Proof

Analysis of factors affecting the consumption of medicinal plants and their products

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Abstract

Medicinal properties, market demand, and satisfaction level are among the most important economic indicators of a medicinal plant. Therefore, it is necessary to investigate the factors affecting the consumption of medicinal plants to analyze the behavior of consumers to implement management strategies in this field. Accordingly, the present research investigate the factors affecting the use of medicinal plants in Shiraz City, an important metropolis in Iran. This study was conducted using a survey and questionnaire with approved validity and reliability. The data were collected from 385 people in 11 municipal districts of Shiraz using a random sampling method. A set of demographic, economic, social, and cultural factors affecting on the consumption of medicinal plants and their products was investigated. The data was analyzed using a logit model. The results demonstrated that the studied factors except gender and income level had positive effects on people's decisions for medicinal plants' consumption. Education, age, awareness about medical properties of plants, fewer side effects, advertisement, family knowledge, doctor's prescription, personal experience (trial and error), effective distribution marketing channels, consumption experience, anxiety caused by infectious diseases, unwillingness to attend the clinic, and the belief that medicinal plants are more compatible with the body were among the factors influencing people's decisions for medicinal plants' consumption. Regarding the tendency to use medicinal, it is necessary for policymakers to pay attention to the factors affecting the use of medicinal plants. By knowing the behavior of consumers, more appropriate policies could be implemented in the medicinal plant industry such as the presence of suitable distribution markets, production, supply, and consumption of herbal medicines under easy conditions according to international standards, and practical training to increase community knowledge in the field of medicinal plants.

Introduction

Almost two-thirds of the world population use medicinal plants to treat or prevent disease, in addition to maintaining and improving their health (Oladeji, 2016). Today, due to the lack of financial resources (especially in developing countries) (Mirjalili, 2021), and increased social awareness about the side effects of chemical treatments, herbal medicines are used as one of the health care sources in the world (Hilal and Hilal, 2017). According to the World Health Organization (WHO), about 90% of the population of developing countries rely on traditional medicine and use medicinal plants for primary health care (Toksoy et al., 2010). The COVID-19 pandemic also caused significant changes in the diet of people worldwide, which have not yet been fully investigated, understood, and experienced. In the meantime, food industry experts predict widespread attention to the consumption of organic products for the post–COVID-19 era, (Gerasimova et al., 2020), and plant foods are considered useful as regulators of the immune system (Sari et al., 2021).

Various studies have been performed on medicinal plants effectiveness on the strengthening immune system, preventing infection, and even controlling the coronavirus (Saruk Islam et al., 2021). Herbal compounds used in China have shown positive results in a pilot study in COVID-19 patients, although prospective randomized trials with larger sample sizes are still needed to confirm the results (Lee et al., 2021; Shi et al., 2020). Studies conducted in Brazil also indicate that medicinal plants such as Melissa officinalis, Peumus boldus, and Mentha spicata are the most commonly used medicinal plants for the treatment of this disease (da Silva et al., 2023). The general view in Iranian traditional medicine is first to prevent and then treat diseases (Monfared et al., 2019). Also, according to WHO, the gradual replacement of chemical substances with natural ones has prompted different countries to invest in, grow, and market medicinal plants. In developing countries, there are 2 important aspects: first, the local communities treat their diseases and health problems by using their indigenous knowledge and experience of medicinal plants, and second, to earn income from medicinal plants as the main or the second job. Therefore, to exploit the available capacities in developing countries, policymakers prioritized the cultivation and use of medicinal plants (Kiasi, 2019).

Economic, social, and cultural features can be effective in the tendency of a social group to use medicinal plants and can influence their increase or decrease; therefore, one of the first steps in moving toward the development of cultivation and production is to identify the consumers (Haghjou et al., 2011; Heidarzade et al., 2015). Knowing the factors affecting the use of medicinal plants facilitates the way researchers identify people's behavior to expand the use of medicinal plants or effective herbal medicines and limit their use in inappropriate cases. This can help researchers to increase the level of awareness and attitude of consumers to increase the consumption of medicinal plants. The present study investigated the various factors affecting the consumption and preferences in choosing medicinal plants as an alternative or supplement in Shiraz city, which was the capital of Iran at different times, when traditional medicine had been popular (Javanbakht and Esmaili, 2014).

