

Evaluation for the level of knowledge about herbal medicine use within people and university students in Mutah region

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Abstract

Background: Conventional medication; traditional or folk medicine as well as herbal medicines; have been widely used since ancient times. In Jordan traditional medicines are freely available and self-prescribed as well. No previous study has investigated believes and knowledge with regards to herb-drug interaction in Mutah geographical in Jordan.

Objectives: This study aims to investigate and evaluate knowledge and attitude about self-medication using herbal medicine and its drug interaction among the public in Mutah.

Materials and methods: A questionnaire-based survey conducted. Survey took place in different locations in the Mutah region in Al-Karak city from Jordan, during December 2017 and January 2018. Data analyzed by SPSS.

Results: The majority of responders (82%) use self-prepared herbal preparation. While (56%) go for self-medication rather than visiting a physician. About (63%) participants responded that physicians didn't ask them about if they use any herbal medication and about (50%) not willing to tell their physician about their self-medication. Knowledge about herbs gained from the family in the first place (38%); TV (21%) and friends (15%). Almost (79%) responders agree that herbs are safer and easier to be used compared to physician-prescribed medicine.

Conclusion: A high belief in herbal therapy use. Responders gain their knowledge primarily from their families which they obtain their knowledge primarily from their tradition. They are not aware of their interaction with other therapies. Care-givers in this region should be aware of the high percentage of herbal medicine use and are encouraged to discuss potential use with their patients to avoid future complications.

Keywords

Awareness, Attitude, Herbal medicine, Herb-Drug interaction, Mutah.

Introduction

Traditional medicine is defined by the World Health Organization as “The total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indi-

genous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness” (WHO 2003).

These medicines have been widely used since ancient times, and they are gaining more power despite the development; progression, and advancement in modern healthcare medicine. This medicine applied to treat, investigate, and avert disease in the general public. Commonly, conventional medicines are a complex mixture of several active constituents which may be known or unknown identity (Swerdlow 2000; WHO 2003). As a result, these unknown constituents might augment the possibility of drug interactions and adverse effects. The common old belief that folk derived medicines being natural is safe; led to the growing trust with these medicines. One of the important factors such as low cost and availability from the area around led to the extensive use of herbal medicines worldwide in general and in Jordan specifically.

UK as well as some other European countries has a historical tradition of using herbal medicines (Martins 2013). In these regions this type of medicine is considered as approach for healing that justify their substantial proportion of the global drug market (WHO 2005). Chiropractic one of the best known alternative treatments has been used by 10% of Americans (Aimee 2001). Similar attitude has been reported in other countries as Saudi Arabia (Alkhamaiseha and Aljofan 2020).

In Jordan traditional medicines are freely available and self-prescribed as well. These medicines are not safe or free from side effects, while some are toxic. The major concern about their usage is safety as well as proper procession and preparation. Moreover, as they are sometimes self-prepared or within small scale manufacturing with folk medicine expert humans, they lack adequate labeling; dosing information; suitable quality control; interaction with other preparations, or even food interaction and absence of appropriate patient information. A study by Abdelhalim et al. 2017 (Abdelhalim et al. 2017) showed the most used plant as a traditional medicine in Tafilah region in the south region of Jordan. They did not discuss or evaluate knowledge about the safety or influence of herbal medicine on modern medicine. Siler study by Afifi and Abu-Irmaileh 2000 concerned with herbalist point of view (Afifi and Abu-Irmaileh 2000). Most of the folk medicine consumed in Jordan is non-regulated; lacks scientific evidence and are mostly consumed in the absence of medical advice that threatens the consumer's health. In previously discussed studies by Farrington et al. 2018 as well as Byard 2010. That most of the folk medicine derived preparations in Asia might potentially contain substances or medications that may have a significant negative effect on wellbeing health (Byard 2009; Farrington 2018). This direct to great concern about drug-herb interaction and demonstrate more requirement for extra studies to evaluate the real situation for this problem with societies. Several studies evaluated drug herbs interaction from the modern medicine point of view (Gohil 2007; Hussain 2011; Zimmerman and Kandiah 2012; Posadzki et al. 2013; Moreira et al. 2014).

