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Original Article

Awareness of Natural Herbs' Effect on Blood Pressure among the Western Region of Saudi Arabia Population: A Cross-Sectional Study

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ABSTRACT

Background: Knowledge of potential interaction between herb-drug is essential to reduce both the risk of serious medical disorders such as life-threatening arrhythmia and uncontrolled blood pressure and the increased healthcare cost, because of treating these complications. Therefore, the primary aim of this study was to assess the western Saudi population's knowledge of potential interaction between herbal preparations containing Garlic, Ginger, Cinnamon, or Liquorice when concurrently administered with conventional hypotensive therapy. The secondary aim was to explore the source of information about herbal medicine use. **Materials and Methods:** A cross-sectional survey was conducted from January 2021 to February 2021 and involved Saudi Arabia's population from the western region. The study involved 164 participants by stratified random sampling. **Results:** The commonly used herbs among the western Saudi population included Garlic (44%), Ginger (23%), Cinnamon (13%), Liquorice (3%), and others (13%). Approximately 45.1% of herb user was based on advice from friends or relatives, 38.4% were based on online information, and 16.5% were based on medical resources. Our study showed that 70.7% of the herb users weren't asked by their physicians about using herbal medicine, also 86.6%% weren't asked by their pharmacists. **Conclusion:** The study showed a low percentage of awareness of the potential effect of herbal medicines on blood pressure, and their potential interaction with conventional therapies. The study highlighted the low percentage of healthcare providers, who ask their patients about herbal medicine use before prescribing any new medication.

Keywords: Herbal medicine, Knowledge, Garlic, Ginger, Cinnamon, Liquorice, Hypertension, Drug interaction, Physician, Pharmacist.

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INTRODUCTION

Natural products are important complementary and alternative therapies that can manage multiple health disorders such as hypertension, cardiovascular disorders, diabetes mellitus, and dyslipidemia.[1] Herbal medicine can be defined as medicines that originate from plants either by extraction, purification, heating, steeping, or any other physical methods.[1] The use of herbs as primary care for these conditions is gaining increasing popularity worldwide due to the ease of access, natural origin, perception of high safety, and acceptable efficacy.[2] There was a steady and significant increase in the consumption of herbal medicines over the last decade according to the report of the National Health Statistics Reports (NHSR), 4 out of 10 (40%) of US adults depend mainly on complementary and alternative medicine.[3]

A lot of herbal plants have been found to have significant effects on blood pressure such as garlic, ginger, cinnamon, and Liquorice, although some of them need further studying, and testing for their mechanism of action, adverse effects, and drug interaction.[4] Garlic (*Allium sativum*) showed a significant cardioprotective effect, especially hyperlipidemia in addition to hypotensive action. The main active constituent of garlic is allicin which is responsible for healing benefits, antioxidant, and hypotensive effects in patients with high systolic pressure.[5] Many studies explained the hypotensive effect of garlic by increasing nitric oxide production which leads to vasodilation and smooth muscle relaxation and a significant reduction of 8-hydroxy-2-deoxyguanosine.[6] On the other hand, Garlic showed complicated interactions with Antihypertensive medications as it increases plasma drug concentration and half-life. A definitive therapeutic dose should be well defined to avoid any unintentional fatal interactions.[7]

Ginger is widely used to relax muscles surrounding blood vessels and therefore improve blood circulation and decrease blood pressure as it has Ca^{2+} channel-

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blocking activity like the effect of verapamil.[8] The anti-hypertensive effect of ginger can partly involve the antagonism of serotonin receptors.[9] Concurrent use of ginger continuously with standard antihypertensive therapy may cause blood pressure to drop too low which leads to an irregular heartbeat.[10] Cinnamon showed an important improvement in the treatment of hypertension and lipid profile in many different studies; however, the results of cinnamon studies remain controversial.[11] Cinnamon as a complementary therapy may cause headache, diarrhea, and drug interaction, so designing new studies on the cinnamon's pharmacological effect is required to evaluate its possible side effects in humans.[12] Cinnamon consumption with antihypertensive medications causes multiple pharmacokinetic interactions owing to the additive effects which result in the enhanced hypotensive effect.[10]

