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Mohamed Rashrash
Chapman University, rashrash@chapman.edu

Jon C. Schommer
University of Minnesota

Lawrence M. Brown
Chapman University, lbbrown@chapman.edu

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Mohamed Rashrash, MSc (Pharm), PhD[1],
Jon C. Schommer, MS, PhD[2],
and Lawrence M. Brown, PharmD, PhD[1]

Abstract

Objective: To describe the prevalence of herbal medicine use among US adults and to assess factors associated with and predictors of herbal use. **Design:** The data for herbal products use were collected from the 2015 National Consumer Survey on the Medication Experience and Pharmacists' Roles. Chi-square test was used to analyz factors associated with herbal use, and predictors of herbal use were assessed with logistic regression analysis. **Results:** Factors associated with herbal supplement use include age older than 70, having a higher than high school education, using prescription medications or over-the-counter (OTC) medications, and using a mail-order pharmacy." All Disease state associated significantly with herbal use. Approximately thirty-eight percent of those who used herbals used prescription medications and 42% of those who used herbals also used an OTC medication. The most frequent conditions associated with herbal supplement use were a stroke (48.7%), cancer (43.1%), and arthritis (43.0%). Among herbal product users, factors that predicted use included having higher than school education, using OTC medications, using mail-order pharmacy, stroke, obesity, arthritis, and breathing problems. **Conclusions:** More than one-third of respondents reported using herbal supplements. Older age and higher education were associated with a higher use of herbal supplements. People with chronic diseases are more likely to use herbal medicines than others. OTC drug users and patients with stroke are more likely to use herbal medicines than others.

Keywords

herbal medicine, complementary medicine, alternative medicine, predictors, national consumer survey

Herbal medicines are classified as any products originating from plants and used to preserve or recover health, as described by the National Institutes of Health (1). Historical data show that herbal medicine has been used for over 5000 years (2) and was the only documented medicine in use during that time. Animal and mineral products were also used by ancient systems of medicine including Siddha, Ayurveda, and Chinese medicine (3,4). As late as the 1890s, 59% of the products in the US Pharmacopoeia were based on herbs or herbal combinations (5). Currently, thousands of herbal products are available over the counter and are commonly used by the general population in the United States (6).

Herbal products are among a comprehensive assortment of treatments referred to as complementary and alternative medicine (CAM), and many of them are still lacking scientific evidence of effectiveness and safety (7).The increased popularity of treating patients with various illnesses using CAM is evident throughout the past decades (7–12). About 42% of Americans acknowledged using some form of CAM in 1997, with 12% of the population using herbal medicine. Merging of CAM with conventional medicine has been an active influence on present health-care practices (13–17) and is increasingly used by clinicians and researchers under the term of "integrative medicine" (18).

A 2012 report by the American Botanical Council disclosed that herbal products sales exceeded US$5.3 billion in the United States in 2011, a 4% growth compared to 2010 (19). In 2013, sales increased by 8%, reaching a total of approximately US$6 billion (20).

[1] Chapman University School of Pharmacy, Rinker Health Science Campus, Irvine, CA, USA
[2] University of Minnesota College of Pharmacy, Minneapolis, MN, USA

Corresponding Author:
Mohamed Rashrash, Chapman University School of Pharmacy, Rinker Health Science Campus 205 9401 Jero, Irvine, CA 92618, USA.
Email: rashrash@chapman.edu

Mainstream consumers use herbal medicines in combination with both prescription and nonprescription drugs (21,22). Those users specify that their use of herbal medicine demonstrates their independence in managing their health problems, thereby improving their general well-being and enhancing longevity (23).

A survey of the literature shows that various research studies have been conducted on determinants or the most salient predictors of herbal medicine utilization, especially in the United States and Europe. Despite evidence of the prevalent use, information about the use of herbal medicine patterns and reasons behind the choice of medicinal herbs is limited (24). Despite the exponential growth in the interest and use of herbal medicine, there is a clear lack of medical record documentation of herbal medicine use among patients (25). This study aims to describe the prevalence of herbal supplement use among the US adult population and to examine the effect of demographic and health-related factors on adult herbal medicine use in the United States.

Methods

Data Source

The 2015 National Consumer Survey on the Medication Experience and Pharmacist Role (NCSME-PR) was the primary and only source of data. The NCSME-PR is a cross-sectional, self-administered, online survey used for collecting data about consumers' views and perceptions regarding medications and pharmacy via technical support from Qualtrics Panels. The data included responses from at least 500 adults from 50 states plus the District of Columbia, with a minimum total sample of at least 25 500 respondents.

