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The Effect of the COVID-19 Pandemic on Medicinal Plants Consumption Among Iranian Households: Determinants and Consumption Patterns

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Abstract

Background: The coronavirus disease 2019 (COVID-19) pandemic has heightened interest in using medicinal plants (MPs) for disease management. Considering regional, socioeconomic, and demographic differences, this study explores the determinants and consumption patterns of MPs among Iranian households before and after the pandemic.

Methods: This descriptive and analytical study was conducted using survey data from the the Iranian Statistics Center (ISC). from 2018-2019 (prepandemic) and 2020-2021 (postpandemic) to compare MPs consumption. Logistic regression analysis examined the impact of independent variables, and COVID-19 on MPs consumption. The outcome variable was household MPs consumption (yes: 1, no: 0), with explanatory variables including the sex, age, and marital status of the household head, education level, number of educated household members, place of residence (rural/urban), income quintile, and province.

Results: MPs consumption in Iran increased from 15.8% before the COVID-19 pandemic to 18.8% after. After COVID-19, the provinces with the highest MPs consumption were Markazi (43.7%), Guilan (39.2%), and Qom (34.3%). In contrast, the lowest consumption rates were observed in Lorestan (5.6%), Chaharmahal and Bakhtiari (5.6%), and Sistan and Baluchistan (6.1%). Overall, MPs consumption increased across all provinces and socioeconomic groups after the pandemic. Households led by women were more likely to consume MPs, with an adjusted odds ratio (aOR) of 1.280 (95% CI, 1.083-1.516, $P = 0.010$). Similarly, married heads had a higher likelihood of MPs consumption (aOR, 1.630 [95% CI, 1.161-2.297]; $P = 0.010$). Households with more educated members also showed increased odds (aOR, 1.380 [95% CI, 1.163-1.629]; $P < 0.001$). Rural residents had lower odds compared to urban residents (aOR, 0.830 [95% CI, 0.781-0.876]; $P < 0.001$). Higher-income quintiles were associated with increased MPs consumption, particularly in the fifth quintile (aOR, 1.800 [95% CI, 1.592-2.025]; $P < 0.001$). Additionally, COVID-19 significantly raised MPs consumption compared to prepandemic levels (aOR, 1.290 [95% CI, 1.212-1.367]; $P < 0.001$).

Conclusion: MPs consumption in Iranian households increased significantly during the COVID-19 pandemic, but these increases were not uniform across all socioeconomic and demographic groups. Health policymakers must address the quality, safety, and efficacy of MPs, their interactions with conventional pharmaceutical treatments, and the potential economic consequences associated with increased utilization.

Keywords: Epidemic, COVID-19, Medicinal Plants, Household, Iran

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↑What is "already known" in this topic:
Previous studies have established that the coronavirus disease 2019 (COVID-19) pandemic has led to increased interest in using medicinal plants (MPs) for health management, particularly in developing countries. This trend reflects a broader reliance on traditional remedies during health crises, highlighting the significance of MPs in public health strategies.

→What this article adds:
This article reveals that MPs consumption among Iranian households significantly increased during the COVID-19 pandemic, with notable variations across different provinces and socioeconomic groups. Our findings indicate that factors such as sex, education level, and income influenced consumption patterns, underscoring the need for health policymakers to evaluate the safety and efficacy of these plants as their use continues to rise.

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Introduction

Viral diseases present significant challenges to human survival, with human coronaviruses (HCoVs) emerging as a major global cause of mortality (1). These viruses have been identified in birds, mammals, and humans, with the first human coronavirus reported in 1965. (2). Since 2000, multiple variants have been discovered—including the severe acute respiratory syndrome coronavirus (SARS-CoV) in China in 2002 and the Middle East respiratory syndrome coronavirus (MERS-CoV) in Saudi Arabia in 2012. Both of these viruses originated from animals, specifically bats (3, 4). The most recent and highly transmissible variant is the severe acute respiratory syndrome coronavirus type 2 (SARS-CoV-2), causing the coronavirus disease 2019 (COVID-19) outbreak, which was officially declared by the World Health Organization (WHO) on February 12, 2020 (5-8). Given the high mortality associated with COVID-19 and the lack of effective treatments, urgent efforts are underway to address this crisis. One promising approach is the exploration of medicinal plants (MPs) and their secondary metabolites, which are known for their potential antibiotic properties and have been extensively utilized in various traditional medicine systems (9-12). Furthermore, the efficacy of MPs in managing viral diseases has been demonstrated (13).

