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Prevalence of Using Medicinal and Edible Plants During the Covid-19 Pandemic in Taif-Saudi Arabia

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ABSTRACT

In early January 2020, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was identified as the agent responsible for coronavirus disease 2019 (COVID-19). Recently, a high percentage of patients show a high interest in natural medicines. This is mainly due to the general feeling that natural medicines are safer than synthetic drugs. This study is designed to measure the prevalence of medical and edible plants during the (COVID-19) pandemic in Taif-Saudi Arabia. A cross-sectional study was conducted. Data was collected online using a Google forms survey. The online questionnaire was distributed to participants aged 18 years or older, living in Taif city. The data were analyzed by using IBM- SPSS version 25. In this study, we collected data from 325 participants where 76.9% of the participants were females. Considering the use of plants, 25.7% of the participants reported using Cinnamon while 20% of the participants reported using Star anise. Among the users of plants, family and friends were the main advisors of using these plants at 44.62% followed by social media at 23.69%. Moreover, 62.4 % of the participants reported using plants to protect against COVID-19 while 37.5 % reported using plants in relieving the symptoms of COVID-19. There is a significant increase in the trend of using herbs and natural products among Saudi populations, due to the COVID-19 pandemic. Cinnamon, Star Anise, and pomegranate were the main reported plants to be used by the participants.

Key words: *Medicinal and edible plants, Cinnamon, Star anise, Covid-19 pandemic, Saudi Arabia*

INTRODUCTION

In early January 2020, the cause of coronavirus illness in 2019 was determined to be the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (COVID-19). The global spread of this virus has caused a pandemic. It may spread directly through droplet transfer from person to person and by indirect contact with infected things. The majority of COVID-19 patients have mild to moderate flu-like symptoms, such as fever, myalgia or weariness, and a dry cough, but more serious instances can result in consequences such as acute respiratory distress syndrome (ARDS) and multiple organ failure. It had been reported that Through a pathologic process involving excessive inflammation and interference with coagulation that causes clot formation, organ tissue damage (particularly in the lungs), multiple organ dysfunction syndrome, septic shock, and ultimately death, "cytokine storm" is the primary cause of ARDS and multiple organ failure in COVID-19 patients [1].

Patients with COVID-19 are often treated with symptomatic therapy such as antiviral medications (including lopinavir/ritonavir), which frequently have disappointing results. Most significantly, COVID-19 is most likely to develop into a conventional epidemic that lasts for an extended period because of the high infectiousness of

SARS-COV-2. In order to prevent and treat viral infections, nutritional supplements or functional meals may be of utmost importance [2].

Patients have recently shown a lot of interest in natural remedies. This is mostly because there is a perception that natural remedies are safer than synthetic ones [3]. Till now, there is no specific treatment for COVID-19, but some herbal medicines have safety margins that are used as an adjuvant in the treatment of early/mild cases of COVID-19 [4]. The natural bioactive chemicals that act on SARS-CoV-2 as an antiviral, anti-inflammatory, immune-regulating, and organ protective mechanism are the main focus of the potential processes behind the activity of natural products in treating COVID-19 [2]. The following are some medicinal and edible plants that had been reported to possess beneficial effects against the COVID-19 virus. Tea leaves contain polyphenols such as catechin, caffeine, and smaller amounts of other xanthines such as theophylline and theobromine [5]. The main ingredient in green tea, epigallocatechin-3-gallate (EGCG), offers several health benefits, including antiviral characteristics. Its antiviral capacity against SARS-CoV-2 was tested. Together with the Middle East respiratory syndrome virus (MERS-CoV) and the severe acute respiratory syndrome coronavirus (SARS-CoV), EGCG also prevented the entrance of SARS-CoV-2 and prevented viral infections in vitro. Inhibition of the SARS-CoV-2 spike-receptor interaction was seen in terms of mechanism. EGCG might therefore be used as a lead structure to create more potent anti-COVID-19 medications [6].