Materials and Methods
Study area
Shiraz City is located in Fars Province, Iran with a geographic coordinate of 29.5926° N and 52.5836° E. The area is 10,434 km2, of which 60.4% is in mountainous areas and 39.6% in plains and lowlands. Shiraz is divided into 11 regions. According to the latest population and housing census in 2021, its population is 1,955,500.
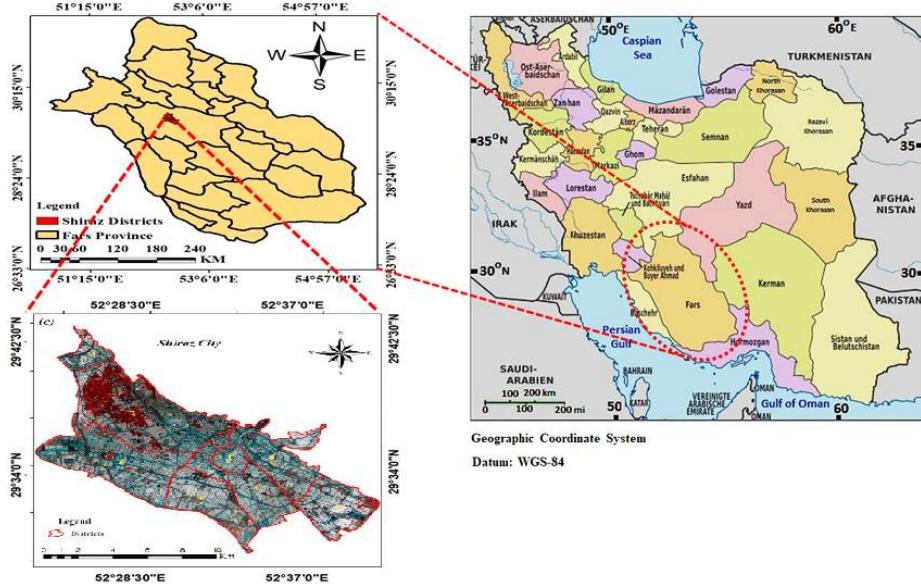
Figure 1. Location of the study area in Iran

Method

The research method was based on field studies and data collection through a questionnaire and random sampling. Therefore, to collect information, a questionnaire was designed and distributed. This questionnaire consisted of 2 parts: demographic information (gender, age, education, occupation, income, insurance, etc.) and questions about the reasons for using medicinal plants, sources of information, people's attitudes toward medicinal plants, and factors affecting the level of consumption. In this regard, 385 copies of the questionnaire were distributed in different parts of the city, and data were collected through direct interviews. The sample size was calculated using the Cochran formula (Yeganeh et al., 2022).

$$n = \frac{N.p.q.t^2}{N.d^2 + p.q.t^2} \qquad (1)$$

In this equation, N is the statistical population of Shiraz, n is the required sample size, p and q are the response probability and not responding (equal to 0.5), the t is equal to 1.96, and d is the sampling accuracy (d = 0.05-0.3). The number of people was estimated at 385 according to the Cochran formula, and the same number of questionnaires were distributed randomly. A panel of academic experts in the field of medicinal plants confirmed the validity of the study indicators. According to the reliability test, Cronbach's alpha coefficient was 0.805 for the mentioned indicators, indicating a high internal correlation. According to the purpose of the study (investigating people's preferences for using medicinal plants), the dependent variable is people's acceptance or non-acceptance of medicinal plants, which is a binomial variable with 0 and 1 digits. The value of this variable is 1 for the users of medicinal plants and 0 for people who do not want to use medicinal plants. Among the suitable models for such dependent variables is the logit model; since the response variable is in 2 states (0 or 1), it is not appropriate to use the normal linear model.