MPs have a significant research history in disease management worldwide, particularly in developing countries. According to the WHO, approximately 80% of the global population utilizes MPs for their healthcare needs (14). Recognizing the importance of traditional medicine, countries with a rich traditional medicine heritage, such as China and India, have explored the role of traditional and complementary medicine alongside conventional treatments in combating COVID-19 (15).

Since the onset of the COVID-19 outbreak in China, traditional MPs have been utilized, with evidence showing that 90% of patients treated with traditional medicines have recovered (16). In Iran, studies have reported the use of various MPs, such as Shirazi thyme, green tea, Echinacea, aloe vera, black seed, eucalyptus, chicory, cloves, licorice, peas, and saffron, by the general public for the prevention and treatment of COVID-19 (17, 18). However, the effectiveness of MPs in preventing or treating COVID-19 remains unclear. Despite the absence of definitive treatments for this disease, there is a growing inclination among the general public to consume MPs. This inclination can be attributed to cultural factors, limited access to formal medical centers, vaccines, and pharmaceutical drugs, particularly among middle- and low-income groups in developed countries, as well as the high costs associated with COVID-19 treatment (19, 20). However, despite this growing enthusiasm, there remains a significant gap in our understanding of how effective these plants are against the virus.

To date, no study has investigated the impact of the COVID-19 pandemic on the consumption of MPs among Iranian households. This study aims to address this gap by exploring how the COVID-19 pandemic has influenced medicinal plant consumption among Iranian households. By examining consumption patterns before and after the pandemic across various provinces and demographic groups, we aim to uncover valuable insights into public health behaviors during crises. Understanding these patterns is crucial not only for informing policymakers but also for guiding future research into the efficacy and safety of MPs. Ultimately, this research seeks to contribute to a more nuanced understanding of how traditional practices can coexist with modern healthcare strategies during challenging times. This version maintains an engaging tone while ensuring originality and clarity in expressing the study's significance.

Methods

To investigate the consumption patterns of medicinal plants (MPs) in urban and rural areas before and after the COVID-19 pandemic, we utilized data from household expenditure and income surveys conducted by the Iranian Statistics Center (ISC). The analysis incorporated data from 2 distinct periods: 2018-2019 (March 2018 to March 2019) representing prepandemic consumption, and 2020-2021 (March 2020 to March 2021) reflecting postpandemic trends. The target population included all Iranian households, ensuring a comprehensive representation of the country.

Data Sources and Variables

The primary data source for this study was the ISC, accessible at www.amar.org.ir. The datasets included variables such as household expenditures on MPs, demographic characteristics of household heads (sex, age, marital status, education level), the number of educated individuals in the household, place of residency (urban or rural), income quintiles, and provincial residency.

Sampling Methodology

A multistage random sampling method was employed by the ISC for data collection. Initially, urban and rural areas were classified. Subsequently, study blocks were defined within these areas, with blocks randomly selected for inclusion. Households within each selected block were also randomly sampled. The sampling method ensured that the study population was representative of each province by calculating sampling weights based on the ratio of the population to selected samples. These weights were applied in all statistical analyses to enhance representativeness.

Data Collection Process

The data on MPs were collected directly through a structured questionnaire conducted by trained personnel from the ISC. Respondents were asked specific questions regarding their expenditures on different types of MPs during the survey periods. The questionnaire included a list of various MPs, ensuring that respondents understood what was being asked and could provide accurate information about their

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consumption patterns. The inclusion of fixed questions about specific types of MPs not only standardizes responses but also enhances the reliability and accuracy of the data collected.

Validity of Data

The validity of data approved by the Statistical Center of Iran is established through a rigorous process that includes quality assurance checks and adherence to established standards.

