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Bioscience Research

Print ISSN: 1811-9506 Online ISSN: 2218-3973

Journal by Innovative Scientific Information & Services Network

RESEARCH ARTICLE BIOSCIENCE RESEARCH, 2020 17(3): 2242-2248. **OPEN ACCESS**

Botanical identification of medicinal herbs used in Jeddah

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Accurate botanical identification of medicinal herbs has been a great concern in their safety and effective therapeutic use, as it exclusively relies on healers' skills, knowledge, and practices. The objective of this study is to assess the knowledge of the healer's herbs on the correct identification for the species of the most requested herb amongst the public in Jeddah, Saudi Arabia and to evaluate the healer's knowledge on medicinal herbs botanical identity. A total of 13 herbal specimens mentioned by all healers were considered as common herbs and included in the study. We found that there was a significant correlation between healer's age, nationality, mother tongue, and years of experience on medicinal plants botanical identity. However, healer's educational status and medical herb/plant course do not affect having healers' medicinal plant knowledge.

Keywords: traditional medicine, herb medicine, correct botanical identity, misidentify

INTRODUCTION

With the global expanded use of herbs to cure several kinds of human diseases, the World Health Organization raises concerns regarding the safety and effectiveness of herbal medicines (WHO, 2004, 2005b). Plants contain hundreds of constituents and some of them may cause allergic reactions or could interact with conventional drugs, where several plants are toxic if used improperly or at high doses. Particular constituents of these medicinal plants are potentially toxic, mutagenic, carcinogenic (Rakotoarivelo, Rakotoarivony et al. 2015, Awodele, Fajemirokun et al. 2018, Ndlovu, Africa et al. 2019).

Proper botanical identification is the foundation of plant safety and efficiency for appropriate medicinal herb consumption. Accidentally substitution or use of the incorrect plant species one of the factors that lead to adverse effects reported from the consumption of herbal medicines (Watson and Preedy 2008, Arora 2012, Ekor 2014, Kamsu-Foguem and Foguem 2014, Moreira, Teixeira et al. 2014, Zhang, Onakpoya et al. 2015, Sen and Chakraborty 2019). Plant natural typically has a similar appearance, multiple synonymous names, and in other cases, the same vernacular name is applied on multiple plant species, which may lead to plant misidentified occurrence (Street, Stirk et al. 2008, Abdullahi 2011, Sen, Chakraborty et al. 2011, Zhang, Wider et al. 2012, Payyappallimana and Serbulea 2013). The procedure of plant identification requires adequate training/education, and commitment effort, involving many methodological decisions and implicit assumptions at every step in the plant identification process (Weisheit and Male 2003, Karunamoorthi, Jegajeevanram et al. 2013).

Healers can provide information about the local name of a plant product, its medicinal uses, and its origins. However, this information may be imprecise, or insufficient for species identification purposes, especially considering that herbalists

often do not possess knowledge of medicinal plants in the wild (Kool, de Boer et al. 2012).

The healers' knowledge, qualification, and experience have a high effect on herbs safety and effective therapeutic use and reduce any risks related to herbal medicine (Sen, Chakraborty et al. 2011, Ahmed 2016, Zhou, Li et al. 2019). In developed countries, drawn up regulations for herbs medicine practitioners, and practitioners are required to complete an official education/training program (Chan 1997, Kassaye, Amberbir et al. 2006). Although the use of herbal medicines is widely used in many developing countries, herbal medicine has not been officially recognized. Consequently, education, training, and research in this area have not been accorded due attention and support. Healers knowledge of medicinal plants relies on experience and observations transferred from generation to generation orally or in writing, making it difficult to identify qualified practitioners (Sen, Chakraborty et al. 2011, Cock 2015).

The objective of this study to assess healers (known as Attars) knowledge on the herb's botanical identity, and to explore healers' characteristics, that influence the awareness for the species of the most requested herb amongst the public in Jeddah Saudi Arabia.

MATERIALS AND METHODS

The study proceeded from May to September 2018 in Jeddah, Saudi Arabia. A total of 21 healers were interviewed and verbal consent was obtained from all healers after research purposes had been explained. The research was divided into the following steps:

Inventory with the most requested herb species they sell.

Healers were visited in their shops and requested to list the names of the most frequently requested herb species. All herbs mentioned were bought from each shop and placed in clear transparent zip-lock plastic bags, and healers (seller) were requested to write all the herb common names. This process was applied to all the 21 healers.

All herbs obtained per healers were organized in Excel spreadsheet 2013. Approximately, 327 herbs that listed were bought from shops to demonstrate the most frequent herb mentioned by healers which is considered to be the common herb they sold. (UV) the value was calculated for each herb according to the following equation:

UV = U/N where UV refers to the use-value of the herb; U to the number of herb citations; and N to the number of healers interviewed.

Botanical identification for herb specimen.

The 13 most common herb specimens were listed and given a code and taken to the lab for botanical identification. The samples were taxonomically identified with the aid of literature taxonomic books and booklets from the library of the University of King Abdulaziz. To determine all herb local/common names, literature search review was conducted on books and scientific articles via databases Google Scholar, ScienceDirect, the Saudi Digital Library, King Abdullah bin Abdulaziz Library using the search terms 'Saudi Arabia', 'Medicinal Plant', 'Herbal', 'common name in English and Arabic, with no restriction on date of publication. All common name for each of the herb previously cited is listed.