In this case, a regression model is used with a 2-mode response or linear probability model (which is a regression model with a 2-state dependent variable).

$$y_i = x_i \beta + \varepsilon_i \qquad (2)$$

In the above equation, x_i indicates the values for the ith observation, β the parameters, and ε_i the error factor. If the desired event has occurred, $y = 1$. Otherwise, $y = 0$ is considered. If we have only one independent variable, the structure is as follows.

$$y_i = \alpha + \beta x_i + \varepsilon_i \qquad (3)$$

If y is a two-state random variable, the

unconditional expectation is in the form of the following relationship.

$$(yi)=1\times P(yi=1)+0\times P(yi=0)=P(yi=1) \qquad (4)$$

While the conditional expectation for the regression model is as follows:

$$(5)$$

$$E\ (yi|\ xi)=1\times P(yi=1|\ xi)+0\times P(yi=0|\ xi)=P(yi=1|\ xi)$$

In other words, in this case, the model can be rewritten as a linear probability model as follows.

$$P\ (yi=1|\ xi)\ =\ xi\ \beta \qquad (6)$$

Logit model 1 is based on the cumulative probability of logistic 2. It is a special type of regression model in which the dependent variable is 2-state and can only take the values of 0 or 1. Based on this model, the probability of acceptance of medicinal plants is calculated using the following equation:

$$(7)$$

$$Pi=F\ (zi) = F\ (\beta 0 + \sum_{i=1}^{n} B_j Xu) = \frac{1}{1+e^{-xi}} = \frac{e^{xi}}{1+e^{xi}}$$

where pi is the probability of consumption of medicinal plants by the ith person, F is a functional relation, $\beta 0$ is the width from the origin of the model, Bj is the parameters estimated by the model, Xu is the explanatory variables in the form of a set of socio-economic characteristics of the person, i is the person number (questionnaire number), n is the total number of explanatory variables, and zi is the individual response index. The response index is a random variable that if its value is greater than a certain limit (for example, zi), the person in question will be among the users of medicinal plants; otherwise, they will be among those who do not use medicinal plants. This index is obtained from the following relationship for the i-th person:

$$Zi=\ln\frac{fi}{1-fi} = \beta_0 + \sum_{1=i}^{n} B_j Xu \qquad (8)$$

As the above shows, to calculate Zi, the regression model of the following relationship should be estimated:

$$Zi= \beta_0 + \sum_{1=i}^{n} B_j Xu + Vi \qquad (9)$$

Then, by using the parameters of the estimated model for independent variable Xi,

Zi is calculated for each individual. In the logit model, the relative effect of descriptive variable Xij on the probability of consuming medicinal plants can be calculated by deriving the model compared to the explanatory variable, which is given in Equation (Toksoy et al., 2010):

$$\frac{\partial P_i}{\partial X_{ji}} = \frac{B_j\ e^{zi}}{(1+e^{zi})} \qquad (10)$$

According to the type of explanatory variable, the final effect in the logit model is also calculated as follows:

If Xk is a quantitative variable, the change in the probability of success of the dependent variable (Yi=1) due to a change of one unit in Xk, which is called the final effect, is defined as follows:

$$ME=\frac{\partial P_i}{\partial X_{ji}} = \frac{\exp(Bx)}{(1-exp(Bx))^2} \qquad (11)$$

To determine the data collinearity, the variance inflation factor (VIF) was used. This index was calculated as follows:

$$VIF(bi) = \frac{1}{(1-R_i^2)} \qquad (12)$$

Where R_i^2 is the multiple recognition coefficient obtained from the regression of Xi on k-1 remaining independent variables. If there is no linear relationship between the independent variables, then R_i^2 will be 0, and the VIF value will be 1. Deviation of VIF from the value of 1 indicates deviation from orthogonality and a tendency to collinearity. The approach of R_i^2 to 1 is a sign of a linear relationship between the independent variables, in which the VIF related to β_i tends to infinity. If the VIF is greater than 10, it may cause estimation problems. To evaluate the logistic regression model, the logarithm of the likelihood, Cox and Snell, Nagelkerke correlation coefficient, and Hosmer and Lemeshow test were used (Zare Chahuki, 2013).

