Research Paper

Attitudes and Belief among the Population in Saudi Arabia about the Consumption of Herbal Products for the Prevention of COVID-19 Infection: A Cross-Sectional Study

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The purpose of this study was to assess the Saudi population's perceptions about the use of herbal products to prevent coronavirus disease 2019 infection in Saudi Arabia. Here, 803 subjects participated in the online survey, which was cross-sectional in nature and self-administrated. The study included all Saudi Arabian adults, whereas pregnant women were excluded. Participants who decided to participate in the study filled out the questionnaire completed by 803 people. During the coronavirus disease 2019 pandemic, most participants were aware of alternative and complementary medicines, whereas 60.1 % obtained their knowledge from social media sites. Prior to online shops/pharmacies and homemade remedies, the traditional apothecary was the most common source for alternative and complementary medicines. About 56 % of participants ($p<0.05$) did not believe that the complementary and alternative therapies could prevent or treat coronavirus disease 2019 infection, whereas 53.9 % of them considered safe. Only 22 % of those who took part in the survey agreed that alternative and complementary therapies could successfully combat coronavirus disease 2019 and could be used as a substitute for vaccines. Finally, our study found that during coronavirus disease 2019, medicinal plants and other complementary and alternative therapies were used and considered to be more effective.

Key words: Coronavirus disease 2019, severe acute respiratory syndrome coronavirus 2, herbal medicines, alternative and complementary medicines

The world's current Coronavirus Disease 2019 (COVID-19) pandemic originated in Wuhan, derived from the novel strain coronavirus known as "Severe Acute Respiratory Syndrome Coronavirus 2" (SARS-CoV-2)[1]. It is the seventh member of the Coronaviridae family to infect humans and is the only cause of this infectious condition[2]. Direct contact with infected patients through coughing and/or sneezing could be attributed to the rapid transmission of COVID-19. Furthermore, two new transmission pathways, namely aerosol transmission and contact transmission, have been identified[3]. Saudi Arabia reported the first case of COVID-19 in March 2020 and then the virus started to propagate steadily more throughout the whole country. Now-a-days, preventive and curative battles for COVID-19 have focused on discovering vaccines and specific therapeutic agents targeting SARS-CoV-2[4]. There are some potential therapeutic agents for COVID-19 treatments, such as antiviral agents, dexamethasone; however, several protocols still show conflicting results. The deficiency of treatment options for COVID-19 has enhanced many concerns among people worldwide, which has led to many endeavors to find alternative options to prevent the transmission of the disease or to mitigate the progression of the infection through focusing more on preventive side and the use of natural products and herbal extracts to raise immunity and diminishing the probability of getting infected[5]. These herbal compounds are assumed to have the activity to regulate the immune response. Therefore, they are believed to have beneficial effects on preventing or treating COVID-19[6,7]. During the pandemic, various pharmaceutical companies presented their herbal products commercially. Consequently,

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based on the information from the advertisements on television, radio and online media, people strive to shop for these herbal products to fight against COVID-19. Unfortunately, this community behavior was begun without a clear research base on the herbal effects of COVID-19. Research that describes the relation between herbal drugs and the molecular mechanisms of COVID-19 infection, treatment and prevention remains to be investigated[8].

Despite the benefits of using herbal products, there is a considerable drawback, namely the herbal-drug interaction. Posadzki *et al.* reported the potential interactions between herbal medicinal products and drugs, categorized as minor, moderate and severe. Their study showed that the combination of herbal medicine and drugs resulted in some cases in life-threatening conditions[9]. Unfortunately, a recent report showed that about 80 % of developed countries populations still depend on herbal medicines without any control[10,11]. Many investigations have been undertaken on COVID-19 to see if it can be treated using antiviral herbal medications that are already well-known. Furthermore, there has been significant growth in the usage of this type of treatment among people concerned about getting COVID-19, without considering the potential adverse effects of some drugs. With this study, we explore Saudi Arabians knowledge and attitudes on COVID-19 beliefs about the use of herbal medicines to prevent or treat COVID-19 infection.

MATERIALS AND METHODS

Ethical considerations:

The data collection processes were systematic and no personal details were obtained from the participants. During the study and data analysis, the data collected was kept strictly confidential. The World Medical Association (WMA) Declaration of Helsinki: Ethical standards for medical research involving human beings, as approved by the 59th WMA (ECM#2021-5510), Seoul, Korea, was followed in this study.