Analysis Availability

The datasets for 2018-2019 included 18,610 households from rural areas and 20,350 households from urban areas. For the 2020-2021 analysis, data comprised 18,251 rural households and 19,306 urban households. Expenditures on various medicinal plants—including Cinnamomum (Cinnamomum cassia), Ginger (Zingiber officinalis), Cardamom (Elettaria cardamomum), Persian hogweed (Heracleum persicum), Oxtongue Flower (Echium amoenum), rock spray cotoneaster (Cotoneaster horizontalis), Manne of hedyzarum (Alhagi camelorum), Musk willow (Salix aegyptiaca), Chicory (Cichorium intybus), and Mint (Mentha longifolia)—were extracted for analysis.

Statistical Analysis

A logistic regression model was employed to evaluate the effects of socioeconomic factors, demographic characteristics, and the COVID-19 pandemic on MPs consumption prevalence. The model utilized cumulative distribution functions (CDFs) to explain relationships between independent variables and the probability of MP consumption (Equation 1).

$$p(y|x) = \varphi(b^{\wedge}x) = \int_{-\infty}^{b^{\wedge}x} \varphi(z)d(z) \qquad (1)$$

The logit model was defined as follows (Equation 2).:

$$y_i^* = \beta^{\wedge}X_i + \varepsilon_i \qquad (2)$$

Where

y_i^* represents household consumption of MPs.

The outcome variable was categorized as "Yes" (1) or "No" (0) for MPs consumption. Explanatory variables included demographic details such as sex and age of household heads, marital status, education level, number of educated individuals in the household, residency type (urban/rural), income quintile, and province. Households were classified into 5 economic categories based on reported income status provided by the ISC.

Statistical significance was set at α = 0.05. Data extraction utilized Access and Excel 2013; data analysis was conducted using Stata Corp Version 14.2. Also, the study utilized ArcGIS to create detailed maps illustrating the variation in MPs consumption across different provinces, both pre- and post-COVID-19. Figure 1 illustrates the stages of this study.

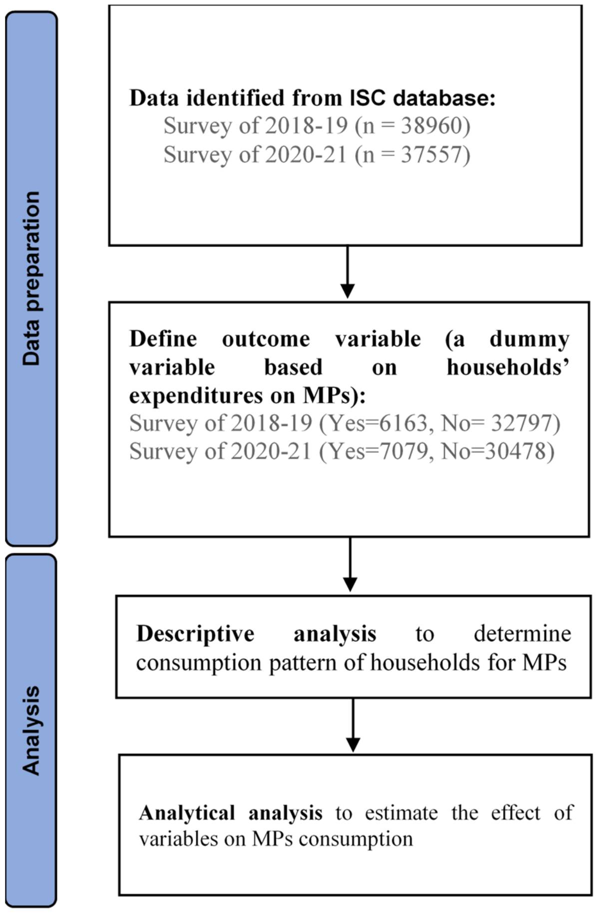

Figure 1. Flow chart of the study steps

Results

The consumption of MPs in female-headed households was 12.71% before the pandemic and increased to 15.50% after. In male-headed households, the proportion was 16.30% before the disease and rose to 19.43% after. When considering age, households headed by individuals ≤ 35 years old had the lowest consumption of MPs (14.24% before and 16.86% after), while households headed by individuals aged 51 to 65 years had the highest consumption. Before COVID-19, households with single heads had a consumption rate of 10.71%, households with married heads (16.38%), and divorced/widowed heads (12.78%) had higher consumption. After the pandemic, the consumption rates for these 3 groups were 14.31%, 19.58%, and 15.19%, respectively.