Liquorice consumption was found associated with dose-dependent hypertension, while 2-4 weeks of use does not affect its hypertensive effect. Its effect was explained by the Liquorice-induced hormonal changes in response to a 100 g Liquorice consumption for 1 week.[13] Coadministration of Liquorice with diuretics causes severe hypokalemic effect and also potentiates its action.[14] The regulatory authorities put appropriate measures for the herbal remedies use control to ensure that all sold herbal medicines are safe and effective as the efficacy and safety became a major issue with the use of herbal remedies.[2] Pharmacovigilance systems which are responsible for drug interactions and safety of herbal medicine monitoring stated that there is a common belief that natural remedies are safe and have no risk. However, serious health events might be occurred because of the possible drug-herbs interactions, in addition, the patients have limited reliable information resources regarding herbal medicines used as the major information sources on herbal medicines are relatives and friends.[15,16]

Knowledge of potential interactions between herbs and conventional medicine is very important to reduce the risk for serious medical disorders such as irregular heartbeat and life-threatening arrhythmia, uncontrolled blood pressure, and increased healthcare cost. Therefore, Health Care Professionals need to be aware of the importance of monitoring any adverse effects of herbal medicine to prevent any risk of abnormal health conditions.[17] There is a critical need for randomized controlled trials including many participants to evaluate the clinical effect of garlic, cinnamon, Liquorice, and ginger on blood pressure and their interaction with antihypertensive therapies.[18]

Upon checking the studies conducted worldwide regarding awareness of herbal use in HTN, drug herbal interactions were detected. Mansoor, G. A. (2001) highlighted the commonly used herbals which may cause drug interactions in the hypertensive patient and discussed the problems disrupting complete awareness about these interactions.[19] Camara, *et al.* (2016) concluded that the prevalence rate of hypertension was 62.5% with an awareness rate of 34.9%, and a control level of 16.3%. There was a low awareness and hypertension control rate among the adults in Guinea.[20] Regarding studies in Saudi Arabia, Alkharfy, *et al.* (2010) conducted a study for determining the knowledge, attitude, and practice of herbal therapies among pharmacists and ranked the most used herbals which include Ginseng [47%], ginkgo [23%], valerian [17%] and St John's wort [3.5%]. And this study revealed a poor awareness of potential herb-drug interactions.[21] Alghamdi, *et al.* (2018). revealed the high prevalence of herbal medicine use by Saudi patients with chronic diseases. The prevalence of herbal medicine users was (67.65%), with Trigonella foenum-graecum (32.7%), Pimpinella anisum (19.49%), Nigella sativa (17.61%), Green tea (13.83%) and Peganum (5.66%) as the most frequently used. Nearly 88.67% of herb users were without a healthcare professional's consultation. A high percentage of healthcare professionals (90.56%) did not respond to herbal users' questions about herbal medicine.[22-25] Alqathama, *et al.* (2020). reported a high prevalence of herbal medicine use (68.1%) among Saudi patients with type 2 diabetes, and that 50.6% of herb users is due to advice from friends or relatives.[26]

Several studies revealed the high consumption rate of herbals by Saudi patients with chronic illnesses; however, there were no studies that have addressed the population's awareness of herbals' effect on the blood pressure in the western region of Saudi Arabia. Therefore, this study aims to explore the degree of awareness and knowledge about the effect of using herbal preparations of garlic, ginger, cinnamon, or Liquorice concurrently with the standard antihypertensive medicines for both patients and healthcare professionals. As well as identify the source of information and advice about using herbal medicines.

MATERIALS AND METHODS

Study design and setting

A cross-sectional survey was conducted, using an online questionnaire. It was carried out over two weeks; starting from January 2021 to January 2021, and involved Saudi Arabia's population from the western region; Makkah, Jeddah, El Medina El Munawara, Al-Taif, and Al-Lith.

Sampling and recruitment strategies

The study involved a selected sample using stratified random sampling. The questionnaire was piloted among adult persons, aged above 18 years old, who live in the western region of Saudi Arabia. Patients with hypertension only or with other additional chronic diseases were included. Participants who are representative of all educational levels were recruited.

Study questionnaire

The questionnaire was designed to address the study objectives after reviewing relevant literature.[1,19-21] It was conducted in Arabic for the patients' convenience. It is consisted of 21 questions which were divided into two partitions; the first part was regarding the demographic characteristics of the participants such as age, country, education level, job, gender, health status, and the commonly used herbals. The second part was about evaluating the knowledge of the herbal effects on the blood pressure, information source, prescription or personal use, enhancement, complementary usage, and alternative usage. [Available in English as supplementary material].