Another family of polyphenols present in black tea is theaflavins (TFs). Theaflavin (TF1), theaflavin-3-mono gallate (TF2A), theaflavin-3′-mono gallate (TF2B), and theaflavin-3,3-gallate are some of them (TF3). The potential binding sites on SARS-CoV-2 were recently discovered and their interactions with tea polyphenols were examined by recent in silico activity of tea polyphenols on COVID-19. TFs, particularly TF3, and EGCG have demonstrated a substantial interaction with the receptors. Further docking experiments highlight the effectiveness of these polyphenols against COVID-19. These articles and studies support the idea that tea polyphenols might be used to prevent and cure COVID-19 [7]. Formulation is Boiled and drunk [8].

Ginkgo biloba can lower the risk of respiratory infections, these mechanisms include quercetin and other constituents, which have anti-inflammatory and immune-modulating effects, it has been used topically as an efficient treatment for active lesions, such as (varicella-zoster virus, HSV-1 and HSV-2). By its therapeutic effects, ginkgo biloba may help treat those who have coronavirus COVID-19 infection [9]. Elderberry contains a group of flavonoids called anthocyanins, which may have immunomodulating and possibly anti-inflammatory effects. The inhibitory effect of elderberry on viral infections (influenza A and influenza B and H1N1 viruses) is due to anthocyanins that can attach to viral glycoproteins that enable viruses to enter host cells. Therefore, elderberry has potential benefits in treating COVID-19 symptoms [10]. Costus roots may have a possible role in the treatment of COVID-19 in Saudi Arabia, where its use has dramatically grown among the general public during the epidemic [11].

The chemicals found in mushrooms are thought to either have direct antiviral effects by preventing viral enzymes, viral nucleic acid production, viral adsorption and absorption into mammalian cells, or indirect antiviral effects through immune-stimulating activities. It has antiviral, anti-inflammatory, immunomodulatory, and protective effects on lung function that can also be used to treat COVID-19 [12].

Fenugreek is a source of saponins, flavonoids, choline, carotene, and essential oils. The seeds and green leaves are used in food as well as medicinally. It showed an efficient inhibition of 3CLpro, the main protease of COVID-19 [13]. *E. purpurea* may be a significant antiviral agent that can combat COVID-19 by modifying viral entrance, internalization, and reproduction [14]. It is beneficial in the treatment of COVID-19. Echinacea administration had been hypothesized to reduce cytokine storm-related levels of pro-inflammatory cytokines [1]. All of the consequences of COVID-19 infection, including pulmonary fibrosis, diffuse alveolar damage, pneumonia, acute respiratory distress syndrome, concomitant septic shock, lung injury, and kidney disease, can be treated by onion [15].

The 4-furanodien-6-one contained in Myrrh also works by blocking the NF-B protein complex, which is involved in DNA transcription regulation. As a result of this action, neuro-inflammation is reduced, resulting in anti-inflammatory activity. So, there is a chance that myrrh might be useful in treating the present COVID-19 instances [16]. The root of liquorice is consumed and used medicinally. In recent studies, the most common mechanism of antiviral activity is attributed to preventing viral uptake into host cells known as ACE2 situated in the respiratory tract and gastrointestinal system [3]. Curcumin offers various beneficial therapeutic effects that might help manage the symptoms of the COVID-19-infected patient, including antiviral, antinociceptive, anti-inflammatory, antipyretic, and antifatigue properties [17].

Garlic has been proven to have antiviral, antifibrotic, antioxidant, anti-inflammatory, and immunomodulatory. Garlic is effective in preventing pulmonary fibrosis, lung damage, and sepsis-related organ failure, all of which are symptoms seen in patients with severe COVID-19 infection. All of the symptoms reported in people infected with COVID-19, including acute respiratory distress syndrome (ARDS), pulmonary fibrosis, pneumonia, and inflammatory diseases like sepsis, may be treated with ginger extract [15]. Papaya leaf extract boosts thrombopoiesis and dramatically raises platelet counts in mouse models and dengue patients. Moreover, an in vitro experiment reveals that papaya leaf extracts may help to maintain the erythrocyte membrane, which would stop hemolysis. Hence, it may have potential positive benefits for COVID-19 patients [15].

Pomegranate peel (Punica granatum F. Punicaceae)

The human active metabolite urolithin A may also contribute to the bioactivity of pomegranates. Pomegranate polyphenols are thus great candidates for prospective therapeutic use since they may reduce the SARS-CoV-2 S-capacity glycoproteins to bind to the ACE2 receptor [18]. *Formulation:* Fruit juice, a decoction of seeds, and dried bark [8].