The study findings also revealed that households with higher-educated heads had higher consumption rates of MPs. The lowest consumption percentage was observed in households with illiterate heads (13.33% before and 14.69% after COVID-19), while households with highly educated heads had the highest consumption (16.96% before and 25.65% after COVID-19). A similar trend was observed when considering the number of educated individuals in each household, with households having more literate people showing higher consumption of MPs.

In terms of location, urban areas had higher consumption of MPs compared to rural areas. The prevalence of consumption before the disease was 16.21% in urban areas and 15.39% in rural areas. After the pandemic, the consumption

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Table 1. Comparison of the Consumption of MPs in Iranian Households Before and After the COVID-19 Pandemic

Variable		Before COVID-19			After COVID-19		
		N	MPs Consumption		N	MPs Consumption	
			Yes (%)	No (%)		Yes (%)	No (%)
Sex of head of household	Female	5171	657 (12.71)	4514 (87.29)	5522	856 (15.50)	4666 (84.50)
	Male	33789	5506 (16.30)	28283 (83.70)	32035	6223 (19.43)	25812 (80.57)
Age of head of household (years old)	≤ 35	7724	1100 (14.24)	6624 (85.76)	5784	975 (16.86)	4809 (83.14)
	36-50	13545	2205 (16.28)	11340 (83.72)	13305	2617 (19.67)	10688 (80.33)
	51-65	10482	1799 (17.16)	8683 (82.84)	10892	2197 (20.17)	8695 (79.83)
	>65	7209	1059 (14.69)	6150 (85.31)	7576	1290 (17.03)	6286 (82.97)
Marital status of head of household	Single	504	54 (10.71)	450 (89.29)	510	73 (14.31)	437 (85.69)
	Married	33183	5435 (16.38)	27748 (83.62)	31372	6144 (19.58)	25228 (80.42)
	Widow/ divorces	5273	674 (12.78)	4599 (87.22)	5675	862 (15.19)	4813 (84.81)
Education level of head of household	illiterate	9401	1254 (13.33)	8153 (86.67)	8663	1273 (14.69)	7390 (85.31)
	Under diploma	17792	2861 (16.08)	14931 (83.92)	17736	3272 (18.45)	14464 (81.55)
	Diploma	6372	1116 (17.51)	5256 (82.49)	6166	1317 (21.36)	4849 (78.64)
	Bachelor	3992	695 (17.41)	3297 (82.59)	3752	899 (23.96)	2853 (76.04)
	Master of Sciences and higher	1397	237 (16.96)	1160 (83.04)	1240	318 (25.65)	922 (74.35)
Number of educated persons	0	4105	464 (11.30)	3641 (88.70)	3950	510 (12.91)	3440 (87.09)
	1-2	14368	2174 (15.13)	12194 (84.87)	13165	2457 (18.66)	10708 (81.34)
	3-4	17036	2926 (17.18)	14110 (82.82)	17005	3467 (20.39)	13538 (79.61)
	5 and more	3451	599 (17.36)	2852 (82.64)	3437	645 (18.77)	2792 (81.23)
Place of residency	Rural	18610	2864 (15.39)	15746 (84.61)	18251	3044 (16.68)	15207 (83.32)
	Urban	20350	3299 (16.21)	17051 (83.79)	19306	4035 (20.90)	15271 (79.10)
Income quintile	1st (the lowest)	7792	812 (10.42)	6980 (89.58)	7511	908 (12.09)	6603 (87.91)
	2nd	7792	1140 (14.63)	6652 (85.37)	7511	1293 (17.21)	6218 (82.79)
	3rd	7792	1293 (16.59)	6499 (83.41)	7511	1502 (20.00)	6009 (80.00)
	4th	7792	1363 (17.49)	6429 (82.51)	7511	1515 (20.17)	5996 (79.83)
	5th (the highest)	7792	1555 (19.96)	6237 (80.04)	7513	1861 (24.77)	5652 (75.23)

rate increased to 20.90% in urban areas and 16.68% in rural areas. Higher-income groups also showed higher consumption of MPs. The highest consumption was observed in the 5th income quintile (19.96% before and 24.77% after COVID-19), while the first income quintile had the lowest consumption (10.42% before and 12.09% after COVID-19). Table 1 shows the consumption of MPs in Iranian households before and after the COVID-19 pandemic in more detail.