The primary outcome variable was a question regarding the current use of herbals (How many of herbal supplements are you currently taking every day?). The question did not confine the usage of herbal products by a time frame (such as during the past month, year, etc).

Independent factors were demographic variables including age, gender, education, race/ethnicity, annual household income, and insurance coverage. Health-related factors included self-rated health status, use of prescription and Over the Counter drugs (OTC) medications, use of mail-order pharmacy, and disease states of the respondents.

The chi-square test was used to compare herbal medicine users versus nonusers with respect to demographic and health-related characteristics. All demographic and health-related variables were included in a multivariable logistic regression analysis to assess which variables were significantly related to herbal use adjusted for other factors. All analyses were performed using SPSS version 22.

Results

A total of 26 157 eligible respondents were included in the study, and approximately one-third of them reported current use of at least 1 herbal medicine (35%). The average number

Table 1. Sociodemographic Characteristics and Use of Herbal Medicine.

Characteristic	Sample, n (%), 26 157(100)	Use of herbal medicine, 9194 (35.1)
Age[a]		
Millennials (aged 18-33)[b]	8527 (32.6)	2819 (33.1)
X'ers (aged 34-50)[c]	7989 (30.5)	2771 (34.7)
Boomers (aged 51-69)[d]	7843 (30.0)	2882 (36.7)
Pre-1946s (aged 70 or older)[e]	1798 (6.9)	722 (40.2)
Education[a]		
High school	6024 (23.0)	1741 (28.9)
Less than high school	20 133 (77.0)	7453 (37.0)
Gender		
Male	7544 (28.8)	2646 (35.1)
Female	18 613 (71.2)	6548 (35.2)
Race/ethnicity		
White	21 114 (80.7)	1795 (35.6)
Nonwhite	5043 (19.3)	7399 (35.0)
Income		
US$20 000 or less	5027 (19.2)	1759 (35.0)
US$21 000 to US$40 000	6599 (25.2)	2323 (35.2)
US$41 000 to US$60 000	5319 (20.3)	1909 (35.9)
US$61 000 to US$80 000	3817 (14.6)	1346 (35.3)
US$81 000 to US$100 000	2501 (9.6)	860 (34.4)
More than US$100 000	2894 (11.1)	997 (34.5)
Insurance coverage		
Yes	21 432 (81.9)	7540 (35.2)
No	4725 (18.1)	1645 (35.0)

[a]Statistically significant association with herbal use.
[b]Millennials: born from 1982 (these turned 18 in 2000) through 1997.
[c]X'ers: born between 1965 and 1981. Thus, in 2015, they would have been aged 34 to 50.
[d]Boomers: often defined as being born between 1946 and 1964.
[e]Pre-1946er's: was the oldest age category and included everyone born before the Boomer generation.

of herbal supplements used by study population was 2.6 (2.4).

Demographic Characteristics

The study participants were predominantly female (71%), white (81%), had greater than a high school education (77%), had insurance coverage (82%), and had an annual household income less than US$80 000 (79%). The sociodemographic features of the study population are presented in Table 1.

Herbal Medicine Use

Approximately 35% (9194) of respondents reported their current use of herbal medicine. Respondents born before

Table 2. Association of Use of Herbal Medicine and Health Status Variables.

Variable	Sample, n (%), 26 157 (Total)	Use of Herbal Medicine, n (%), 9194 (35.1)
Rated health		
Excellent	3678 (14.1)	1304 (35.5)
Good	14 633 (55.9)	5168 (35.3)
Fair	6761 (25.8)	2331 (34.5)
Poor	1085 (4.1)	391 (36.0)
Use of prescription medications[a]		
Yes	16 728 (64.0)	6294 (37.6)
No	9432 (36.0)	2898 (30.8)
OTC use[a]		
Yes	13 944 (53.3)	5851 (42.0)
No	12 200 (46.7)	3335 (27.3)
Use of mail-order pharmacy[a]		
Yes	4447 (17.0)	1898 (42.7)
No	21 710 (83.0)	7296 (33.6)
Heart disease[a]		
Yes	1778 (6.8)	765 (43.0)
No	24 379 (93.2)	8429 (34.6)
Stroke[a]		
Yes	618 (2.4)	301 (48.7)
No	25 539 (97.6)	8893 (34.8)
Cancer[a]		
Yes	1739 (6.6)	749 (43.1)
No	24 418 (93.4)	8445 (34.6)
Diabetes[a]		
Yes	3050 (11.7)	1256 (41.2)
No	23 107 (88.3)	7938 (34.4)
Obese[a]		
Yes	7541 (28.8)	3082 (40.9)
No	18 616 (71.2)	6112 (32.8)
Arthritis[a]		
Yes	6954 (26.6)	2993 (43.0)
No	19 203 (73.4)	6201 (32.3)
Breathing problems[a]		
Yes	6238 (23.8)	2582 (41.4)
No	19 919 (76.2)	6612 (33.2)

[a]Significant association with herbal use.