Healers herbs botanical identity

To assess healers' herbs correct identity, we compared the herb name given by healer, with the cited common names previously published on literature for the same herb. When the healer herb common name matched with the listed common name, the herb is correctly identified. If the herb name given by the healer did not match with the listed common name, the misidentification herb case is recorded. Interviewed healers' characteristics such as age, education level, nationality, mother tongue, years of experience in this field, had scientific training were recorded.

Data Analysis:

Descriptive statistics were performed using the Statistical Package for the Social Sciences (SPSS) for Windows, version 11.5. Categorical variables were described using frequency distribution and percentages. The relationship between herbs botanical identity and healers' characteristics was assessed by calculating the Pearson's correlation coefficient; healers characteristics were treated as independent variables whereas healers' herbs botanical identity were categorized as dependent variables. A Pearson chi-square test was used to test healers' herbs identity. The level of statistical significance was assumed at P value of < 0.05.

RESULTS AND DISCUSSION

The common herbal medicines used in Jeddah are list in Table 1. More than 272 herbs

samples were bought from herb shops, whereas only (13) herb belong to eight families, which mentioned by all healers were considered very common herbs and included in the study. Interviewed healers' characteristics are summaries in Table 2; The majority of the healers (33%) were range between 31–40 years old age, only (14%) of the participant were fell between 21-31 years, (28%) were 41–50, while (14%) were the oldest 51–60, healers who are more than 61 years old formed only (9%). About 19% of the healers were Saudis nationals, while Arabic nationals' healers formed (43%), and 38% of healers were non-Arabia. the majority of the healers (62%) spoke Arabic while non-Arab healers constituted 38% of healers. Regarding healers education state (24%) of the healers had a diploma, while (19%) of the healers have just primary education, and the same number were able to read and write and (28%) had attended secondary school. two were not learned to read or write (9%). The majority of the healers (85%) had their knowledge about plants from formal education and only one healer (4%) had Additional courses about plant and (9%) percent of the healers did not have any knowledge in plant and herb. about (24%) percent of the healers had between 1-4 years of experience, and (14%) have 5-10 years, and the same percent of healers had more than 16 an experience as herbalist and (48%) healers had between 11-15 years' experience as an herbalist. Pearson correlation analysis was computed to assess the relationship between the healers' characteristics; like age, education level, nationality, mother tongue, years of experience in this field, had scientific training with healers' herb identification. The results of Pearson correlation analysis were illustrated in Table 3. Current research has found that healer's age and experience have a significant effect on healers' herbs identity. The results show that elderly healers were acquired more herb knowledgeable whereas herbs misidentification cases were widely found connected with young healers. Fennell, Light et al. (2004) spotted that lack of knowledge and practice among South Africa traditional healers is an important factor leading to herb substitution that could threaten consumers health and safety. We found healers who have been practicing as herbalists for over 16 years did not commit misidentification events. However, this is not particularly surprising if we consider that old healers accumulated more experiments on herb plants for longer periods than younger ones. This finding is consistent with (Tan, Bakar et al. 2013, Awodele, Fajemirokun et al. 2018, Kováts, Hubai et al. 2018) as it has been found a positive association between healer's experience and adequate herbs knowledge.

The healer's nationality and mother tongue represent a strong influence on healers' herb botanical identification. Our results found that healers who speak the language that is spoken by local people in Jeddah (Arabic) were more knowledgeable about herb identity. Misidentification incidents weren't reported among Arab healers, while all the wrongly labeled cases reported were related to non-Arabic healers. Individuals normally use common names which thus need to be interpreted with the healer definition. World Health Organization (WHO) defined a traditional healer as a person who is recognized by the community in which he lives as competent to provide healthcare by using vegetable, animal, mineral substances, and certain other methods (WHO, 1978b). Based on this description, we can understand that a healer should be a person from the community, having the same language and culture (Ohemu, Sariem et al. 2017). This makes communicating between healers and local people easy and helps to avoid the confusion regarding herbs names, herbs safety, and effective consumption associate with the local language. Commonly people used local common herb names, which may define different herbs to different communities and languages around the world, depending on the region. Distinctive herbs may have the same name, or one herb may have several names. In other cases, the same common name refers to multiple plant species. From the above, it is understood that herb safety and effective consumption are strongly associated with the local language (Abu-Irmaileh and Afifi 2003, Applequist and Miller 2013, Ekor 2014, Dauncey, Irving et al. 2016). Loss of local language is the main factor that leads to the loss of herb knowledge (Beltrán-Rodríguez, Ortiz-Sánchez et al. 2014). Moreover, the results did not confirm any significant correlation between healer's educational level and the herbs identified. To understand this finding, it is necessary to agree on plant identification involving many methodological decisions and implicit assumptions at every step in the process.

Table 1: List of the common herbal medicines used in Jeddah.