Cinchona bark (Chincona spp. L., F. Rubiaceae)

Quinine possesses antiviral immunosuppressive, and immunostimulant properties. However, because of the potential for different negative events, it is not advised that healthy individuals regularly consume this herbal treatment to prevent COVID-19 [19].

Star Anise (Illicium verum F. Magnoliaceae)

It is an aromatic plant that serves as one of the key components of Chinese herbal remedies and is well-recognized for its antiviral properties. The consumption of star anise fruit powder is recommended for the relief of abdominal pain, cough, digestive disorders…. etc. Its broad therapeutic and immunomodulatory properties suggest its use for COVID-19 mitigation and management [20].

Cinnamon

It is also termed as Darchini, Ceylon cinnamon, and real cinnamon. Its pharmacological properties include anti-inflammatory, antioxidant, and anti-proliferative properties. Cinnamon is a valuable, potent medicinal plant. Overall, due to multi-targeting therapy, cinnamon, and its components can be suggested for SARS-CoV2 control [21]. Eucalyptus essential oil is used to treat upper respiratory conditions, particularly viral infections, by inhaling it to reduce nasal congestion [22].

Black cumin seed

The antiviral, antioxidant, anti-inflammatory, immunomodulatory, bronchodilatory, antihistaminic, and antitussive properties of N. sativa have been linked to the etiology, symptoms, and indications of COVID-19 [23]. Cloves are used in traditional medicines to treat respiratory ailments, whilst clove ingredients show antiviral and anti-inflammatory properties. All these attractive features highlight its potential in the fight against the COVID-19 disease [24].

Basil

These refined extracts have been used in traditional Chinese medicine to treat measles in children and to cure adenoviruses and enteroviruses. So, continuing research into basil as a therapeutic agent for treating coronavirus is justified by the possibility of using it to treat viral infections in the raw or refined form [25].

Black pepper

Vesicular stomatitis Indiana virus (an enteric virus), human parainfluenza virus, and coxsackie virus type B3 (CVB3) were all susceptible to the antiviral effects of black pepper (a respiratory infection-causing virus). Yet black pepper contains immune-suppressing qualities [26]. The use of Sumac extracts may be advantageous, according to an assessment of the most recent information, as shown by clinical trials, on the features of COVID-19 infection, its pathophysiology, clinic, and therapy [27].

Ginseng (Panax quinquefolius L., F. Araliaceae)

Infectious bronchitis virus and Newcastle disease virus-specific-antibody responses have been observed to be enhanced by ginseng stem-leaf saponins. Ginseng's ability to effectively prevent viral attachment, membrane

penetration, and virus reproduction inside the host cell is what gives it its antiviral properties. Ginseng use appears to be crucial for the creation of new medicines or for improving the efficacy of existing treatment approaches for disorders of the male reproductive system [28]. Ashwagandha is said to be the best option out of all the medicinal herbs in this potential battle against COVID-19 infectivity [28].

Objectives

Estimate the prevalence of using medicinal and edible plants during the Covid-19 pandemic in Taif-Saudi Arabia, determine the indication of using them, and detect any adverse effects.

Specific objectives

- Determine the frequency and how to use these plants.
- Determine the effectiveness of the commonly used plants.
- Identify any adverse effects after using these plants.

MATERIALS AND METHODS

Study design

A cross-sectional study using an online survey was conducted from 16 January and 1 March 2022. The survey is based on extensive literature reviews on medicinal and edible plants during the COVID-19 pandemic. Ethical approval of this study is obtained by the research ethics committee at Taif University on 5 December 2021, Approval No. (HAO-02-T-105).

Sample

The sample size was calculated according to the prevalence of using medicinal and edible plants during the COVID-19 pandemic in Taif Saudi Arabia in the pilot study, from both sexes, aged 18 years or older, including citizens and residents living in Taif city conducted in the study.

Data collection instrument

Data was collected online using a Google forms survey. The questionnaire consisted of 21 questions including 5-opened ended questions. The first part of the questionnaire is assigned to the demographic characteristics of the participants (e.g., gender, age, nationality, region of residence in Taif city, educational level, employment status, and chronic health history). The second part is asking about the most commonly used plants in Taif-Saudi Arabia, sources of information, participants' frequency, methods of taking, reason, and side effects of these plants (if present) which are not mentioned in the questionnaire questions. The questionnaire was pilot tested on a small sample size of 34 individuals of the actual target participants to evaluate its clarity and quality and validity.