Analyzing the provinces, Alborz (34.1%), Guilan (31.3%), and Qom (28.4%) provinces had the highest proportion of MPs consumption before the pandemic, while Chaharmahal and Bakhtiari (2.9%), Semnan (4.5%), and Sistan and Baluchistan (5.1%) provinces had the lowest. After the pandemic, the Markazi (43.7%), Guilan (39.2%), and Qom (34.3%) provinces exhibited the highest prevalence of consumption, whereas Lorestan (5.6%), Chaharmahal and Bakhtiari (5.6%), and Sistan and Baluchistan (6.1%) provinces had the lowest consumption. Overall, the comparison of findings before and after the COVID-19 pandemic showed a significant increase in MPs consumption in almost all provinces of Iran, as depicted in Table 2 and Figure 2.

The results of the logistic regression model revealed several significant findings regarding the consumption of MPs among Iranian households. Households headed by women showed a higher likelihood of consuming MPs compared to those headed by men, with an OR of 1.280 (95% CI, 1.083-

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Table 2. Prevalence of MPs' Consumption and Changes Before and After COVID-19 in Iran

Province	Before	After	Difference	Province	Before	After	Difference
Alborz	34.1	17.2	-16.9	Kermanshah	7.5	15.6	8.1
Ardabil	9.5	7.5	-2.0	Khorasan, North	18.8	19.0	0.2
Azerbaijan, East	8.3	10.1	1.8	Khorasan, Razavi	20.5	18.2	-2.2
Azerbaijan, West	13.7	8.0	-5.7	Khorasan, South	19.2	23.3	4.0
Bushehr	14.9	22.2	7.3	Khuzestan	16.6	16.8	0.2
Chahar Mahaal and Bakhtiari	2.9	5.6	2.7	Kohgiluyeh and Boyer-Ahmad	21.1	18.0	-3.2
Fars	23.7	23.2	-0.5	Kurdistan	11.6	26.9	15.3
Golestan	13.7	17.6	3.8	Lorestan	5.4	5.6	0.2
Guilan	31.3	39.2	7.9	Markazi	27.6	43.7	16.1
Hamadan	11.3	15.6	4.3	Mazandaran	11.7	18.5	6.8
Hormozgān	13.4	14.5	1.1	Qazvin	17.5	12.1	-5.4
Ilam	25.7	24.0	-1.7	Qom	28.4	34.3	5.9
Isfahan	18.2	19.7	1.5	Semnan	4.5	16.3	11.8
Kerman	6.5	10.2	3.7	Sistan and Baluchestan	5.1	6.1	1.0
Zanjan	15.0	20.5	5.6	Tehran	15.8	27.4	11.6
Yazd	15.3	17.5	2.3	TOTAL	15.8	18.8	3.0