The mentioned criteria show the degree of compatibility of the logistic model with the data. The data were analyzed using SPSS version 5 (SPSS Inc., Chicago, Ill, USA) and the ordinal logit model to introduce the factors affecting the consumption of medicinal plants.

Results

The results indicated that 55% of the medicinal plants are used to treat various diseases, 32.5% are used as food (mostly in the form of herbal extracts and spices), and 4.4% were used for cosmetic purposes (mostly for skin, hair, and detergents); further, 8.1% did not use medicinal plants and products (Table 1).

Table 1. The frequency distribution of interviewees based on the use or non-use of medicinal plants

Monthly consumption	Frequency	Percentage
No consumption	32	8.3
Consumption	353	91.7
Total	385	100

The results show that among the respondents, 55% of the medicinal plants are used to treat various diseases, 32.5% as food (Mainly herbal extracts and spices), and 4.4% for cosmetic purposes. (Mostly for skin, hair, and detergents) and 1.8% do not use medicinal plants and products.

Table 2. The frequency distribution of interviewees based on the reason for using medicinal plants

Priority for consumption	Frequency	Percentage
Disease	212	55
Edible	125	32.5
Cosmetic	17	4.4
Non-use	31	8.1
Total	385	100

Based on the information obtained, medicinal plants are primarily used to treat colds, Corona, and flu (51.5%). Digestive diseases, blood pressure, edible, flavoring, and sedative are in the following ranks with 41, 33.2, 28.5, and 24.4 percent, respectively.

Table 4 shows that the interviewees used medicinal plants for various reasons, including their effectiveness/usefulness, fewer side effects, advice from knowledgeable people, advertisements, and lower prices (which were expressed more than other reasons by the respondents).

Table 3. The frequency distribution of consumption of medicinal plants

Disease	Frequency *	Percentage
Cold - Corona - Flu	198	51.5%
Sedative	94	24.4%
Anemia	43	11.2%
Blood sugar	52	13.5%
Blood lipids	61	15.8%
Blood pressure	128	33.2%
Fitness	89	23.1%
Heart disease	45	11.6%
Musculoskeletal pain	59	15.3%
Digestive diseases	158	41%
Obstetrics and gynecology	29	7.5%
Liver and kidney diseases	36	9.3%
Skin diseases	84	21.8%
Body strengthening	31	8%
Oral disease	4	1%
Cancer	8	2%
Eye disease	5	1.3%
Edible, flavoring	110	28.5%

* Because every respondent provided more than one answer to each question, the sum of the frequency of answers is more than 100.

According to the results, most of the interviewees purchased their medicinal plants from herbal medicine stores available in the city and then from pharmacies. With a significant difference of 73% (compared to pharmacies with 33%), herbal medicine stores are the priority of providing medicinal plant products.

The findings showed that in Shiraz, medicinal plants were mainly bought wholesale, dry (72.5% of respondents), and as herbal extracts (53.7%). Other modes of consumption were placed in other categories.

Table 4. The frequency distribution of interviewees based on reasons for choosing medicinal plants

Reasons for selecting medicinal plants	Frequency	Percentage
Lower price	77	20%
Fewer side effects	138	35.8%
Family indigenous knowledge	39	10.1%
Knowledgeable people recommendations	52	13.5%
advertisement (media and social networks)	119	30.9%
Personal experience (trial and error)	72	18.7%
Easy accessibility	21	5.4%

Reasons for selecting medicinal plants	Frequency	Percentage
Ease of use	9	2.3%
Going to the doctor	42	11
Going to traditional and local doctors	68	17.6%
Study and research	22	5.7%
Being organic	35	9%
Good quality and healthy products	38	9.8%
Effectiveness and usefulness	44	11.4%
Ensuring the content of the medicine	15	3.8%
Having lessons related to medicinal plants	24	6.2%