As mentioned earlier a variety of studies developed to evaluate this situation worldwide. A result demonstrates that most patients do not consider it necessary to disclose

their herbal medicine intake to physicians (Howell et al. 2006). Physicians themselves often have little information about drug-herbs interaction and have little or even no training about the effects of herbal medicines on humans and their possible interaction with folk derived medications (Rivera et al. 2013). Other studies result in that high percentages of patients use the help of traditional medicine preparations before getting the help of physicians and after without disclosed this information for their care-giving person (Klepser et al. 2000). On the other hand, as most of the care-giving physicians have somehow little training about this issue they rarely ask their patients about herbal medicine consumption. Our study is planned to evaluate the knowledge; pattern and awareness of the use of herbal products within Mutah University students as well as the general population (Mutah city) in the south of Jordan, regarding the use of herbal medicines. This would help to improve our knowledge about the scope of the pharmacist counseling skills and for patients as well as recommendations for caregivers in this area. As no enough information available about the exact behavior about this region, this study is needed as starting point for further data collection studies. Moreover, this might evaluate if there is a need for education and training for healthcare providers regarding drug- herb interactions as well as well designed patient counseling programs that are directed for this region.

Methods

Participant

This research is a cross sectional study, in all Mutah citizens who are above 18 age. Survey took place in different locations in the Mutah region in Al-Karak city from Jordan, during December 2017 and January 2018. Exclusion: Pharmacy school students from the second year and higher; medicine school students. Moreover, People who were less than 18 years old and those who did not consent to participate. Inclusion: Students from all other university schools; people of both genders who ≥ 18 years of age at the time of surveying.

Ethical Concerns

The cross sectional study was approved by the Scientific Ethics and Research of pharmacy school at Mutah University (Reference: 02-1/2017/2018). Survey took place in different locations in the Mutah region in Al-Karak city from Jordan, during the December 2017 and January 2018. The objective of the study was explicitly stated to the participants, and then written informed consent was obtained from all participants.

Study design

The participation was completely voluntary without revealing identity in the questionnaire. All the participants

were asked to fill a self-administered questionnaire consisting of 20 questions which included both open-ended and close-ended (multiple choice) questions. The closed-ended questions were provided with 2–4 answer options and participants asked to tick the right option. The questionnaire evaluates the participant's knowledge and practice regarding herbal medicines. Open ended questions considered as data collection source, participants were asked to write which plant remedies, if any, they currently use, for which purpose they were used and how they were applied. The questionnaire was designed in English then translated to Arabic by proficient speakers of both languages and was revised to be suitable to the general population. Participants were randomly selected at the library; cafeteria; and lecture rooms as well as shopping centers and markets. They were given full details of the study and its intended aims then consented to participate. All participants were aware that this study is for research purposes only and their participation was voluntary. No questions were about names or contact information ensuring the privacy of the survey.

Data storage

All collected and questionnaires kept in a secure place, only available to the principal investigator in accordance with the requirement of Mutah University.

Statistical analysis

Data were recorded on a data collection form and entered on a Microsoft Office Excel (2007) spreadsheet. Tables were generated using Microsoft Office Excel (2007). Data were described as counts and frequencies (%) using SPSS version 22.

Results

Demographic data

A total of 1000 questionnaires were distributed, but only 926 were completed given an overall response rate of (92.6%). The majority of the participants were Jordanian with only 2.4% of the participants from other nationalities. As shown in Table 1, the percentage of males and females was 22.4%, and 77.6% respectively. The mean age \pm SD (years) of the total sample was 27.96 ± 14.1 , with a range of 18–70. About 562 (60.7%) participants were university students and or graduated whereas 56% still undergraduate.

Prevalence of herbal medicines usage

During this investigation, we considered that herbal medicine is a natural product either plant or biological materials/preparations that used or intended to be used for therapeutic purposes or alleviation of disease signs and

Table 1. Demographic Characteristics of the Respondents (n = 926).