Study design and the questionnaire:

This is a self-administrative cross-sectional questionnaire-based study that was carried out in the Saudi Arabian general population. The total number of people who participated in the study was 803, with a 100 % response rate. Except for the pregnant woman, all adults were included in the study. A survey was created using an online platform. There were three sections to the questionnaire. Participant's demographics were examined in the first section, Section I, which focused on their region of residence in the Kingdom of Saudi Arabia, their age and educational level, and their monthly income. The second section (Section II) aimed to determine the knowledge of herbal medicines that would be used to defend against COVID-19 and other relevant sources and information of herbal medicines. The third section was required to determine whether herbal remedies effectively prevent the COVID-19 (Section III). Participants were given the questionnaire in Arabic. An expert in the field of linguistics assessed the study's language. The study was carried out for 3 mo.

Statistical analysis:

Data was processed and analyzed using the Statistical Package for the Social Sciences (SPSS) version 20 (IBM Corp., Armonk, NY, USA). Frequencies and percentages were used to describe categorical variables. The Chi-square test was used to analyze the results. Statistical significance was considered as a p value of less than 0.05.

RESULTS AND DISCUSSION

A total of 803 subjects agreed to participate in the current study and completed the questionnaire. About 37 % (n=295) of the participants were male and 63 % (n=508) were female. About half of the study sample were residents of the Southern region in Saudi Arabia (n=378) and bachelor's degree holders (n=405). Somewhat below two-thirds of the participants had a monthly income of less than Saudi Arabian Riyal (SR) 9000. The full demographic information for the study participants is listed in Table 1.

A higher proportion of the study participants heard alternative and complementary therapies during the COVID-19 pandemic, p value<0.001 (Table 2). Just below two-thirds (60.1 %) of those got the information about alternative and complementary therapies from social media platforms and about 30 % referred to their family and friend's experiences. As shown in fig. 1, the most popular alternative and complementary therapy used to prevent or treat COVID-19 infection were vitamin C, followed by black seeds. Herbal admixtures obtained from traditional apothecaries were not used extensively in preventing or treating COVID-19 infections. A small minority of the study participants have used other alternative and complementary therapies to treat or prevent COVID-19 infection. Examples included honey, lemon, olive oil, ginger, clove, garlic, onion, turmeric, anise and yogurt.

TABLE 1: DEMOGRAPHIC INFORMATION OF THE PARTICIPANTS (n=803)

Characteristics	n (%)
Mean age	803 (100)
29.74 (9.26)	
Gender	
Male	295 (36.7 %)
Female	508 (63.3 %)
Region	
Southern	378 (47.1)
Northern	76 (9.5)
Central	173 (21.5)
Western	109 (13.6)
Eastern	67 (8.3)
Qualification	
Less than high school	15 (1.9)
High school	295 (36.7)
Diploma	6 (0.7)
Bachelor	405 (50.4)
Postgraduate studies	82 (10.2)
Monthly income	
Less than SR 9000	480 (59.8)
SR 9000-15 000	227 (28.3)
More than SR 15 000	96 (12)