Data collection and analysis

Data were collected from all participants using a structured data form; the data included demographic data, types of chronic diseases, level of education, employment status, and place of residence. The data also included the herbal product used, frequency of use, the reason for use, and whether the healthcare provider asked about the use of herbal medicine.

All obtained results were analyzed using EXCEL 2020 software. Both descriptive and analytic statistics were applied. For descriptive data, results were presented as percentages, and frequencies.

Ethical approval

Ethical approval was obtained from Umm al-Qura university institutional review broad Approval Number (HAPO-02-K-012-2021-04-652), and informed verbal consent was also obtained from all participants.

RESULTS

Participants

A total of 164 persons from the western region of the Kingdom of Saudi Arabia were included in the study. We excluded 36 persons from outside the western region and included only those from the western. The demographic and clinical data of the participants are presented in (Table 1). About 84.1% (*n*=138) of the participant were females and 15.9% (*n*=26) were males. Most of the participants 58.5% (*n*=96) were between the ages of 41-65 years, 15.2% (*n*=25) of them were between 18-29 years, 17.1% (*n*=28) were between 30-40 years, and only 9.1% (*n*=15) of the participants were older than 65 years.

Regarding the education degree, many of the participants 50% (*n*=82) were university students, 24% (*n*=48) were high school students, 26.2% (*n*=43) were preparatory education and middle school students, 11% (*n*=18) were post-graduate students, 6.7% (*n*=11) were uneducated, and other. Most of the participants were unemployed 69.5% (*n*=114) and the rest of them were either non-healthcare providers 23.8% (*n*=39) or healthcare providers 6.7% (*n*=11). Most of the participants 66.5% (*n*=109) were hypertensive patients, while 33.5% (*n*=55) of them were non-hypertensive. Nearly, 57.9% (*n*=95) of the participants were suffering from hypertension mainly, while 42.1% (*n*=69) suffered from additional chronic diseases such as diabetes mellitus (4.8%), asthma (3%), heart diseases (1.8%), thyroid disorders (1.8%), and others (Table 1).

Table 1: Demographic characteristics of the study participants (*n*=164).

Demographic Data	Number of Participants	Percentage (%)
Gender		
Females	138	84.1%
Males	26	15.9%
Age		
18-29	25	15.2%
30-40	28	17.1%
41-65	96	58.5%
Older than 65 years	15	9.1%
Region		
• Western regions of KSA	• 164	99.8%
• Makkah	• 94	57.3%
• Jedda	• 54	32.9%
• El Medina El Munawara	• 5	3%
• Al-Taif	• 5	3%
• Al-Lith	• 6	3.6%
Education Level		
Uneducated	8	4.9%
Preparatory education / Middle School Students	18	11%
High School Students	43	26.2%
University Students	82	50%
Post-Graduate	11	6.7.6%
Other	2	1.2%
Job		
Healthcare providers	11	6.7%
Non-healthcare providers	39	23.8%
Unemployed	114	69.5%
Hypertension		
Hypertensive	109	66.5%
Non-hypertensive	55	33.5%
Additional chronic diseases		
Yes	69	42.1%
No	95	57.9%

Outcomes

The data in (Figure 1) Suggests that the most common herbal products consumed in the western region of Saudi Arabia are; Garlic 44% (*n*=72), followed by Ginger 23% (*n*=38), Cinnamon 13% (*n*=21), Liquorice 3% (*n*=5) and then others 13% (*n*=21) e.g., roselle nigella, anise, fennel, fenugreek, and lavender), while only 4%(*n*=7) don't ever use the herbs in their life.

The daily herbal utilization can be considered limited to 17.7% (*n*=29) among Saudi Arabia's population in the western region, the majority of the participants used herbals only, if necessary, 66.5% (*n*=109), 7.9% (*n*=13) of the participants never used herbal in their life, and 2.4% (*n*=4) of them take herbals several times daily, while only 5.5% (*n*=9) use herbals once weekly. (Figure 2).

The data in (Figure 3) shows that 36.6% (*n*=60) of the participants believe that herbal products work synergistically with medications to produce an effect greater than the effect of the single constituent, while 18.9% (*n*=31) of them reported that herbal medications are individual agents that act separately and are not affecting the other. 44.5% (*n*=73) of them deny knowing any effect between herbals and other conventional medications.