Variable	N (%)
Gender	
Male	207 (22.4)
Female	719 (77.6)
Marital Status	
Single	610 (65.9)
Married	294 (31.7)
Divorced	4 (0.4)
Widow	13 (1.4)
Education	
Basic	175 (18.9)
Secondary	128 (13.8)
Collage	22 (2.4)
University	562 (60.7)
Occupation	
Student	527 (56.9)
trader	28 (3)
Herbalist	6 (0.6)
Other	332 (35.9)
Student Specialty	
Scientific Schools	217 (41.2)
Medicine	82 (37.8)
Pharmacy	56 (25.8)
Engineering	39 (18)
Nursery	32 (14.7)
Science	6 (2.8)
Dentist	2 (0.9)
Humanities School	
Sports	7
Business	4
Low	3
English	2
Insurance	
Insured	820 (88.6)
Uninsured	106 (11.4)
No. of family member	
≤ 5	274 (29.6)
6–10	556 (60)
11–15	64 (6.9)
>15	8 (0.9)

symptoms without medical advice or supervision. Out of the 926 surveyed individuals, 763 respondents (82.4%) indicated that they have used herbs as an alternative to medicine (Table 2). About 286 out of 763 used herbs as prophylaxis while 477 as treatment. Regarding therapeutic uses, the majority of the respondents claimed to self-treat based on traditional beliefs 525 (56.7%). while regarding preference justification for using herbs overseeing physician, 399 (43.1%) despondence for their safety and 339 (36.3%) for easiness of their use (Table 2).

Practice and use of herbs

To investigate the scientific base for herbs used as medicine participants asked about their source for knowledge. Their answer was as in Fig. 1 that 38% from their families.

To establish the respondents experience with herbal medicine, we asked about Illnesses for which herbs are used. Specifically they asked about their behavior about weight loss” How you would react at weight loss”; mem-

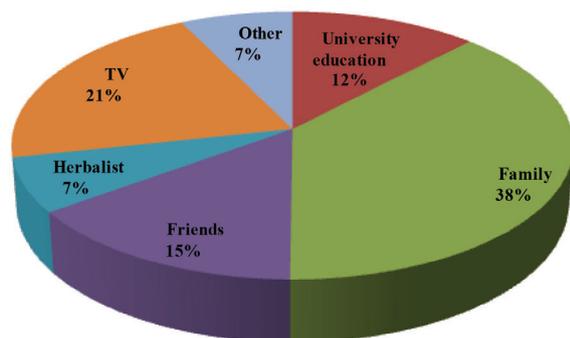


Figure 1. Source of herbal information. The chart shows the sources of information about way and recipes to herbal drugs.

Table 2. Prevalence of herbal medicines usage.

Variable	N (%)	Gender	
		Female (%)	Male(%)
Do you use herbs as an alternative to medicine			
Yes	763 (83.3)	606 (84.3)	157 (76.3)
Prophylaxis	286	226	60
Treatment	477	380	97
No	163 (16.7)	113 (15.7)	50(24.2)
If you exhibit symptom of disease			
Self-medicate with herbs	525 (56.7)	422 (58.7)	103 (49.8)
Visit a physician	349 (37.7)	255 (35.5)	94 (45.4)
Other(go to herbalist, ask a friend or family members ;...)	52	41 (7.2)	11 (5.3)
Prefer using herbs over seeing a physician			
Safer	399 (43.1)	320 (44.5)	79 (38.2)
Easier	339 (36.6)	279 (38.8)	60 (29.0)
Lower cost	98 (10.6)	56 (13.6)	42 (20.3)
Other	78 (8.4)	63 (10.8)	15 (7.2)
Did you receive any education about herbs			
Yes	521 (56.3)		
No	379 (40.9)		
Did Physicians ask about use of herbs			
Yes	323 (34.9)		
No	585 (63.2)		
Do you feel that it's important to tell your physician about herbs you use			
Yes	453 (48.9)		
No	465 (50.2)		