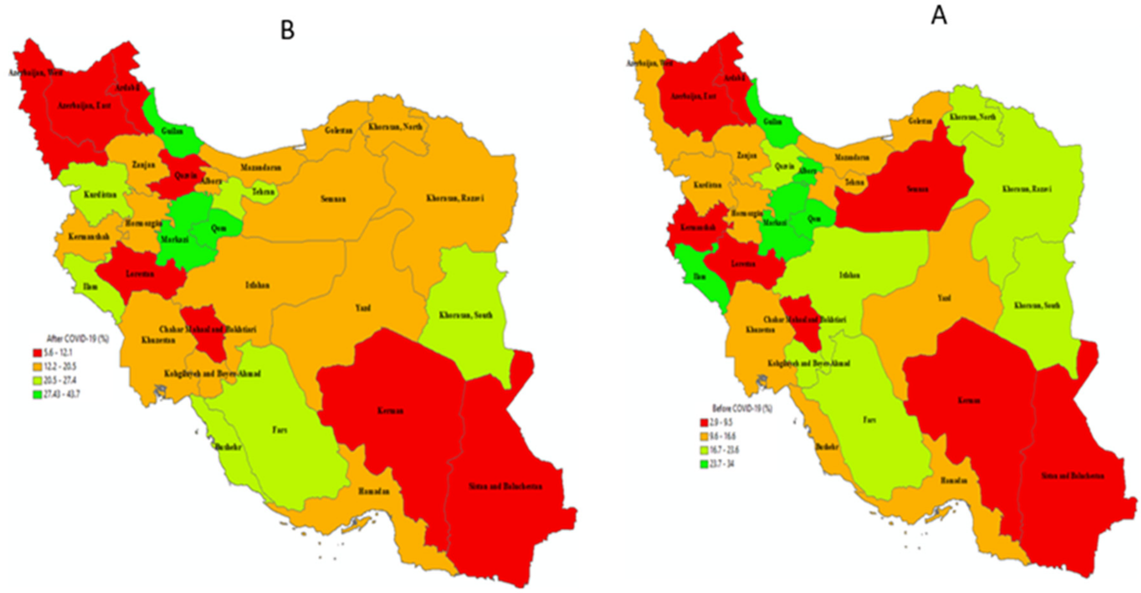

Figure 2. Comparison of the consumption of MPs in Iranian households before (A) and after (B) the Covid-19 pandemic, by provinces

1.516; P = 0.010). Additionally, households with heads aged 51 to 65 years had an increased likelihood of using MPs (OR, 1.170 [95% CI, 1.057-1.291]; P = 0.010), while those aged 65 and older also demonstrated significant odds (OR, 1.150; P = 0.022). Married heads of households had a notably higher probability of consuming MPs than single heads, with an OR of 1.630 (95% CI, 1.161-2.297; P < 0.010).

Further analysis indicated that while the educational level of the household head did not significantly affect MPs consumption (P > 0.050), having 1 to 2 educated individuals in a household increased the likelihood of using MPs (OR, 1.290; P = 0.010). Rural households were less likely to consume MPs compared to urban households (OR, 0.830; P < 0.001). Income levels also played a crucial role; households in the fifth income quintile had an OR of 1.800 (95% CI, 1.592-2.025; P < 0.001), indicating an 80% higher chance of using MPs compared to those in the lowest income quintile. The province of residence significantly influenced MPs consumption, with all provinces except Guilan province showing lower probabilities relative to Markazi province (P < 0.001). Overall, the regression model demonstrated that COVID-19 had a substantial impact on MPs consumption among Iranian households, resulting in an average increase in likelihood by approximately 29% (OR, 1.290; P < 0.001). These findings are summarized in Table 3, which details the factors influencing the use of MPs across different demographics and provinces.

Discussion

MPs have been widely used in Iran for centuries and play a significant role in traditional medicine across the country. These plants have been extensively studied for their therapeutic potential in treating various diseases, both infectious

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Table 3. The Results of the Logistic Regression Model on Consumption of MPs Among Iranian Households