Table 3. Predictors of Herbal Medicine Use by Multivariate Logistic Regression Analysis.

Factors	P Value	AOR	95% CI for AOR Lower	95% CI for AOR Upper
Age category				
Millennials	Reference	Reference	Reference	Reference
X'ers	.237	0.96	0.89	1.03
Boomers	.066	0.94	0.87	1.01
Pre-1946s	.757	0.98	0.88	1.12
Male	.851	0.99	0.94	1.05
HS or less	.000	0.70	0.65	0.74
White ethnicity	.001	.89	0.84	0.96
Household income	.308	0.99	0.97	1.01
Insurance coverage	.733	1.01	0.94	1.08
Rate health	.645	0.99	0.96	1.03
Prescription	.291	0.97	0.91	1.03
OTC use	.000	1.71	1.62	1.81
Mail pharmacy	.000	1.25	1.17	1.35
HD	.934	1.01	0.90	1.12
Stroke	.003	1.30	1.09	1.54
Cancer	.075	1.10	0.99	1.22
Diabetes	.647	1.02	0.94	1.11
Obesity	.000	1.12	1.05	1.19
Arthritis	.000	1.28	1.20	1.37
Breathing	.000	1.15	1.08	1.22

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; HD, heart disease; HS, high school.

medicine use. Association of herbal medicine usage and self-rating of health was not significant ($P > .05$), but respondents with medical diseases reported a higher usage of herbal medicines (Table 2).

Compared to respondents without these diseases, herbal medicine use was higher in patients with cancer (43% vs 35%), diabetes (41% vs 34%, $P < .001$), heart disease (43% vs 35%, $P < .001$), breathing problems (41% vs 33%, $P < .001$), obesity (41% vs 33%, $P < .001$), arthritis (43% vs 32%, $P < .001$), and patients with a history of stroke (49% vs 35%, $P < .001$).

Predictors of Herbal Medicine Usage

All variables appearing in Tables 1 and 2 were included in a multivariable logistic regression model to assess the predictors of herbal products current usage. The findings are presented in Table 3.

The likelihood of herbal medicine usage was significantly higher among patients with a history of stroke (odds ratio [OR]: 1.30; 95% confidence interval [CI]: 1.09-1.54), obesity (OR: 1.12; 95% CI: 1.05-1.19), arthritis (OR: 1.28; 95% CI: 1.20-1.37), breathing problems (OR: 1.15; 95% CI: 1.08-1.22), and among people with prior use of mail-order pharmacy and current use of over-the-counter products (OR: 1.25; 95% CI: 1.17-1.35 and OR: 1.71; 95% CI: 1.62-1.81, respectively). In contrast, having high school or a lower level of education was associated significantly with lower odds of

1946 reported higher use of herbal medicine than other age groups although this finding was not statistically significant when adjusted for other factors. Education was also significantly associated with the herbal medicine use ($P < .001$).

Approximately 37% (7453) of people with post-high school education admitted their current use of herbal medicine.

Health Status

The breakdown of herbal medicine users and nonusers according to health status variables is shown in Table 2 with a significantly higher proportion of prescription medication users, OTC medication users, and mail-order pharmacy users (38%, 42%, and 43%, respectively) reporting herbal

current use of herbal products (OR: 0.70; 95% CI: 0.65-0.74).

Discussion

The current study shows higher use of herbal medicine among patients with chronic diseases compared to the overall sample population. According to Bressler, people with chronic conditions may take herbal and/or nutritional supplements to enhance or maintain their health and that possibly explains this finding (26,27).

There was little difference in herbal medicine use among those respondents who rated their health as excellent from those who rated their health as poor. This finding is not consistent with other studies which show that individuals who are worried about their health status, and specifically about self-sufficiency, consume herbal products more than others (28). One of the possible explanations of these differences is the larger sample size and more diverse geographic locations (the entire United States) of our population compared to these studies. Moreover, our population is Internet users, and the majority was white females. These differences in sample size might affect the power of statistical analysis and might lead to different findings, as the statistical differences in small sample size population might be diluted in larger sample size and become not significant. In addition, any variation in population characteristics (such as race, gender, and geographic location) might lead to variability in findings.