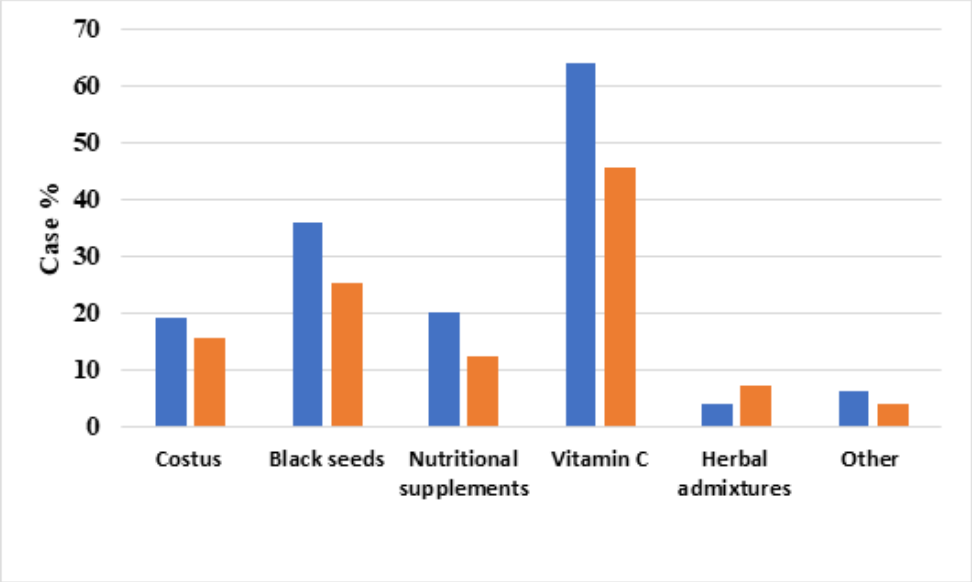

Fig. 1: Participants use of alternative and complementary therapies during COVID-19 pandemic, (■) Preventing COVID-19 infection; (■) Treating COVID-19 infection

The traditional apothecary was the most popular source for obtaining alternative and complementary therapies, followed by online shops/pharmacies and homemade preparations (Table 2).

Just above half (54.3 %) of the study participants indicated that they did not check the products obtained from traditional apothecaries for purity, storage conditions, expiry date, active ingredients and strength. However, about 58 % of those who get the products from online shops outside Saudi Arabia indicated that they did check whether the Saudi Food and Drug Authority (FDA) approve the product.

About 56 % of the participants did not believe that complementary and alternative therapies are evidence-based for preventing or treating COVID-19 infection, $p<0.05$ (Table 3). When asked about what to do when hearing about the benefits of complementary and alternative therapies, around half of the study sample indicated that they would search trusted sources before using them. The majority of the participants (82.4 %) indicated that taking multiple alternatives and complementary therapies without professional consultation could cause serious adverse events such as organ failure or even death. Likewise, the majority reported that they would seek a doctor/pharmacist consultation before taking any herbal products if they are already on Over-the-Counter (OTC) drugs or other drugs for chronic diseases.

Only around half (53.9 %) of the study participants disagreed that all alternative and complementary therapies are safe and if it is not beneficial, it will not cause harm. The majority (76.1%) thought that alternative and complementary therapies might contain active substances with biological effects and is not safe for everyone (Table 4). About two-thirds of the study sample agreed that herbal therapies might be toxic due to their chemical structure and might result in organ failure or even death. Only 22 % of the participants agreed that alternative and complementary therapies might effectively fight COVID-19 and are alternatives for vaccines.

TABLE 2: PARTICIPANTS PRACTICE TOWARDS THE USE OF ALTERNATIVE AND COMPLEMENTARY THERAPIES DURING COVID-19 PANDEMIC

Question	n (%)	p value
Heard of alternative and complementary therapies during COVID-19 pandemic		0.000
Yes	706 (87.9)	
No	97 (12.1)	
Sources of information about alternative and complementary therapies during COVID-19 pandemic		0.000
Social media	424 (60.1)	
Family and friends experience	213 (30.2)	
Prophet Mohammed speech	64 (9.1)	
Scientific articles	4 (0.6)	
Source of acquiring alternative and complementary therapies		0.000
Traditional apothecary	282 (37.5)	
Online shops/ pharmacy	238 (31.7)	
I prepare them myself	202 (26.9)	
Other	29 (3.9)	
If your source is traditional apothecary, do you check the product for purity, storage conditions, expiry date, active ingredients and their strength?		0.021
Yes	129 (45.7)	
No	153 (54.3)	
If your source is online shops outside Saudi Arabia, do you check whether or not the product is approved by the Saudi FDA?		0.000
Yes	139 (58.4)	
No	99 (41.6)	