Variable		aOR	%95 CI (Min-Max)	*P* Value
Gender of head of household (ref: male)	Male	1		
	Female	1.28	1.083, 1.516	0.010
Age of head of household (years) (ref: =<35)	≤35	1		
	36-50	1.12	1.014, 1.226	0.024
	51-65	1.17	1.057, 1.291	0.010
	>65	1.15	1.021, 1.295	0.022
Marital status of head of household (ref: Single)	Single	1		
	Married	1.63	1.161, 2.297	0.010
	Widow/ divorces	1.12	0.801, 1.563	0.510
Education level of head of household (ref: Illiterate)	Illiterate	1		
	Under diploma	0.94	0.846, 1.045	0.255
	Diploma	1.00	0.887, 1.134	0.960
	Bachelor	1.07	0.926, 1.227	0.374
	Master of Sciences and higher	1.01	0.849, 1.210	0.880
Number of educated persons (ref: 0)	0	1		
	1-2	1.29	1.101, 1.506	0.010
	3-4	1.38	1.163, 1.629	<0.001
	5 and more	1.29	1.064, 1.568	0.010
Place of residency (ref: Urban)	Urban	1		
	Rural	0.83	0.781, 0.876	<0.001
Income quintile (ref: 1st (the lowest))	1st	1		
	2nd	1.25	1.116, 1.392	<0.001
	3rd	1.50	1.339, 1.681	<0.001
	4th	1.52	1.357, 1.707	<0.001
	5th (the highest)	1.80	1.592, 2.025	<0.001
Province of residency (ref: Markazi)	Markazi	1		
	Guilan	0.90	0.780, 1.047	0.179
	Mazandaran	0.37	0.310, 0.450	<0.001
	Azerbaijan, East	0.16	0.134, 0.198	<0.001
	Azerbaijan, West	0.23	0.184, 0.292	<0.001
	Kermanshah	0.22	0.178, 0.277	<0.001
	Khuzestan	0.33	0.280, 0.393	<0.001
	Fars	0.55	0.476, 0.645	<0.001
	Kerman	0.17	0.138, 0.215	<0.001
	Khorasan, Razavi	034	0.290, 0.399	<0.001
	Isfahan	0.35	0.292, 0.413	<0.001
	Sistan and Baluchestan	0.12	0.098, 0.154	<0.001
	Kurdistan	0.42	0.348, 0.498	<0.001
	Hamadan	0.28	0.237, 0.342	<0.001
	Chahar Mahaal and Bakhtiari	0.07	0.054, 0.092	<0.001
	Lorestan	0.12	0.089, 0.155	<0.001
	Ilam	0.61	0.514, 0.726	<0.001
	Kohgiluyeh and Boyer-Ahmad	0.36	0.310, 0.428	<0.001
	Bushehr	0.34	0.282, 0.403	<0.001
	Zanjan	0.40	0.342, 0.480	<0.001
	Semnan	0.18	0.142, 0.219	<0.001
	Yazd	0.26	0.212, 0.317	<0.001
	Hormozgān	0.27	0.228, 0.317	<0.001
	Tehran	0.35	0.300, 0.400	<0.001
	Ardabil	0.17	0.134, 0.221	<0.001
	Qom	0.66	0.558, 0.789	<0.001
	Qazvin	0.33	0.275, 0.407	<0.001
	Golestan	0.28	0.240, 0.325	<0.001
	Khorasan, North	0.35	0.299, 0.407	<0.001
	Khorasan, South	0.59	0.504, 0.685	<0.001
	Alborz	0.50	0.413, 0.607	<0.001
Covid-19 (ref: No)	Yes	1.29	1.212, 1.367	<0.001

aOR: Adjusted Odds Ratio

and noninfectious. The literature emphasizes the effectiveness of MPs in traditional medicine and their potential as a source for developing new drugs.

Several studies have highlighted the medicinal properties of specific plants. For example, cinnamon intake has been linked to alleviating diarrhea symptoms by modulating intestinal microbiota composition (21). Cinnamon bark extract has also demonstrated antitumor effects on colon cell lines, especially when combined with probiotic fermentation (22). Ginger has been suggested as an adjuvant treat-

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ment for iron deficiency anemia (23) and has shown promise in synthesizing iron nanoparticles with strong antioxidant and antibacterial properties (24). Cardamom has been found to have a positive impact on biochemical parameters in diabetic patients (25), while Heracleum persicum (giant hogweed) has shown potential as a green drug for treating breast adenocarcinoma (26). Compounds from Heracleum persicum with antioxidant or anti-inflammatory properties also hold promise as anticancer agents (27). Echium amoenum (snake flower) has exhibited antidepressant properties and may serve as an alternative to fluoxetine for mild to moderate depression (28, 29). Additionally, Cichorium intybus (chicory) has been suggested as a chemotherapy supplement for acute leukemia (30), and essential oil derived from Mentha longifolia (wild mint) has demonstrated growth-inhibiting and bactericidal effects against various bacteria (31).

Studies conducted in Iran have specifically explored the effectiveness of various MPs in preventing and inhibiting COVID-19. For instance, one investigation identified several available MPs in domestic markets, such as Shirazi thyme, green tea, Echinacea, aloe vera, black seed, eucalyptus, chicory, cloves, licorice, peas, and saffron, which were effective against COVID-19 (17). Another study identified 20 molecules from common Iranian MPs that could serve as inhibitors against the virus (32). Although many studies have focused on the types of MPs used during the COVID-19 pandemic (33-39), only a few have examined MPs consumption in relation to national socioeconomic and demographic characteristics. These studies have shown that MPs usage is primarily rooted in familial traditions (40).

In the present study, we investigated the consumption patterns of MPs in Iranian households at the national level, comparing data from before and after the COVID-19 pandemic. Our findings indicated an increase in MPs consumption across all provinces and socioeconomic groups after the pandemic. The likelihood of using MPs varied significantly among different socioeconomic groups, with one exception: the education level of the household head. Specifically, female-headed households, those with older individuals, married households, families with more educated members, urban households, and households in higher income quintiles were more likely to consume MPs.