ory enhancement “Plants Locally Used for Memory enhancement”; skin problems” complementary medicine to treat skin problems “and as anti-wrinkles. About 466 (50.3%) used herbs as weight loss remedy, 453 (48.9%) treat skin problems and 141 (15.2%) anti-wrinkles remedy. Data about other uses for traditional herbal medicine was as follows: majority 501 (65.3%) used herbs to treat Cold and Influenza while 114 (14.9%) for Abdominal pain and 78 (10%) for Headache (Fig. 2). When respondents asked for why do they use herbal medicines instead of other standard therapy, a total of 399 respondents out of the 763 users (43.1%) claimed that they use them because herbal medicines have no side effects, 349 respondents (37.7%) believed that herbal medicines are much easier to be used and 98 (10.6%) use herbal med-

icines as they are cheaper to purchase than the standard medicines (Table 2).

As an output for open ended question about any other comment that can be added for their practice. Their parents or family members (patients) didn't tell their physicians that they used herbal medicine instead of prescribed one, and they just go for the physician for monitoring. In cases like cancer, hypertension, post menopause, burns.

Discussion

One of the oldest known forms of therapy is the use of medicinal herbal plants. It is used by a large percentage of the Jordanian population. This may lead to a lot of herb-drug interactions, the cause of which may go unnoticed in several patients due to the lack of knowledge. Herbal medicine is integrated as a crucial part of Jordanian culture and its traditions (Abu-Irmaileh and Afifi 2010; Afifi et al. 2010). In the present study, information gathered such as on age, sex, knowledge, awareness, and usage of herbal medicines as a questionnaire. The data obtained were analyzed and expressed as counts and percentages. The present study shows a significantly high prevalence of herbal preparations uses amongst Mutah people. This agreed with other studies in different regions in Jordan or in Globe (Bishop et al. 2007; Afifi et al. 2010; Radi et al. 2018; Alkhamaiseha and Aljofan 2020; Eid and Jaradat 2020).

Eid and Jaradat have reported several plants used by women during pregnancy in west bank Palestine. While Alkhamaiseha and Aljofan surveyed 1226 responders with 57% used herbal products in Saudi Arabia based on their traditional believes while 34% based on family advice (Alkhamaiseha and Aljofan 2020). Other areas in the world focused on this practice and result in variable attitudes while maintaining the same or less dependence upon plant resources as alternative medicine (Bishop et al. 2007).

In our study 562 participants that are 56.9% of the total participants are students. University education (still or graduated) conforms 60.7% while 32.5% have secondary and basic education. This indicates a high level of education and knowledge. High percent that is 88.6% have medical insurance.

It is clear that this area represented by this small group that has a high prevalence of the use of self-prepared herbal preparations they conform 82.4%. From this group, female represents 84.3% who answered yes in addition to 76.3% of the male group. This represents high practice for herbal and alternative medicine in this area. Females or males both have a high tendency for self-medication 56.7% while 37.7% tend to visit a physician. Taking into consideration that financial issues of little impact as 88.6% are medically insured, it is a matter of believers and attitudes. They believe that they are safer. It is important to highlight that this information about herbs is based on scientific knowledge; it is from family resources (Fig. 1). These recipes or preparations are not oriented by health