Sampling strategy

Individuals living in Taif city were invited to participate in this via social media (Facebook, Twitter, Instagram, Snapchat, and WhatsApp). The online questionnaire is written in the Arabic language to suit participants with different levels of education and to increase their number.

The inclusion criteria

Participants who live in Taif city, from both sexes and aged 18 years or older age and use medicinal and edible plants during the COVID-19 pandemic as protective measures.

The exclusion criteria

Participants who are young age (below 18 years old), and live outside Taif city are excluded from this study.

Statistical analysis

Qualitative variables were summarized as frequencies (presents). All statistical analyses were conducted by Statistical Package of Social Science (SPSS) version 26.0 (IBM; Armonk, New York, USA). Tables and figures were used for illustrating the provided data.

RESULTS AND DISCUSSION

Demographics of the participants

In this study, we collected data from 325 participants. Most of the participants were females (76.9 %; 250), aged 36 to 55 years (52.6%; 171), were Saudi (95.1%; 309), were living in cities (92.6%; 301), were working (55.1; 179). Regarding the educational level, (77.23%; 251) of the participants had a University education level while (15.8%;50) had high school and (1.54%; 5) had intermediate school **(Table 1)**.

Table 1. Demographics of the participants

Demographics, n(%)	Total number = 325
Gender	
Male	75 (23.1)
Female	250 (76.9)
Age groups	
18-35 years	137 (42.2)
36-55 years	171 (52.6)
>56 years	17 (5.2)
Nationality	
Saudi	309 (95.1)
Non-Saudi	16 (4.9)
Residency	
Rural	24 (7.4)
City	301 (92.6)
Working state	
Working	179 (55.1)
Not working	146 (44.9)
Educational level	
Primary school	2(0.62)
Intermediate school	5(1.54)
High school	50(15.38)
University	251(77.23)
Advanced studies	17(5.23)

Baseline characteristics of the participants

Baseline characteristics of the participants are demonstrated in **Table 2**, (8.3%; 27) were working at healthcare services and (17.5%; 57) had chronic conditions. Approximately (31%; 101) participants were previously infected with the COVID-19 virus.

Table 2. Participants' baseline characteristics

Baseline characteristics, *n*(%)	Total number = 325
Do you work at healthcare services?	
Yes	27 (8.3)
No	298 (91.7)
Do you suffer from a chronic condition?	
Yes	57 (17.5)
No	268 (82.5)
Did you get infected with COVID-19 before?	
Yes	101 (31.1)
No	224 (68.9)

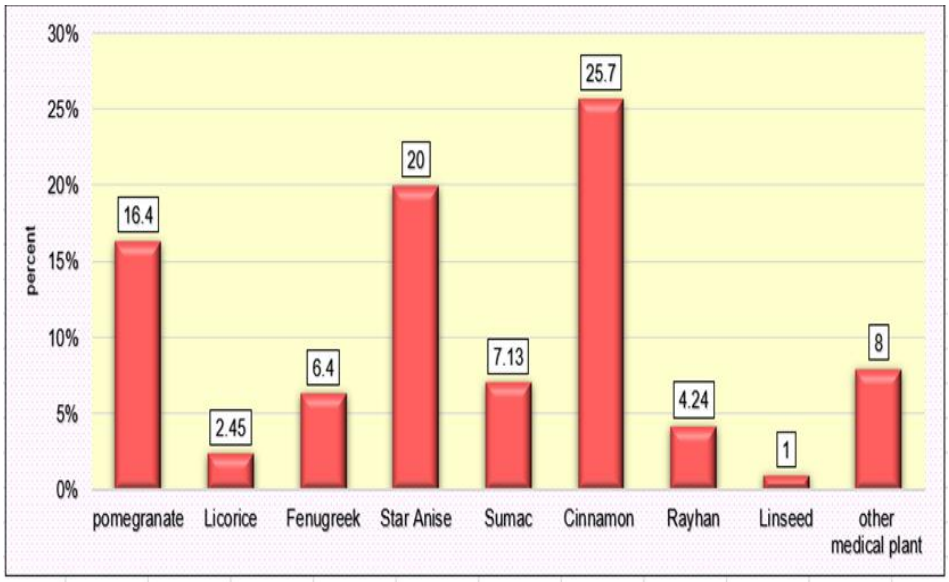

Figure 1. The prevalence of different plant uses among the participants

Use of different plants among the participants

Most of the participants were (25.7%; 106) cinnamon users while (20%; 70) were star anise users. Other used plants are demonstrated in **(Figure 1)**.