Table 5. The frequency distribution of respondents based on the business of purchasing medicinal plants

Business of purchasing medicinal plants	Frequency	Percentage
Fruit and vegetable markets	34	8.8%
Herbal medicine stores	281	72.9%
Supermarkets	29	7.5%
Mobile peddlers	8	2%
Pharmacy	125	32.4%
Online sale	36	9.3%
Private farm or garden production	13	3.3%
Collecting from nature	12	3.1%

Table 6. The frequency distribution of consumption method

Consumption method	Frequency	Percentage
Herbal extracts	207	53.7%
Fresh wholesale	28	7.2%
Fresh packing	12	3.1%
Dry wholesale	279	72.4%
Dry packing	8	31%
Herbal medicine	104	27%
Essence	16	4.1%

In Table 7, the results of the logit model showed that except for gender and income level, the rest of the variables had a positive effect on people's choice of medicinal plants. It should be noted that in the logit model, the coefficients had no quantitative interpretation and only showed the effect of the explanatory variables on the probability of accepting dependent variables. In these models, the final effects were interpreted; therefore, to obtain more favorable results, the final effects for each person or different levels of consumption of medicinal plants should be examined (Table 8). The positive coefficients of the final effects indicated higher levels of consumption than the current level, while the negative coefficients showed the probability of being in the current or lower group (Yeganeh et al., 2022).

The results of the logit regression model showed that among the investigated factors, the variables of gender, education, age, income level, knowledge of healing properties of plants, fewer side effects, advertisements, family's indigenous knowledge, doctor's prescription, personal experience (trial and error), convenient distribution markets, consumption experiences, anxiety caused by COVID-19, unwillingness to attend the clinic, and the belief that medicinal plants are more compatible with the body were among the factors influencing people's choice of medicinal plants. Among the mentioned variables, only gender and income level had a negative effect, and others had a positive effect on the consumption of medicinal plants. For example, the results of the final effect of the gender variable showed that by changing a consumer from a woman to a man, the amount of consumption would decrease and cause negative changes. For example, by increasing 1 unit from a woman to a man, the probability of consumption decreases by 5%. The significance levels of all variables are presented in Table 8. Based on the results, it is expected that the longer the history of using medicinal plants in the family and relatives, the more people tend to buy herbal medicines, and the probability of using these plants increases. In the same way, other variables (such as the doctor's prescription or recommendation, indicating the consumption of various medicinal plants) have a positive effect and statistically

significant coefficients in the use of these   medicines.

Table 7. The results of logit regression estimation for the factors affecting the consumption of medicinal plants

Variable	coefficient	standard deviation	|P|>z	Final effects
Gender	-1.17	0.53	0.041*	-0.05
Education	0.31	0.18	0.016*	0.04
Age	0.12	0.11	0.028*	0.002
Income level	-0.38	0.21	0.011*	-0.03
Knowledge of the healing properties of plants	2.01	0.37	0.031*	0.11
Fewer side effects	0.31	0.51	0.019*	0.17
advertisement	1.07	0.42	0.045*	0.04
Family indigenous knowledge	1.03	0.24	0.039*	0.14
Doctor's prescription	1.01	0.78	0.01**	0.05
Seller's Knowledge	0.71	0.6	0.023*	0.13
Personal experience (trial and error)	0.88	0.37	0.027*	0.19
Number of family members as consumers	0.02	0.31	0**	0.002
Having a specific disease	0.15	0.15	0.06	0.01
price of product	0.34	0.21	0.48	0.04
The credit of the manufacturing company	0.25	0.12	0.08	0.004
Having a license and meeting the necessary standards	0.13	0.004	0.081	0.003
suitable packaging	0.45	0.08	0.12	0.12
Variety of products	0.19	0.14	0.151	0.009
Easy accessibility	0.87	0.09	0.204	0.02
Good smell and taste	0.45	0.19	0.13	0.005
Convenient distribution markets	0.25	0.11	0.022*	0.02
Consumption experience	1.33	0.16	0.05	0.16
Corona anxiety	1.43	0.14	0.003**	0.19
Reluctance to attend the office and clinic	0.91	0.49	0.000**	0.003
Preference for using herbal over chemical medicines	0.7	0.17	0.11	0.06
More compatibility of medicinal plants with the body	0.25	0.07	0.027*	0.07
Tendency to use organic plants	0.8	0.22	0.07	0.03

