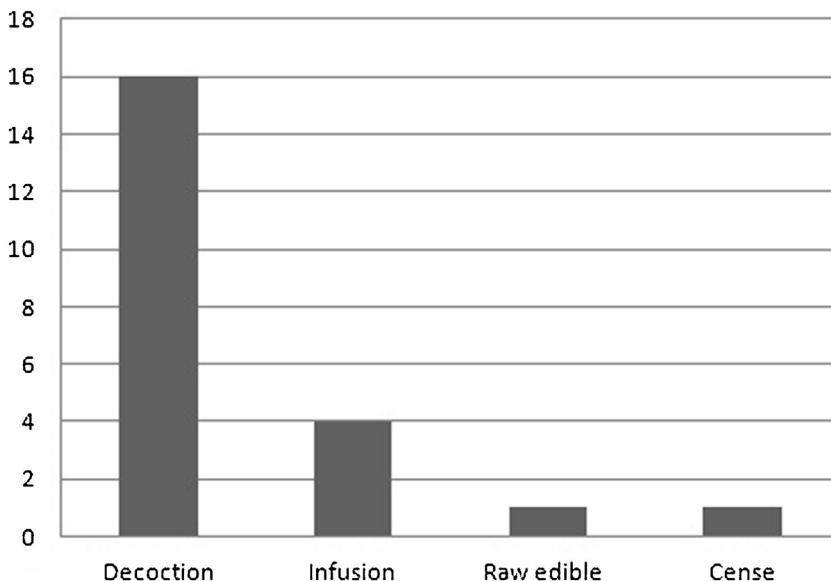


Fig. 4. Preparation methods for using ethno-medicines for kidney stones in Urmia.

Table 2

The numbers of traditional healers (herbalists) have mentioned the use of each plant (frequency of citation).

Scientific name	The number of herbalists mentioned the plant	The total number of herbalists	Frequency of citation (FC) percentage (%)
<i>Alhagi camelorum</i> Fisch	31	35	88.57
<i>Alyssum desertorum</i> Stapf.	7	35	20
<i>Amaranthus blitoides</i> S. Watson	24	35	68.57
<i>Capsella bursa-pastoris</i> (L.) Medik.	10	35	28.57
<i>Cerasus microcarpa</i> (C.A. Mey.) Boiss.	9	35	25.71
<i>Equisetum arvense</i> L.	8	35	22.85
<i>Fraxinus excelsior</i> L.	31	35	88.57
<i>Ruta graveolens</i> L.	7	35	20
<i>Lamium album</i> L.	24	35	68.57
<i>Ononis spinosa</i> L.	10	35	28.57
<i>Polygonum aviculare</i> L.	24	35	68.57
<i>Rosa canina</i> L.	28	35	80
<i>Rosa foetida</i> Herman	21	35	60
<i>Muscari neglectum</i> Guss.	25	35	71.42
<i>Tribulus terrestris</i> L.	11	35	31.42
<i>Xeranthemum longipapposum</i> Fisch. & C.A. Mey.	28	35	80

5. Conclusion

As it is shown in the results, at least 11 medicinal herbs used as ethno-medicines in Urmia had scientific support for their effects on urinary stones. Only four of them were examined for urinary stones and the others have not as yet been examined. Since they have a generation trial as folk medicine and also current investigations support their probable effect. They can be good potential candidates to find new herbal drugs for urinary stones. Also, natural compounds in these plants, such as saponins, flavonoids, vitamins, etc. which seem responsible for their anti calculi effects, can be isolated and can be potential sources remedies against kidney stones.

Author contributions

All research was done by the authors.

Ethical approvals

The protocol of the research was adjusted based on International Society of Ethnobiology (ISE) code of ethics [41] to respect the rights of indigenous peoples, traditional societies, and local communities involved to the study.

Conflict of interest

The authors declare that there are no conflict of interest.

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