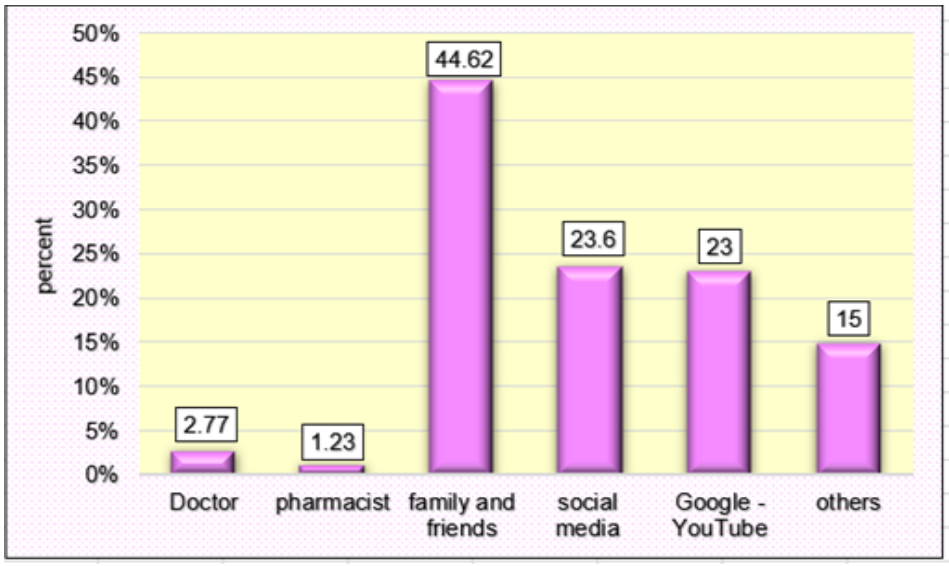

Figure 2. The resource of information about the plants among the participants

The resource of information and Methods of plant preparation

family and friends were the main advisors of plant use (44.62%; 145) followed by social media (23.69%; 77) and google-you-tube (23.08%; 75) **(Figure 2)**. Approximately (75 %; 104) of the plant's users utilized them as a drink after adding boiling water while (24.1%; 22) used them after soaking in water.

Reasons and outcomes of plant use among the participants

Approximately (62.4%; 203) of the participants used plants to protect against COVID-19 while (37.5%; 122) used them to relieve symptoms of COVID-19. About (16%; 52) of the plants' users consulted their physicians before use. About (76.9%;136) of the consulted physicians agreed to use these plants. Furthermore, (76.9 %; 250) of the participants demonstrated positive outcomes after using these plants while (3.1%; 6) number experienced complications and side effects after plants use **(Table 3)**.

Table 3. The reasons for using plants as well as outcomes.

Reasons and outcomes of plant use, *n*(%)	Total number = 325
The reason for using plants	
Relieving the symptoms of COVID-19	122 (37.5)
Protection against COVID-19 infection	203 (62.5)
Did the use of these plants give positive results?	
Yes	250 (76.9)
No	75 (23.1)
Did you suffer from some side effects after using these plants?	
Yes	10 (3.1)
No	315 (96.9)

Table 4 illustrated the frequency of use these plant among the participants. 38.7% use the plant weekly, 33.19% one daily, 11.21% Twice daily also 11.21 use day after day and 5.6% use the plant three times a day.