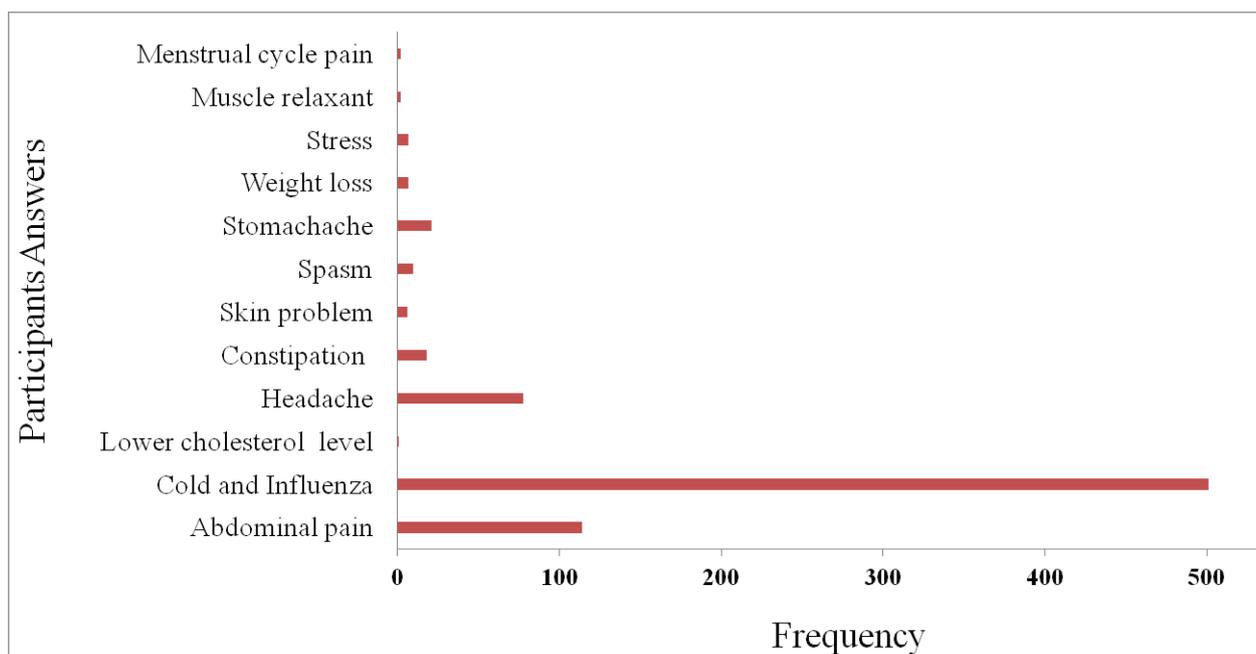


Figure 2. Illnesses for which herbal drugs are used among participants. Participants answer for open-ended question: Illnesses for which herbs are used other than mentioned in the questionnaire.

care professionals or even herbalists. Consequently, safety issues will have an important concern here.

Our results show that the most likely reason for the increase in use is that the participants believe in the safety of herbal medicine, which is in agreement with previous studies about Jordan that suggested the most influencing factor for herbal usage being the belief in the success and safety of herbal medicines (Afifi et al. 2010; Radi et al. 2018; Alkhamaiseha and Aljofan 2020; Eid and Jara-dat 2020). Besides, similar behavior concluded from other near geographic and social areas such as Saudi Arabia. Alkhamaiseh and Aljofan 2020 described the situation of non-scientifically proven herbal medicine usage in Saudi Arabia. They end with high frequency use and a low level of knowledge regarding their risks among participants (Afifi et al. 2010).

Another concern rises here about answering the question if they receive education about herbs. About 56.3% answered yes, this education they means knowledge from family; university education as general information; friends; TV; and community information rather than scientific and health care professionals like physicians or pharmacist as shown in Fig. 1. Even though our participants have appreciated the level of education, they are not willing to tell their physician about their self-medication; about 50.2% of opinions were (No). On the other hand physicians in this geographic area are not aware of the high percent used for herbal medicine and self-medication; about 63.2% of participant responded that physicians didn't ask them about it they use any herbal medication. Taking into consideration as we mentioned earlier responders believe about the safety of this behavior, and lack of knowledge about side effects of herbal medicine, as well as herb-drug interaction, put this the area under pos-

sibilities of the high level of side effects that are not well studied or evaluated. While from other side physicians are not oriented for this issue as from the responder's point of view they don't ask them about their use of herbs in conjunction with drugs, this may lead to failure of therapy as well as serious side effects that make responders believe this attributed to their prescribed medicine rather than herb-drug interactions.

Although most of the herbs used to treat simple self-limited ailments like cold and flu; abdominal pain as well as headache as shown in Fig. 2, we must alarm the importance of a lack of knowledge between responders. As our responders are most of them university students and females they're most general diseases are simple while going to older ages complications are more and side effects are more.

Participants alarm an important issue about their parents or other family member's malpractice about not telling their physicians that they used herbal medicine instead of prescribed one. It's important to go for more well oriented studies to tackle this behavior and to prepare education system for this sector.