Note: *Chi square test, $p<0.05$ is considered significant

TABLE 3: PARTICIPANTS ATTITUDES AND PRACTICE OF ALTERNATIVE AND COMPLEMENTARY THERAPIES

Question	n (%)	p value
Do you think that complementary and alternative therapies are evidence-based for preventing or treating COVID-19 infection?		0.001
Yes	318 (43.6)	
No	411 (56.4)	
What do you do if you hear recommendations about benefits of complementary and alternative therapies?		0.000
I search trusted resources before using it	393 (49)	
Seek a doctor/pharmacist consultation	132 (16.5)	
Seek traditional apothecary consultation	32 (0.4)	
I do not use them	238 (29.7)	
Other	7 (0.9)	
Do you think that taking multiple alternative and complementary therapies without professional consultation could cause serious adverse events such as organ failure or even death?		0.000
Yes	659 (82.4)	
No	141 (17.6)	
What do you do if you would like to take herbal therapies and you are already on OTC drugs or other drugs for chronic diseases?		0.000
I take the herbal product anyway	168 (22.1)	
I seek a doctor/pharmacist consultation	585 (76.9)	
Other	8 (1.1)	

Note: *Chi square test, $p<0.05$ is considered significant

TABLE 4: PARTICIPANTS ATTITUDES TOWARDS ALTERNATIVE AND COMPLEMENTARY THERAPIES

Question	Disagree	Neutral	Agree	p value*
All alternative and complementary therapies are safe and if it is not beneficial it would not cause harm	433 (53.9)	201 (25)	169 (21)	0.000
Alternative and complementary therapies may contain active substances that have biologic effects and are not safe for everyone	92 (11.5)	100 (12.5)	611 (76.1)	0.000
Herbal therapies might be toxic due to its chemical structure and might result in organ failure or even death	118 (14.7)	151 (18.8)	534 (66.5)	0.000
Alternative and complementary therapies might be effective for fighting COVID-19 and are alternative for vaccines	413 (51.4)	213 (26.5)	177 (22)	0.000

Note: *Chi square test, $p<0.05$ is considered significant

Owing to their chemical diversity and important role in the development of novel drugs, medicinal plants have attracted the attention of manufacturers all over the world[12,13]. In 2021, Khadka *et al.*[14] published a study that investigated the use of medicinal plants to prevent the COVID-19 in Nepal. The study found that the utilization of medicinal plants has increased during COVID-19 pandemic and most respondents recommended medicinal plants for preventing COVID-19. In our study, most participants had heard about the feasibility of using alternative and complementary therapies during COVID-19. Effective treatment for COVID-19 is not available yet[15]. In our study, most of the information about alternative and complementary therapies was obtained from social media. This can be attributed to the wide availability of social media tools to the population, especially during the restriction period applied by the Saudi government and nearly all the world. These tools can be used to improve or enhance patient education and care and public health programs[16].

The participants in our study used mainly vitamin C, as well as black seeds to prevent or treat COVID-19. In general, vitamin C has several mechanisms of action that are relevant to severe respiratory infections. These mechanisms include immuno-modulatory, anti-inflammatory, antioxidant as well as antithrombotic functions. Evidence from clinical trials of pneumonia and sepsis patient's, and preliminary observational and interventional studies of patients with COVID-19 suggests that the administration of vitamin C might improve COVID-19 outcomes[17]. Alshammari *et al.* investigated the role of the COVID-19 pandemic on Dietary Supplements (DS) awareness, beliefs and consumption among the Saudi population. Their study showed that COVID-19 did not affect DS consumption decisions. Most DS reported in this study was vitamins/ multivitamins. Participants in this study believed that vitamin C plays a vital role in preventing cold[18].

Another study by El Alami *et al.* focused on the most medicinal plants used during this pandemic in Morocco[19]. The authors identified 23 medicinal plant species belonging to 11 botanical families used during the COVID-19 pandemic. The most important families were that of the Zingiberaceae, Cupressaceae and Lamiaceae. The most used plants were *Olea europaea, Allium sativum, Zingiber officinale, Allium cepa, Foeniculum vulgare, Thymus maroccanus, Curcuma xanthorrhiza, Eucalyptus globulus, Phoenix dactylifera, Rosmarinus officinalis, Mentha pulegium, Thymus satureioides* and *Pimpinella anisum*[20-32].