Furthermore, most of the participated population 66.2% (*n*=107) thought that herbal medicines are efficacious as a complementary

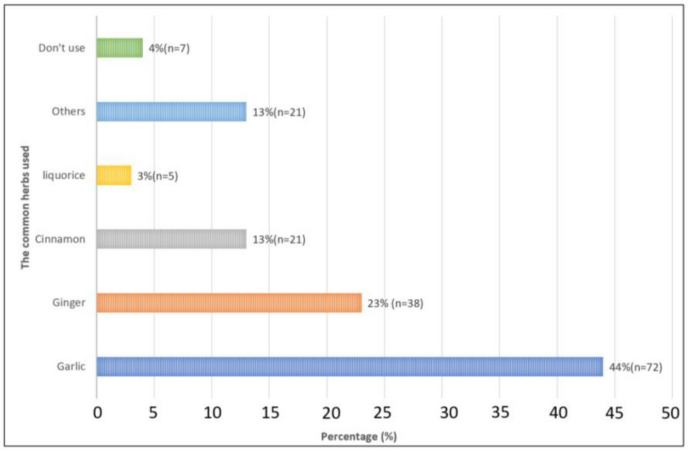

Figure 1: The Common Herbs Used Among Participants.

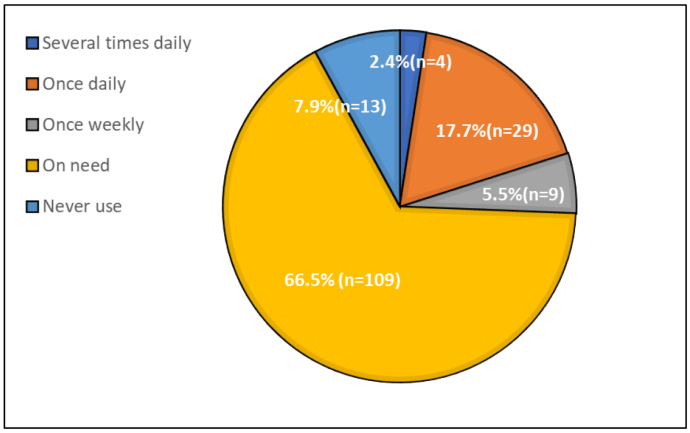

Figure 2: The Frequency of The Herbal Uses.

therapy that can enhance blood pressure. About 27.4% (*n*=45) did not know the effects of the herbals on blood pressure either beneficial or harmful, and only 7.3% (*n*=12) of them disagree that the use of herbals has a significant beneficial effect on blood pressure (Figure 4).

This figure shows that many of the participants 90.2% (*n*=148) are convinced that herbal preparations cannot be used as an alternative therapy. However, it may be used as complementary therapy only. A very minor percentage of the participants 9.8% (*n*=16) thought that herbal preparations can replace conventional medicines (Figure 5).

About 23.2% (*n*=38) of the study population think that the efficacy of herbal medicine may be decreased upon the continuous herbal utilization, while 27.4% reported that the prolonged use of herbals does not affect their effectiveness and there is no correlation between the duration of use and the efficacy of herbal medications. About half of the participants 49.4% (*n*=81) answered that they have no information about the correlation between the herbal consumption duration and their efficacy (Figure 6).

There was a vast difference in the participants' opinions about the safety of the herbal compared with conventional medicines. However, many of the participants 47.6% (*n*=78) believe that herbals are very safe and have lower side effects in comparison with the traditional medicines. Only 23.8% (*n*=47) of the participants thought that herbals have some adverse effects and should be used under the supervision of a physician, and about 28.7% (*n*=47) of the participants were not aware of the safety of herbals (Figure 7).

About 48.2% (*n*=79) of the participants observed that concurrent herbals consumption affects their blood pressure. While 25.6% (*n*=42) denied any effect of herbals on the blood pressure, and 26.2%(*n*=43) of the participants did not use the herbals (Figure 8).

Results have shown that most participants 45.1%(*n*=74) used herbals source of information from friends or relatives, followed by online information 38.4%(*n*=63), then 12.8%(*n*=21) from their physicians and 3.7%(*n*=6) from their pharmacists (Figure 9).