A study conducted in Peru found that approximately 80% and 71% of participants used MPs for the prevention and treatment of respiratory symptoms related to COVID-19, respectively. Women were also found to be more likely to use MPs, and older individuals demonstrated a greater tendency toward MPs usage (41).

It is not surprising that women play a significant role in passing down traditional knowledge of domestic MPs usage across generations. This factor has become more prevalent during the COVID-19 pandemic, highlighting the importance of focusing on women as key contributors to disease management through traditional home care. Interestingly, the study conducted in Peru indicated an inverse relationship between MPs consumption and education level, demonstrating that individuals with higher education levels tend to use fewer MPs (41). In contrast, our study found that households with more educated individuals were more likely to use MPs, although no significant relationship was found between the education level of the household head and MPs consumption. Another study conducted in Nepal also indicated an increase in MPs usage during the COVID-19 pandemic, with registered MPs showing significant associations with education level, place of residence, sex, and age group (42).

While other studies often show that educated individuals rely more on modern medicine for treatment (43), the Nepalese study, similar to ours, found that educated people were more inclined to use MPs for COVID-19-related ailments. Additionally, women played a more significant role in MPs usage, and older individuals had a higher likelihood of consuming MPs. The Nepalese study also revealed that young people (under the age of 30) reported higher MPs usage, likely due to living with their families and receiving information about MPs from older generations (42). Furthermore, studies indicate that individuals engaged in agricultural work and residing in rural areas are more inclined to use traditional methods for health maintenance and disease management (43). In our study, however, urban households had a higher likelihood of using MPs for COVID-19 prevention and treatment. This finding may be attributed to the fact that most urban households were situated in higher income quintiles, which increases their access to and likelihood of using medicinal plants. Moreover, rural households may have a higher probability of collecting MPs from nature without necessarily reporting the purchase of such plants.

The study offers several strengths, including its timely relevance in addressing the impact of the COVID-19 pandemic on MPs consumption, which provides valuable insights into public health behaviors. Utilizing reliable data from the ISC, it encompasses a diverse sample of households from urban and rural areas, enhancing generalizability. By focusing on traditional medicine, the research contributes to existing literature and identifies key determinants influencing consumption patterns. Overall, the findings can inform public health initiatives aimed at educating communities about the safe and effective use of MPs during crises. Besides these strengths, our study employed a cross-sectional design. This approach limits our ability to draw conclusions about cause-and-effect relationships or to track how MPs consumption might change over time. While we made efforts to account for various socioeconomic and demographic factors, it is possible that other influences—like cultural beliefs or access to healthcare—could affect consumption patterns but were not measured in our analysis. Future research could benefit from applying a multilevel logistic regression model to analyze the data, as our study reflected a hierarchical structure with households grouped within provinces. Utilizing this approach would enhance our understanding of how provincial-level differences impact MPs use and provide deeper insights into the factors influencing consumption patterns across diverse regions.

Conclusion

In Iran, the COVID-19 pandemic has led to a significant

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rise in the use of MPs among households. This trend is evident across all provinces and various socioeconomic groups, reflecting a growing reliance on traditional remedies during pandemics. While many people turn to MPs for their potential benefits in managing COVID-19, health policymakers must recognize that the safety and efficacy of these plants are not always well-established. Therefore, generating robust evidence on the appropriate use of MPs is essential to guide the public effectively. By providing clear information on which plants may be beneficial and under what circumstances, we can help ensure that individuals make informed choices about their health during and beyond the pandemic.

Authors' Contributions

A.K.-K. conceptualized the study and designed the methodology. J.Y.D., K.I., S.S., S.R., and A.A.F performed data cleaning and statistical analysis, while M.S. and S.D.R. contributed to the interpretation of results. All authors contributed in drafting the manuscript and revising it for clarity and coherence. Also, all authors read and approved the final version of the manuscript.

Ethical Considerations

This study was conducted in accordance with ethical standards and received approval from the Kermanshah University of Medical Sciences (Ethics Code: IR.KUMS.REC.1402.249).

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Conflict of Interests

The authors declare that they have no competing interests.

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