Conclusions

The folk use of natural resources as medicine is not scientifically proved for all illness. Moreover, this persistent behavior about self-medication that attributed to believes and thought rather than economic problems in the absence of health care specialists allocate a high-risk practice. Accordingly, better regulations needed from pharmacist as well as physician's point of view with other health care professionals. This can be attained by focused on public

awareness and education about herbal therapies and behavior. In the present study, the majority of responders (82%) use self-prepared herbal preparation. While (56%) go for self-medication rather than visiting a physician. About (63%) participants responded that physicians didn't ask them about if they use any herbal medication and about (50%) not willing to tell their physician about their self-medication. Knowledge about herbs gained from the family in the first place (38%). Almost (79%) responders agree that herbs are safer compared to physician-prescribed medicine. Physicians and care-givers in Mutah region should be aware about the use of herbal medicine among wide range of people. Pharmacists and Physicians have to discuss possible risk of this behavior with their patients to avoid future complications and malpractice.

Awareness about traditional medicine use may lead to remarkable changes in the practice; maximize health care services delivered to patients and minimize side effects attributed drug-herb interactions.

Limitations

The first drawback of the study is that most of our responders are university students; this did not reflect all behavior in this region. The second drawback is most of the responders are female and this doesn't reflect the actual male-female ratio. Moreover, this reflects most of the female behavior rather than all people here. This can be overcome in the next stage to target all possible places and more directed surveys as well as introduce males to collect data as they can deal with another male because females sometimes find it difficult to deal with male responders or vice versa.

This study provides preliminary concern, that can be considered by Mutah University to integrate ethnobotanics and

ethnopharmacology subjects in the curricula of all faculties as elective as well as health faculties as mandatory courses.

Author's contribution

AHA: study design, data collection, data analysis, conducting the study, statistical analysis, drafting the manuscript; revising manuscript content, approving final version of manuscript and supervised the study and writing the final approval. AA: conducting the study, data collection, data analysis.

Ethical approval

All procedures in the study involving human participants were in accordance with the ethical standards of the Scientific Ethics and Research committee of Mutah University of school of pharmacy ((Reference: 02-1/2017/2018), and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Declaration of competing interest

The authors declare that there is no conflict of interest.

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References

- Abdelhalim A, Aburjai T, Hanrahan J, Abdel-Halim H (2017) Medicinal Plants Used by Traditional Healers in Jordan, the Tafila Region. *Pharmacognosy Magazine* 13(49): 95–101. <https://doi.org/10.4103/0973-1296.203975>
- Abu-Irmaileh BE, Afifi FU (2003) Herbal medicine in Jordan with special emphasis on commonly used herbs. *Journal of Ethnopharmacology* 89(2–3): 193–197. [https://doi.org/10.1016/S0378-8741\(03\)00283-6](https://doi.org/10.1016/S0378-8741(03)00283-6)
- Afifi FU, Abu-Irmaileh B (2000) Herbal medicine in Jordan with special emphasis on less commonly used medicinal herbs. *Journal of Ethnopharmacology* 72(1–2): 101–110. [https://doi.org/10.1016/S0378-8741\(00\)00215-4](https://doi.org/10.1016/S0378-8741(00)00215-4)
- Afifi FU, Wazaify M, Jabr M, Treish E (2010) The use of herbal preparations as complementary and alternative medicine (CAM) in a sample of patients with cancer in Jordan. *Complementary Therapies in Clinical Practice* 16(4): 208–212. <https://doi.org/10.1016/j.ctcp.2010.05.001>
- Aimee D (2001) Alternative Medicine And Medical Malpractice: Emerging Issues. *Journal of Legal Medicine* 22(4): 533–552. <https://doi.org/10.1080/01947640152750955>
- Alkhamaiseha SI, Aljofan M (2020) Prevalence of use and reported side effects of herbal medicine among adults in Saudi Arabia. *Complementary Therapies in Medicine* 48: e102255. <https://doi.org/10.1016/j.ctim.2019.102255>
- Bishop FL, Yardley L, Lewith GT (2007) A systematic review of beliefs involved in the use of complementary and alternative medicine. *Journal of Health Psychology* 12(6): 851–867. <https://doi.org/10.1177/1359105307082447>
- Byard RW (2010) A review of the potential forensic significance of traditional herbal medicines. *Journal of Forensic Sciences* 55(1): 89–92. <https://doi.org/10.1111/j.1556-4029.2009.01252.x>
- Eid AM, Jaradat N (2020) Public Knowledge, Attitude, and Practice on Herbal Remedies Used During Pregnancy and Lactation in West Bank Palestine. *Frontiers in Pharmacology* 11: e46. <https://doi.org/10.3389/fphar.2020.00046>
- Farrington R (2018) Potential forensic issues in overseas travellers exposed to local herbal products. *Journal of Forensic and Legal Medicine* 60: 1–2. <https://doi.org/10.1016/j.jflm.2018.08.003>