The results show that the majority of the participated population 77.4%(*n*=127) tend to use herbal medicines personally without the healthcare provider's advice or the pharmacist, while only 20.1%(*n*=33) of them ask their healthcare providers about the possibility of herbals use concurrently with the traditional medicines, at the same time, the rest of the participants do not use herbal preparations to avoid any interactions with the traditional medicine (Figure 10).

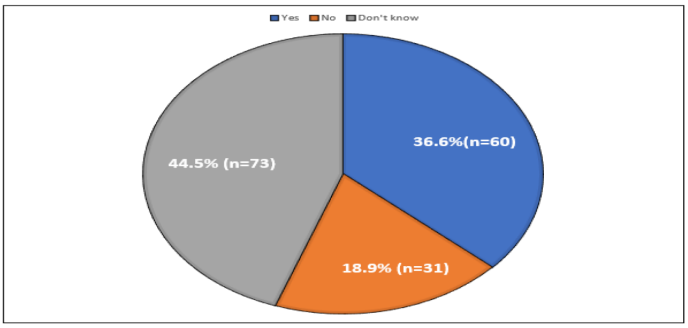

Figure 3: Participants' Knowledge about the Effect of Herbal Product in Combination with Conventional Medication.

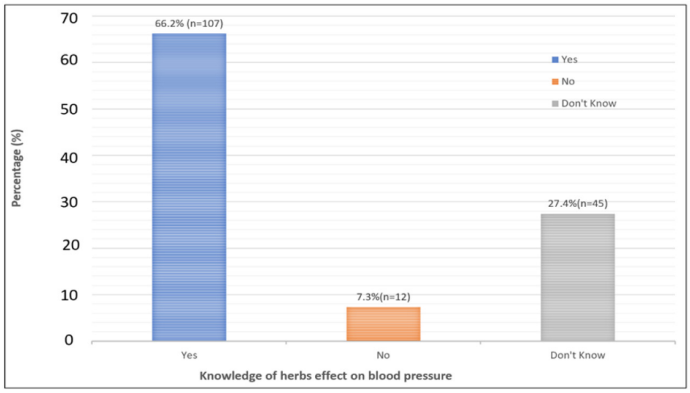

Figure 4: Measuring Participant's Knowledge of Herbs' Effect on Blood Pressure.

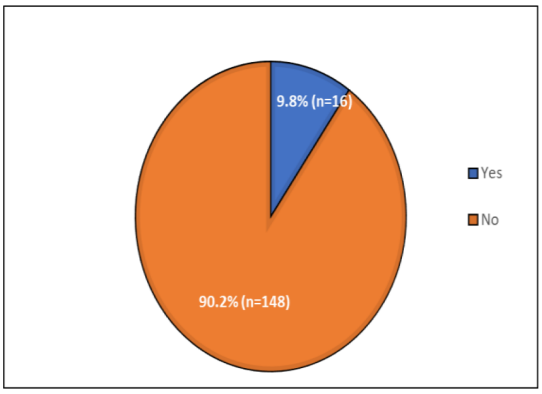

Figure 5: herbal preparations are alternative to complementary antihypertensive.

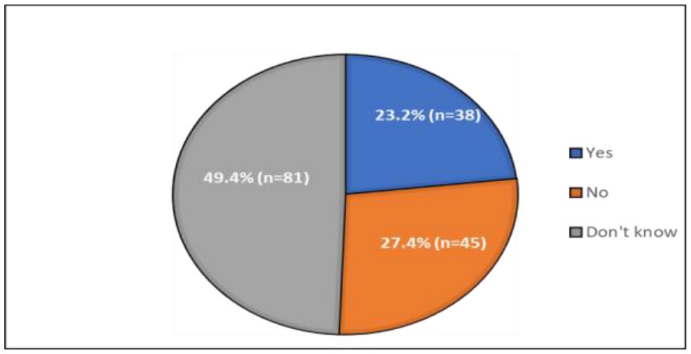

Figure 6: Herbals efficacy upon continuous utilization.