** Significant at 1% level, * significant at 5% level (p-value: 0.000)

Table 8. Results of logistic regression model

Test	2-log-likelihood	Cox and Snell R Squre	Nagelkirk R Squre	Hosmer and Lemeshow Test
Coefficient	28.7	0.71	0.79	0.81

As stated in the Materials and Methods Section, before running the logistic regression model, the variance inflation index was investigated to check the multicollinearity of the measured variables in this research. The results of this test showed that since the VIF for all independent variables was less than 10, there was no multicollinearity between the variables. The results of the logistic regression model evaluation using 4 tests are presented in Table 8. As the accuracy of the model increases, the accuracy decreases by 2 times, and on the other hand, the correlation coefficients of Nagelkerke, Cox, and Snell increase. The Hosmer and Lemeshow test is similar to the chi-square test, showing the agreement between the numbers of observed and expected cases for 2 groups of independent and dependent variables. A high value indicates more agreement; thus, the logistic relationship has a good agreement with the data (Zare Chahuki, 2013).

Discussion
The results showed that almost half of the interviewees (51%) use medicinal plants to prevent or treat colds, COVID-19, or influenza. The review of studies also shows that at the same time, during the SARS epidemic in 2003, the use of medicinal plants had a significant contribution to preventing

and treating the disease (Leung, 2007). For example, during the SARS epidemic, the use of traditional medicinal plants, along with other medicines, significantly reduced the symptoms of the disease, including cough, respiratory problems, and fever (Li et al., 2020). Recent studies have shown that the use of traditional medicine, along with the use of standard care, has led to improved treatment outcomes in patients with Covid-19 (Fan et al., 2020; Lee et al., 2020). The authors attribute the increased interest in medicinal plants to the lack of modern medicines in the treatment and prevention of COVID-19 (Alyami et al., 2021). Nugraha (2021) also showed an increased interest in the use of medicinal plants to prevent and treat COVID-19. There are though very different reports on the number of medicinal plants used in various studies.

This research showed that, in general, women used medicinal plants more than men (in the last year and at least once in a lifetime). Conboy et al (2005), Honda and Jacobson (2005), and Lafferty et al (2006) in independent researches in the United States, confirmed the higher use of traditional medicine methods in women. In the results of their research in Tabriz City, Javanbakht and Esmaili (2014) also indicated that women share their experiences with each other faster due to more use of medicinal plants and observing their positive effects, causing them to consume more medicinal plants than men. The research findings of Yeganeh et al (2022) also showed that consumption decreases from women to men and causes negative changes in 2 levels of medium and high consumption. Regarding the education variable, the results of the final effects showed that with an increase in the level of education, the probability of using medicinal plants increases. Laelago et al (2016) also stated that factors such as sufficient knowledge in the field of medicinal plants and level of education are significantly associated with the consumption of medicinal plants. Also, based on the findings of Javanbakht and Esmaili (2014), Sereshti and Azari (2007), and Soner et al (2013), there is a direct relationship between education and the use of herbal medicines. In the study of Honda and

Jacobson (2005), Conboy et al (2005), and Ni et al (2020), the use of medicinal methods was more in people with higher education.