Table 4. The Frequency of using these plant

Frequency of use, *n*(%)	Total number = 232
How often do you use it?	
One daily	77 (33.19)
Twice daily	26 (11.21)
Three times a day	13 (5.60)
Day after day	26 (11.21)
Once weekly	90 (38.7)

Emerging viral infections are one of the most prevalent global community health problems. COVID-19 pandemic is an infectious respiratory medical condition caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [29]. Till now, no medication is authorized as a radical treatment for COVID-19 [30]. Globally, many previous studies showed that most people tend to use herbs, natural food products, and dietary supplements as alternative treatments to enhance their immune system which could decrease the incidence of contracting an infection [31].

The use of medicinal plants has attracted the attention of several stakeholders worldwide [32]. Medicinal plants with their chemical diversity are excellent candidates for novel drug development [33]. Recent studies clarified the beneficial role of medicinal plants against COVID-19 infection [34]. Moreover, the study by Yang *et al*. Showed that using some plant species as food could help in the enhancement of the immune system of body which could help in the prevention of the symptoms of COVID-19 [8].

Traditionally, medicinal plants were used in combination with Western medicine in the treatment of similar diseases called severe acute respiratory syndrome (SARS) [35]. some medicinal plants are useful in the treatment of viral diseases, COVID-19 is still a novel condition thus the effectiveness of these medicinal plants against COVID-19 is not well studied extensively. Therefore, the excessive and uncontrolled use of medicinal plants could be problematic and is a matter of concern [36].

Most people in Arab countries on traditional medicinal herbs to prevent and treat many diseases [37]. Moreover, the use of these medicinal herbs as well as other natural food products is popular among the Saudi Arabian population [37]. In this study, Cinnamon, Star Anise, and pomegranate were the main herbs used by the participants. Another study in contrast to our results conducted by El Alami *et al*. found that garlic, olives, onions, and ginger were the most commonly used natural products among the Moroccan population [38]. In corroboration to our results, immune-related compounds and foods including vitamin C, omega- 3, garlic, zinc, and ginger had increased dramatically during the pandemic of COVID-19 [39]. Our results showed that most of the participants used plants to protect against COVID-19 and to relieve symptoms.

The use of some herbs including honey, black seeds, lemon, garlic, and ginger could have a positive effect on boosting the immunity of individuals and enforcing the immune system in general and not just related to the COVID-19 infection [40]. In agreement with our results, a recent Saudi study conducted to assess the use of herbal products during the COVID-19 pandemic reported that most of the participants used medicinal herbs and

other nutritional supplements to improve their immunity and reduce the chances of contacting the COVID-19 infection [32].

Contrary to the present results, no strong supporting evidence is documented regarding the protective role of herbal plants against COVID-19 infection as reported by the World Health Organization (WHO) [41]. Some herbal and natural products are considered safe alternatives for regular medicine with low risk for side effects. In our study, almost all participants reported that using these products are safe and did not cause any side effects. Currently, the increased use of medicinal plants among the general population could be attributed to their safety, availability, and advertisements via social media [39].

The sources of information about the use of herbs and other natural products among the participants are significantly important. Our findings demonstrated that family and friends, and social media were the main sources of information for using herbs. In support, a Saudi study conducted by Alotiby *et al*. showed that social media posts, family traditions, and friends' advice were the main sources of information considering the uses of herbs [42].

In contrast to our results, non-Arabian countries including USA, UK, Germany, Italy, and France reported that the internet was the fundamental source of information considering the use of herbs and other food products [40]. Moreover, many governments formally or informally advocate or authorize the use of some herbs in the treatment of COVID-19 mainly because of their effectiveness in reducing respiratory symptoms or because of popular beliefs [29]. Similarly, we found that 16% of the plants' users consulted their physicians before use. About 76.9% of the consulted physicians agreed to the use of these plants.

This study had some limitations. First, this study depends on a self-reported questionnaire which could lead to some personal bias where some participants may not be very honest in applying the questionnaire. Second, depending on online means to distribute the questionnaire using different social media may cause some bias toward the source of information.

CONCLUSION

There is a significant increase in the trend of using herbs and natural products among Saudi populations, due to the COVID-19 pandemic. Family and friends as well as social media are the main sources of information considering the use of plants and herbs. Cinnamon, Star Anise, and pomegranate were the main reported plants to be used by the participants.

Recommendations

Preparing and applying potential awareness campaigns considering the ways to find accurate information from available and reliable sources will help in increasing the level of knowledge of people about the reliability of medical information sources.

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