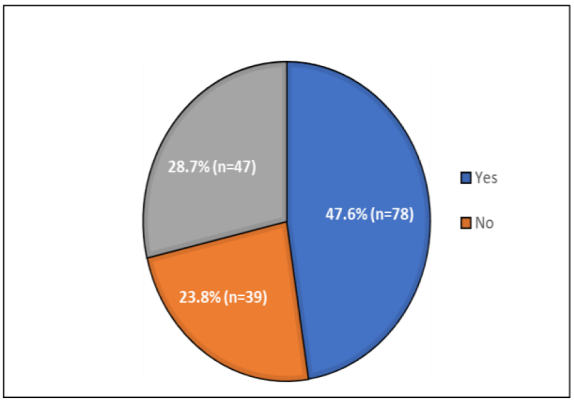

Figure 7: Knowledge about herbal safety and side effects.

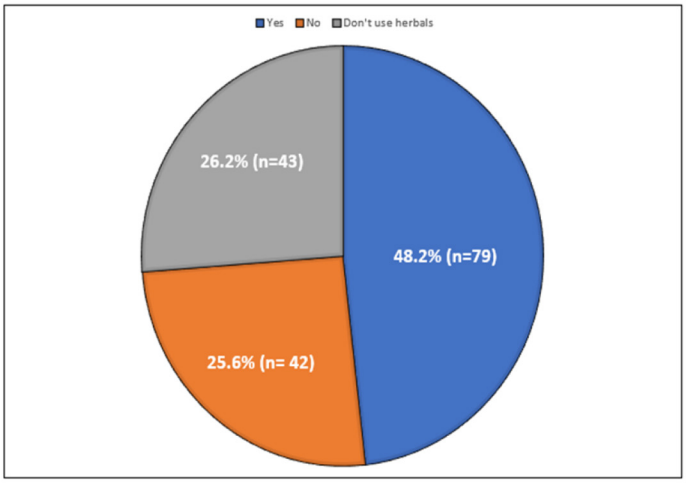

Figure 8: The Effect of the Herbals on the Blood Pressure.

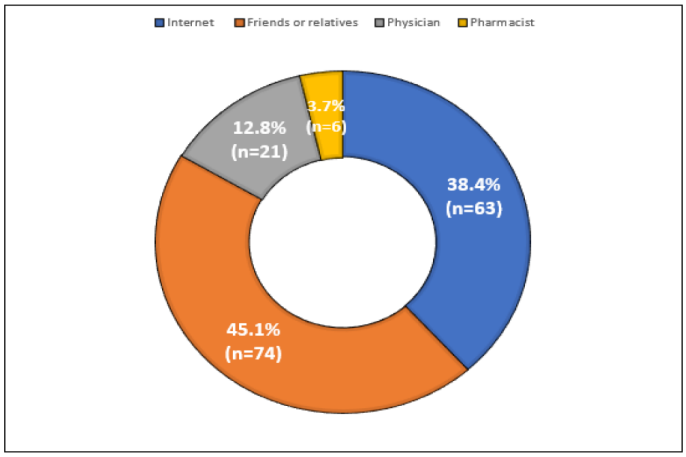

Figure 9: Source of Information about Herbal Uses.

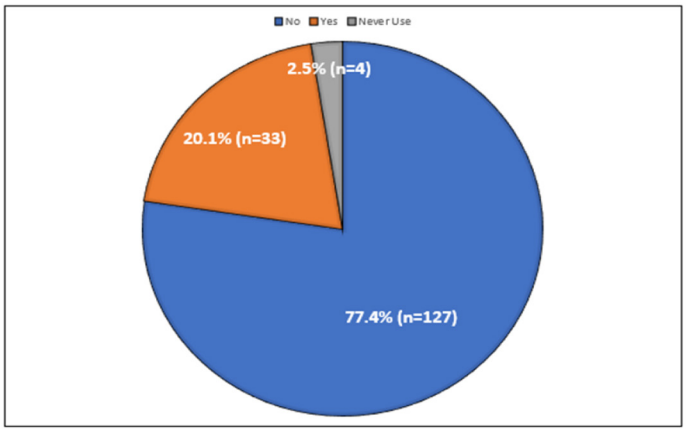

Figure 10: Participants' Attitude towards Seeking Advice about Herbal Preparations Usage.