A recent study carried out in the Kingdom of Saudi Arabia reported that over one-fifth of respondents (n=5258) to a survey reported utilization of herbal products during the COVID-19 pandemic since they believe in the efficacy of these products in preventing COVID-19[33]. The Complementary and Alternative Medicines (CAM) utilized for preventing and relieving symptoms related to COVID-19 (such as fatigue, loss of smell and breathing difficulties) included recitation of Quran or meditation, Hijama (cupping therapy), massage, acupuncture, specific nutritional tonics and herbs such as dates, honey, peaches, figs, olives, garlic, black cumin seeds and chamomile[34]. *Nigella sativa*, when combined with ground chamomile and honey, was referred to as prevention and treatment potential[35].

Our study showed that most participants obtained alternative and complementary therapies from the traditional apothecary, followed by online shops/ pharmacies and homemade preparations. Compared to Khadka *et al.*[14], the participants in their study reported that they obtained medicinal plants from home gardens, markets and jungles (45.61 %, 32.03 % and 10.73 %, respectively). The rest of the participants obtained medicinal plants from all of the above three sources. 47 % of participants were cultivating more medicinal plants during COVID-19 than before and only 3 % just started. Unfortunately, participants in our study did not tend to develop these medicinal plants in their gardens. This type of activity might provide the advantage of sustainable conservation of medicinal plants. The information source is the key to the utilization of medicinal plants. It is somewhat dangerous to follow social websites and depend on them because the accuracy and usefulness of messages about COVID-19 offered by social media such as YouTube have not been investigated. However, in our study, similar to what was reported by Khadka *et al.*[14], a large number of participants were reported engagement in social media for obtaining information about COVID-19.

Moreover, most of our participants (54.3 %) did not check the products obtained from traditional apothecaries for purity, storage conditions, expiry date, active ingredients and strength. Conversely, most of those who get the products from online shops outside Saudi Arabia reported, checking whether the Saudi FDA approves the product. Most of the reported adverse effects associated with the utilization of herbal products can be attributed to the poor quality of the product or its improper use. Potential contributors to these events

include inadequate regulatory measures, weak quality control systems and largely uncontrolled distribution channels (such as internet sales and mail orders)[36]. We, therefore, recommend using official websites of the World Health Organization (WHO) and national health authorities as a source of information about COVID-19.

Most of the participants in our study did not believe that complementary and alternative therapies are evidence-based for preventing or treating COVID-19 infection. This is resealable since reports from WHO and national health authorities did not indicate an approved medication, whether herbal or non-herbal, for treatment or prevention of COVID-19. Around half of the study participants indicated that they would search trusted sources before starting the use of complementary and alternative therapies. This is generally contrary to what was reported in studies by Khadka *et al.*[14] and Bhagavathula *et al.*[37] that most participants did not depend on either national health authorities or WHO for obtaining information about these products. Our study showed that most participants (82.4 %) indicated that taking multiple alternatives and complementary therapies without professional consultation could cause serious adverse events such as organ failure or even death. Likewise, the majority reported that they would seek a doctor/pharmacist consultation before taking any herbal products if they are already on OTC drugs or other drugs for chronic diseases. However, we see that finding such information can be a daunting task. Firstly because of lacking data regarding efficacy and safety that are derived from standard clinical trials; secondly, bibliometric studies report that much information regarding CAM is scattered in several journals and published in many languages[38].

Moreover, relevant information can be found only in the "gray literature," which can be challenging to locate. Gray literature includes pamphlets, trade journals, market research reports, and conference proceedings[39]. In their study investigating the information-seeking behavior among healthcare professionals who seek information regarding CAM, Owen *et al.*[40] reported that healthcare professionals were frequently unable to locate the needed information regarding CAM. Additionally, most healthcare professionals were found to have inadequate knowledge of existing CAM resources and depended instead on MEDLINE.

Our study design as an online survey-based study which constitutes the major limitation of the study, additionally, the questionnaire was delivered mainly to educated participants who can use social media and understand the issue and respond appropriately to the questionnaire. This might be a potential source of bias and limits the ability to generalize the findings of our study. However, during the extreme conditions of COVID-19 and the related governmental regulations, online connections with participants can be a prime method of obtaining information.

In conclusion, our study showed increased utilization and beliefs related to medicinal plants and other types of CAM during COVID-19. The utilization of CAM was related to demographic and social factors. Similarly, the source for obtaining these products varied depending on demographic and social aspects. It is recommended to get information about these products from trusted sources such as WHO and national authorities.

Conflict of interests:

The authors declared no conflict of interest.

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