The results of the present study show that increasing age, level of awareness, number of consumers in families, knowledge of families, personal experience, and advertisements increase the number of people using medicinal plants. Therefore, it can be concluded that with increasing age due to the increase in experience and awareness, the level of people's consumption increases, and the level of consumption is closely related to the level of awareness and knowledge of people about the benefits of medicinal plants. Accordingly, the indicators of local awareness, indigenous knowledge, and personal experience are significant and positive factors in increasing the consumption of medicinal plants (Javanbakht and Esmaili, 2014). Ankli et al. (2002), and Boon et al. (2013) mentioned that informing citizens via advertising is an effective factor in the consumption of medicinal plants. Therefore, increasing the level of knowledge can be an effective factor in increasing the consumption of medicinal plants. These results are in line with some studies. Therefore, it is possible to increase people's knowledge in various ways, especially through effective advertisements and by encouraging them to use medicinal plants. On the other hand, the findings show that one of the main sources of people's knowledge is their personal experience or that of other family members from previous generations, indicating the effectiveness of plants in the treatment of diseases and the role of indigenous knowledge in people's willingness to use it. Thus, people with a longer history of using plants in their families tend to use more medicinal plants. These results are consistent with the studies of Sajadi et al. (2011), and Tardio and Pardo-de-Santayan (2008), and Sojasi Qeidari and Azizi (2019). The reports of the World Health Organization also show that most of the population of developing countries rely on traditional medicine and indigenous knowledge of using medicinal plants for primary health care (Toksoy et al., 2010).

In the context of individuals' inclination to purchase medicinal plants and their products,

Bakhtiari (2010), Sedighi et al. (2004), and Heidarifar et al. (2013) all arrived at comparable findings. They highlighted that the primary driver of people's familiarity with plant usage stems from the experiences shared by their relatives. In the study of Sereshti and Azari (2007), the recommendation of relatives was a significant factor in the use of herbal medicines among women. The credit of the company, seller's knowledge, and doctor's prescription were also effective in the consumption of medicinal plants. It seems that the credit of the company and seller's knowledge can contribute to the trust and satisfaction of consumers, thus resulting in increased consumption of medicinal plants. When medicinal plants are promoted by doctors, it can lead to an increase in consumption because of the social status of this educated class. This is in line with Rashidi et al (2013) and Heidarzade et al (2015).

In other words, if herbal medicines are promoted by doctors, they are more accepted and can lead to an increase in consumption. This issue becomes important when, according to the results, we find out that only 12% of the participants consult a doctor before consuming medicinal plants or their products. Considering the unwanted side effects of some medicinal plants and acute toxicity in case of consuming more than the allowed amount (Ghorani-Azam et al., 2018), it can cause some unwanted reactions and side effects in the society. Therefore, it is necessary for policy makers to pay attention to this (Dabaghian et al., 2020). It should be noted that in New Zealand, Evans (2008) indicated that 86% of hospitalized patients tended to use different complementary and alternative methods, especially medicinal plants; however, according to their doctors, they were not allowed to use these types of treatments. Rashidi et al (2013) also state that increasing the number of doctors specializing in medicinal plants is one of the factors that increase people's tendency to use herbal medicines. This result has been shown in the study of Heidarzade et al (2015).

As another important reason for using medicinal plants, it is thought that such plants are more compatible with the body than chemical medicines. Respondents' views about the nature of these plants and not having side effects, as well as having a healthier life, are in line with Edwards et al. (2012), Oladeji (2016), Hilal and Hilal (2017). The results show that with an increase in the diversity of medicinal plants, the possibility of consumption increases; the possible reason is that consumers could select from different types of medicinal plants. The results of this are in line with the research of Heidarzade et al (2015).

Investigations showed that the variable of the income level had a negative effect on the level of consumption of medicinal plants. In other words, an increase in household income levels results in a decreased level of consumption. Perhaps one of the reasons is that medicinal plants, due to the traditional nature of their production and distribution in society, are mainly purchased by the middle- and lower-income groups of society, and people with higher incomes prefer to treat their diseases with chemical or foreign drugs.