The results of the questionnaire show that 29.3% (*n*=48) of the study population confessed that their physicians asked them about herbal consumption before recommending any medications. While 70.7% (*n*=116) of them answered that their physicians do not care about

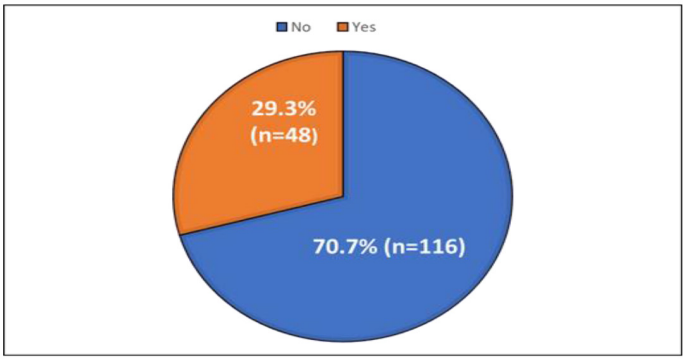

Figure 11: The participants answer regarding whether the health care provider asks them if they use the herbs: (A) Physician question about whether you use herbals.

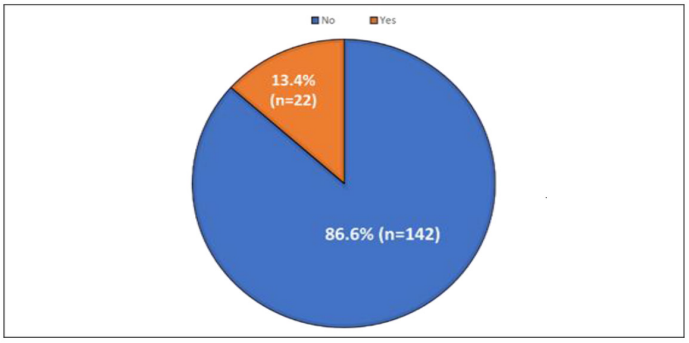

Figure 12: (B) Pharmacist question about whether you use herbals.

concurrent herbal preparations. 13.4% (*n*=22) of the participants answered "yes" that their pharmacist asked them whether they use herbal medicines or not and 86.6% (*n*=142) answered "NO" as their pharmacist ignore the concurrent consumption of herbals (Figure 11,12).

DISCUSSION

Several studies were carried out regarding the use of herbal medicine among Saudi patients with chronic illnesses. However, there is no study addressing the population's awareness of herbals' effect on blood pressure, in the western region of Saudi Arabia.

Alghamdi reported a high prevalence of herbal medicine use (67.65%) among Saudi patients with chronic illnesses including HTN, from the southern region of Saudi Arabia, as the following: with *Trigonella foenum-graecum* (32.7%), *Pimpinella anisum* (19, 49%), Nigella sativa (17.61%), Green tea (13.83%) and Peganum (5.66%) as the most frequently used. Nearly 88.67% of herb users were without medical consultation.[25]

Alqathama reported a high prevalence of herbal medicine use (68.1%) among Saudi patients with type 2 diabetes, from Makkah as the following: cinnamon (23.1%), ginger (19.2%), fenugreek (9.3%), and others as garlic, anise, and black seed. This might be explained by the known ability of these herbal medicines to manage type 2 diabetes. Nearly 71.4% of herb users were without medical consultation.[26]

In our study hypertensive patients used herbal medicines which are different from what is reported in the two previous studies: Garlic (44%), Ginger (23%), Cinnamon (13%), Liquorice (3%), and others (13%). These differences might be explained by the known ability of these herbal medicines to reduce blood pressure (except for Liquorice), so were more preferably used by hypertensive patients, who composed 66.5% of our study sample. Nearly 77.4% of herb users were without medical

consultation. This high percentage of herb users without medical consultation is consistent with what has been reported by Alghamdi (2018) and Alqathama (2020).

Alghamdi reported that the source of information about herbal effects and uses was 85.46% due to advice from friends or relatives and only 14.5% based on medical resources.[25] Alqathama reported that 50.6% of herb users are due to advice from friends or relatives and 39.6% by online information.[26]

Our study reported that 45.1% of herb users are due to advice from friends or relatives, 38.4% by online information, and 16.5% based on medical resources. Our study showed a similar percentage of patients consuming herbal products based on online information, to that reported by Alqathama.[26] This highlighted the need for the Saudi ministry of health platforms, to provide accurate and recent updates to patients and healthcare providers, rather than low quality and doubtable websites, to assure patient safety.

Our study is consistent with the findings of both studies of Alghamdi and Alqathama, in that the most common source was family and friends and the least used source was medical resources.