- Gohil KJ, Patel JA (2007) Herb-drug interactions: A review and study based on assessment of clinical case reports in literature. *Indian Journal of Pharmacology* 39(3): 129–139. <https://doi.org/10.4103/0253-7613.33432>
- Howell L, Kochhar K, Saywell R, Zollinger T, Koehler J, Mandzuk C, Sutton B, Sevilla-Martir J, Allen D (2006) Use of herbal remedies by Hispanic patients: do they inform their physician? *The Journal of the American Board of Family Medicine* 19(6): 566–578. <https://doi.org/10.3122/jabfm.19.6.566>
- Hussain MS (2011) Patient counseling about herbal-drug interactions. *African Journal of Traditional, Complementary and Alternative Medicines* 8(5S): 152–163. <https://doi.org/10.4314/ajtcam.v8i5S.8>
- Klepser TB, Doucette WR, Horton MR, Buys LM, Ernst ME, Ford JK, Hoehns JD, Kautzman HA, Logemann CD, Swegle JM, Ritho M, Klepser ME (2000) Assessment of patients' perceptions and beliefs regarding herbal therapies. *Pharmacotherapy* 20(1): 83–87. <https://doi.org/10.1592/phco.20.1.83.34658>
- Ekor M (2013) The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. *Frontiers in Pharmacology* 4: e177. <https://doi.org/10.3389/fphar.2013.00177>
- Moreira DL, Teixeira SS, Monteiro MHD, De-Oliveira ACAX, Paumgarten FJR (2014) Traditional use and safety of herbal medicines. *Revista Brasileira de Farmacognosia* 24(2): 248–257. <https://doi.org/10.1016/j.bjp.2014.03.006>
- Posadzki P, Watson L, Ernst E (2013) Herb-drug interactions: an overview of systematic reviews. *British Journal of Clinical Pharmacology* 75(3): 603–618. <https://doi.org/10.1111/j.1365-2125.2012.04350.x>
- Radi RU, Isleem U, Al Omari L, Alimoğlu O, Ankarali H, Taha H (2018) Attitudes and barriers towards using complementary and alternative medicine among university students in Jordan. *Complementary Therapies in Medicine* 41: 175–179. <https://doi.org/10.1016/j.ctim.2018.09.012>
- Rivera JO, Loya AM, Ceballos R (2013) Use of Herbal Medicines and Implications for Conventional Drug Therapy *Medical Sciences. Alternative & Integrative Medicine* 2(6): e1000130. <https://doi.org/10.4172/2327-5162.1000130>
- Swerdlow J, Heal NP (2000) *Medicine changes: late 19th to early 20th century*. Washington DC, National Geographic Society, 110–191.
- WHO (2003) Traditional medicine. <http://www.who.int/mediacentre/factsheets/2003/fs134/en/> [16 Nov 2016]
- WHO (2005) WHO global atlas of traditional, complementary and alternative medicine. In: Ong CK, Bodeker G, Grundy C, Burford G, Shein K (Eds) *Map Volume*. Geneva, World Health Organization.
- Zimmerman C, Kandiah J (2012) A pilot study to assess students' perceptions, familiarity, and knowledge in the use of complementary and alternative herbal supplements in health promotion. *Alternative Therapies in Health and Medicine* 18(5): 28–33.