Increasing preference for medicinal plants over chemical drugs will lead to positive changes in the probability of the decision to use them. Observing the therapeutic potential, minimal side effects, and affordability among the economically average to poor population have been mentioned as the most important key indicators in people's preference for medicinal plants (Ghavam et al., 2015; da Silva et al., 2023). The results of various tests have shown that although chemical drugs have a faster rate of action than drug treatment, the durability and stability of the positive effects of herbal and natural medicines are more. Ondicho et al (2015) also stated that the main reason for the positive opinion of the interviewees on the use of medicinal plants was the better efficiency and the nature of medicinal plants. Therefore, the widespread use of medicinal plants can reduce the use of chemical drugs, as well as the physical and psychological risks caused by chemical drugs. Reluctance to attend the doctors' offices and clinics has also been among the factors affecting medicinal plants especially during the outbreak of contagious diseases like COVID-19. It seems that the fear and worry of being in closed

spaces with a high density of patients was one of the most important reasons that are consistent with the results of Sojasi Qeidari and Azizi (2019).

Considering the moderate to severe anxiety level of the majority of respondents, our results indicated a significant relationship between the psychological dimension and the direct effect of anxiety on the willingness to use medicinal plants; this finding could be comparable with the results of Fishchhoff (2020), who discussed the increase of anxiety in during the COVID-19 pandemic. Therefore, anxiety can have an indirect impact on the consumption of medicinal plants (fear of visiting a doctor's office and clinic can indirectly influence the consumption of medicinal plants). Society members, especially those with a lower level of education, have tended to use medicinal plants as a result of anxiety or behaviors such as self-treatment or self-planned preventive measures. Also, the descriptive results of a study show that the majority of the respondents use medicinal plants according to the recommendations of relatives and acquaintances to relieve anxiety and prevent and treat the disease, compared to the period before the outbreak. Thus, it is necessary to provide proper and practical training to increase the knowledge of the studied community (Bayat, 2021; Karami and Ghanbari, 2023).

Conclusion
According to the results, increasing the level of community information can be an effective factor in increasing the consumption of medicinal plants. The reason is that the attitude of the majority of consumers toward herbal medicines is generally positive. In addition to increasing people's awareness of the use of medicinal plants by publishing appropriate resources and advertisements, the health supply of these products can be a useful solution in increasing the appropriate consumption of these products. Considering the interactions and side effects of some plants and related products, it is necessary for policymakers to inform people. Considering the effect of the doctor's prescription and seller's knowledge, it seems necessary to provide comprehensive information on herbal medicines and awareness first by doctors and then by sellers and media to prevent drug interactions. In other words, if herbal medicines are promoted by doctors, they are more accepted and can lead to an increase in consumption; therefore, policymakers must pay attention to this issue. Also, the credit of the company and convenient distribution help to create the consumption culture. In addition to the above-mentioned factors, it is necessary to review the pharmaceutical policies to make laws in the market of herbal medicines to provide methods for the production, supply, and consumption of herbal medicines under appropriate conditions according to international standards. It is possible to improve the use of medicinal plants with appropriate changes in the pharmaceutical system. Paying attention to this can lead to a boom in the consumption of medicinal plants, which can also contribute to economic prosperity by developing the cultivation of medicinal plants. Now that medicinal plants can shed light on improving health care in conditions such as pandemics, and people have a positive attitude toward them, it is necessary to provide practical training to increase people's knowledge about medicinal plants to avoid any possible side effects and toxicity. In this regard, the quality control of these products, along with defining the authority for their prescription and sale, is also necessary.

Conflict of interest
The authors declare no conflict of interest.

Author's contribution
All authors listed on the title page have contributed significantly to the work. Conceptualization, designing the study and involving in data collection: MRF. Data collection and writing: YK. Helping in data analysis: SZM and HNG. All authors read and approved the final manuscript.

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Availability of data and material
All data generated or analyzed during this study are included in this published article.

Ethics approval and consent to participate
The authors asked for permission from the local people interviewed to carry out the study.

Competing interest
There is not competing interest to declare

Consent for publication
We confirm that all authors have read the manuscript, attest to the validity and legitimacy of the data and its interpretation, and agree to its submission.

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