Information related to factors and personal determinants that impact US adults' decisions to use medicinal herbs is scarce (24). In this study, factors associated with herbal medicine usage involved greater than a high school level of education, current use of prescription or OTC medications, prior use of mail-order pharmacy, and having chronic diseases. The most frequent diseases associated with herbal medicine use were patients with a history of a stroke followed by cancer, heart disease, and arthritis. A possible explanation for these findings is that the illness treatments are challenging and complete recovery is not guaranteed, so people might seek alternate therapies and they look to herbal medicine as another expected hope for a cure. However, recovery from illness is also not guaranteed with herbal medicines.

The results of this study revealed that the prevalence of herbal medicine use in US adults is higher than the estimates of other national studies (26,29–34). Characteristics associated with herbal product usage presented in other large-scale national surveys included middle-aged, female gender, holding college degree or higher (35,36), uninsured (37), and using prescription or OTC medications (38). Some of these findings are consistent with our study results such as advanced age and higher degree of education, while other factors, such as gender, were not. It is noteworthy to mention that majority of this study population were white females.

Among the elderly population in the United States, herbal product use is higher among individuals described as female, having a higher annual household income, and higher education (36). The current study is consistent with these conclusions.

In this study, arthritis and breathing problems were among the factors significantly associated with herbal use. This finding is consistent with prior national surveys' findings, which concluded that upper respiratory infections and arthritis are significantly related to the use of herbal supplements (35,38,39).

Among the 9194 herbal medicine users, about 69% were prescription medication users, and 64% were OTC medication users. In 1997, about 15 million individuals used herbal products and prescription medications concurrently (21). Kaufman et al recognized that about 16% of prescription medication takers also admitted using herbal supplements (38). Some reports about the interactions between herbal medicine and prescription medications are increasing. However, concern regarding underreporting of the adverse effects of herbal supplements has grown (38,40–45).

The logistic regression analysis revealed that respondents who were using OTC medications and used mail-order pharmacy were more likely to use herbal medicine, whereas those with a high school or lower level of education were less likely to use herbal supplements. These findings could be explained by the fact that many people do not differentiate between some herbal medicines and OTC medications, while individuals using mail-order pharmacy tend to be elderly who are the largest users of herbal supplements.

The analysis also revealed patients with a history of stroke, followed by patients with arthritis, and those with breathing problems and obesity are more likely to consume herbal products. These findings might be interpreted by the fact that people with a history of chronic diseases are more concerned about their health and are seeking alternative medicine to improve their health (26,27,46,47) and to relieve or avoid unpleasant side effects associated with conventional therapy (48,49). Also, if there are restrictions on access to medical care, needs are unmet by conventional care, or care is delayed, use of CAM is more likely expected among those patients (50).

Study Limitations

There were various limitations to this study. First, the findings were built on self-reported information; thus, respondents might have over or underreported their herbal medicine usage. Second, the term "herbal supplements" used in the questionnaire might have been misinterpreted because of the many terms used, such as herbal medications, herbal products, and others. Third, people who use herbal products in a pharmaceutical dosage form might consider them as OTC medications. Fourth, ethnic minorities were not well represented in the study which may lead to overestimation or underestimation of the prevalence of herbal supplements use

among several ethnic groups. This possibly is the strongest limitation of this study, since Latinos (Hispanics), African Americans, and Asians (who are important users of a broad assortment of herbal medicines) were not equally included in this study like whites who were the only well-represented group. Finally, despite the statistically significant values of the reported ORs, review of the literature revealed that relative risks more than 0.5 and less than 2 are more likely due to bias which is unavoidable in all observational research, and only values out of this limit deserve attention (51,52).

Conclusion and Future Recommendations

The use of herbal supplements among US residents has been increasing over the years. It is unclear whether this increase is due to the effectiveness and safety of herbal medicines or due to other components, such as extensive marketing. More research is needed to confirm already concluded reasons such as improving health and well-being, alleviate symptoms accompanying chronic diseases, relief of unpleasant side effects associated with conventional treatments, and holistic beliefs or disclose new rationale explaining people's choice to use herbal supplements. Mail-order pharmacy, OTC products users, and those having chronic diseases associated positively with the use of herbal supplements. Further studies are needed to assess attitudes, perceptions, beliefs, perceived outcome, and overall effectiveness of herbal medicine use.

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Author Biographies

Mohamed Rashrash, MSc (Pharm), PhD, is a post doctoral fellow at Chapman University.

Jon C. Schommer, MS, PhD, is an associate department head and professor in the Department of Pharmaceutical Care & Health Systems and Peters Chair in Pharmacy Practice Innovation. He is a director of Graduate Studies in Social and Administrative Pharmacy Track.

Lawrence M. Brown, PharmD, PhD, is an associate dean of Student and Academic Affairs and a full professor in the school of pharmacy, Chapman University.