Our findings regarding healthcare professionals asking their patients about the use of any herbal medicines before prescribing any medication were consistent with Alghamdi *et al*. who reported more than 90% of the healthcare workers didn't ask their patients about the use of herbal medicine.[25] Our study showed that 70.7% weren't asked by their physicians and the rest were asked, also 86.6%% weren't asked by their pharmacists and the rest were asked. However, Alqathama reported almost two-thirds of their participating doctors (66%), routinely ask their patients about using any herbal products for their condition.[26]

The low percentage of healthcare providers, who ask their patients about herbal medicine use before prescribing any new medication, highlighted the urgent need for education and awareness about herbal products use among both patients and healthcare professionals, and the necessity of taking a full history of any used herbal product by any healthcare provider in hypertensive patients.

Our study showed that many of the participants (66.2%) thought that herbal medicines are effective therapy that can enhance the conventional therapy effect and 47.6% believed that herbal medicine is very safe. This was in accordance with Alqathama *et al*. who reported that about half of their participants (54%) believed in herbal medicine efficacy and safety (46%) in treating their condition.[26] This high perception among the participants regarding the efficacy and safety of herbal medicine highlighted the necessity of educating the patients about the possible harmful effects of these products when used without medical consultation and supervision.

Based on our data, it showed a relatively low percentage of the awareness about the potential effect of herbal medicines on blood pressure. Also, a relatively low percentage regarding patient perception about potential interaction when concurrently administered with conventional therapies. It showed a low percentage of the knowledge about the appropriate duration for herbal product consumption. However, a relatively high percentage 90.2%, were aware that herbal products are complementary therapy only, not an alternative to the conventional therapy.

Strengths of our study include that it is considered the first preliminary cross-sectional study assessing the awareness regarding herbal medicine use when taken concurrently with conventional hypotensive medicine, in the western region of Saudi Arabia. Also, it enrolled patients from various age groups, including the elderly, various educational levels, and from all over the western regions, various jobs, and even unemployed, to yield a representative study sample as possible, despite the small numbers.

Limitations of our study include that 84.1% of our sample was females, who are reported to have higher rates of herbal medicine use than males.[26] In addition, the small sample size limits the generalizability. So further future studies with a larger sample size to provide a better representation of the whole population, are required. The discrepancy regarding the percentage of the herbal medicine non-users was explained by being an online questionnaire, not a face-to-face interview. Also, many of the participants were from Jeddah and Makkah, while participants from El medina, Al-Taif, and Al-Lith were under-represented.

Future implications of our research are that further studies are required to establish the safest dose for herbal products when concurrently administered with hypotensive medications to assure patient safety. Also, further studies are recommended to assess the change in awareness after implementing educational approaches for both the patient and healthcare professionals.

CONCLUSION

The use of herbal preparations containing garlic, ginger, cinnamon, or Liquorice, is common among the Saudi population in the western regions. Many herbal users were hypertensive patients, who didn't consult their health care providers either the physician or the pharmacist about using them concurrently with their conventional hypotensive therapy. The study highlighted the low percentage of healthcare providers, who ask their patients about herbal medicine use before prescribing any new medication. Also, the main source of information about using herbs were friends and relatives rather than medical resources. As well, our study showed decreased awareness about their potential effect on blood pressure and decreased awareness about potential interactions when concurrently taken with hypotensive medications. Also showed decreased knowledge about their efficacy, safety, and appropriate duration for consumption.

ACKNOWLEDGEMENT

We want to thank all participant who participated in this study.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

NHSR: National Health Statistics Reports; **Ca^{2+}:** Calcium; **HTN:** Hypertension.

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GRAPHICAL ABSTRACT

SUMMARY

Several studies were carried out regarding the use of herbal medicine among Saudi patients with chronic illnesses. However, there is no study addressing the population's awareness of herbals effect on blood pressure, in the western region of Saudi Arabia. The study highlighted the low percentage of healthcare providers, who ask their patients about herbal medicine use before prescribing any new medications. Also, the main source of information about using herbs were friends and relatives rather than medical resources. As well as our study showed decreased awareness about their potential effect on blood pressure and decreased awareness about potential interactions when concurrently taken with hypotensive medications. Also showed decreased knowledge about their efficacy, safety and appropriate duration for consumption.

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