Scientific Name	Family	common names
Alpinia galangal (L.) Sw	Zingiberaceae	Gulangan - Adham - Kulangan – Gelengal – Grangal.
Carum carvi L.	Apiaceae	Caraway - Caraway jamal.
Cinnamomum verum J. S. Presl	Lauraceae	Qarafaha – Darisin.
Commiphora myrrha (Nees) Engl.	Burseraceae	Mara - Ewajat - khdsh - Qful – Rshh.
Coriandrum sativum L.	Apiaceae	Kazabrat - Ksabrat - Qlandat - Taqad – Kbazarat - Yqadat – Ksafrah.
Cuminum cyminum L.	Apiaceae	Kamun - Snwt - Zyrat - Kmun Akhdur – Kmul.
Curcuma longa L.	Zingiberaceae	Karkum - zaeafran hindiin.
Foeniculum vulgare Mill.	Apiaceae	Shmr - Shmar - Shmrt - Shumar – Shwmr.
Lepidium sativum L.	Brassicacea	Rshad - Thfa' - Thna'- Hlf.
Linum usitatissimum L.	Linaceae	Bidharat alkitaan - Habat alkitaan- Kitaan aswd.
Nigella sativa L.	Ranunculaceae	Alhubat alsuwda'u - Kmun 'aswud - Habat albarikat - Mubarkt- Swda'- Kamun Aswd- Akhl - Shwnyz - Kmun hindiun.
Pimpinella anisum L.	Lamiaceae	Yanswn- Kmwn hlw- Habat hulwa.
Salvia officinalis L.	Lamiaceae	Miramyt - Mrymyt - Alqseyn.

Table 2 Interviewed healers' characteristics N=21

Variables	Frequency	Percent
Age		
21-30	3	14.3
31–40	7	33.3
41–50	6	28.6
51–60	3	14.3
mor than 61+ years	2	9.5
Nationality		
Saudi	4	19
Arabic	9	42.9
other	8	38.1
Mother tongue		
Arabic	13	61.9
not Arabic	8	38.1
Education level		
Illiterate	2	9.5
Able to read and write	4	19
primary School	4	19
Secondary School	6	28.6
Diploma	5	23.8
medical herb / plant course		
None	2	9.5
formal education courses	18	85.7
Additional courses	1	4.8
Years of experience		
1-4	5	23.8
5-10	3	14.3
11-15	10	47.6
16 +years	3	14.3
Has licensed for practicing herbal medicine.		
No	21	100%
Yes	0	

Table 3: Pearson correlation value

healers' characteristics variables	Pearson Correlation Sig. (2-tailed) p value
Age	0.028
Nationality	0.009
Mother tongue	0.005
Educational status	0.334
medical herb / plant course	0.729
Years of experience	0.012

Traditional methods used to authenticate herbal primarily including morphological, microscopic, chemical profiling, and recently the use of DNA method, this method requires trained experts.(Nandyal, Anami et al. 2012, Techen, Parveen et al. 2014, Ghorbani, Saeedi et al. 2017, Jiao, Huang et al. 2018). However, it is extremely difficult for taxonomists to definitively identify plant genera, and identify closely related species that share remarkably similar morphological characteristics and chemical profiles (Bussmann 2015), This ability and skill stander cannot be achieved from formal school education. Worldwide adequate education and training are a big challenge facing herbs usage. World Health Organization (WHO) determined some issues related to the use of traditional herbal medicines after conducting a survey across 129 countries, among them, lacking education and training, research data, and poor herb quality control (Benzie and Wachtel-Galor 2011, Zhou, Li et al. 2019). Also in India (Sen, Chakraborty et al. 2011) reported that education and training are the first issues associated with India's herbal medicine practices. In the current research, we found most of the healers were not educated or have not received proper training as herbalists professional. In line with this, Saad, Azaizeh et al. (2005) stated that most practitioners in the Eastern region of the Mediterranean have poor knowledge in the identification of species as well as procedures for preparing medicinal therapies. These results support previous studies conducted in neighboring countries such as Jordan (Afifi and Abu-Irmaileh 2000, Abu-Irmaileh and Afifi 2003), Lebanon (Deeb, Knio et al. 2013), and they were not educated and not licensed for practicing herbal medicine. A similar conclusion was reached by (Fennell, Light et al. 2004, Ouarghidi, Powell et al. 2012)that recognize a lack of knowledge and practice are important factors leading to substitution.

CONCLUSION

To avoid the safety-related issues have caused by inaccurate identification of herbal materials, regulation, and legislation of herbal medicines should be enacted to ensure herbal effective therapeutic use and safety. Therefore, strategies regarding several issues are urgently needed, including regulation for herbal products, legislation, the practice of therapies, education, training, and licensing of providers, research, and development that needed for efficient and safe herbal medicine use by all.

CONFLICT OF INTEREST

The authors declared that the present study was performed in the absence of any conflict of interest.

ACKNOWLEGEMENT

The author would like to thank Dr. Najla Alburae and Dr. Mervat Khalifa for their suggestions and support.

AUTHOR CONTRIBUTIONS

Rahma Alshamrani designed and prepared the survey questionnaire, analyzed the data, wrote the manuscript, and approved the final version.

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