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Original Article

Use of medicinal plants in Honduras: Characteristics and associated factors

[Uso de plantas medicinales en Honduras: Características y factores asociados]

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Abstract

Context: Alternative medicine has been used for thousands of years in Latin America, but there are no updated reports in Honduras, a Central American country.

Aims: To characterize and find the factors associated with the use of medicinal plants in Honduras.

Methods: A cross-sectional analytical study was carried out by means of Physicians in Social Service (MSS) in hospitals and health institutions; 16,379 respondents were reached in all departments of Honduras, who were asked about their general characteristics, use of medicinal plants and other similar characteristics; descriptive and analytical statistics were obtained.

Results: 87.9% (14,398) mentioned that they had used medicinal plants. Their use was higher in the female population (p<0.001), living in a rural area (p<0.001), having been treated with natural medicine (p<0.001), among those who recommended that others be treated with medicinal plants (p<0.001) and those who thought that plants are cheaper than pharmacological treatments (p=0.042); on the contrary, those who thought that drugs were cheaper (p<0.001), those who did not know about the prices (p<0.001) and those who perceived that natural medicine care was cheaper (p<0.001) used fewer natural treatments; adjusted for four variables.

Conclusions: The study identified key characteristics and factors associated with the use of medicinal plants in Honduras. These findings offer valuable insights for public health officials and policymakers, especially in countries with similar cultural and socioeconomic contexts within Central America. Understanding the prevalence and types of alternative medicine used across urban and rural populations can help guide health interventions and integrate traditional medicine into public health strategies.

Keywords: alternative medicine; Honduras; medicinal plants; traditional medicine.

Resumen

Contexto: La medicina alternativa se ha utilizado desde hace miles de años en América Latina, pero no existen reportes actualizados en Honduras, país centroamericano.

Objetivos: Caracterizar y encontrar los factores asociados al uso de plantas medicinales en Honduras.

Métodos: Se realizó un estudio analítico transversal a través de Médicos en Servicio Social (MSS) de hospitales e instituciones de salud; se llegó a 16.379 encuestados en todos los departamentos de Honduras, a quienes se les preguntó sobre sus características generales, uso de plantas medicinales y otras características similares; se obtuvo estadística descriptiva y analítica.

Resultados: El 87,9% (14.398) mencionó haber usado plantas medicinales, su uso fue mayor en la población femenina (p<0,001), viviendo en zona rural (p<0,001), habiendo sido tratados con medicina natural (p<0,001), entre quienes recomendaban que otros se trataran con plantas medicinales (p<0,001) y quienes pensaban que las plantas son más baratas que los tratamientos farmacológicos (p=0,042); por el contrario, quienes pensaban que los medicamentos eran más baratos (p<0,001), quienes desconocían los precios (p<0,001) y quienes percibían que la atención con medicina natural era más barata (p<0,001) usaban menos tratamientos naturales; ajustado por cuatro variables.

Conclusiones: El estudio identificó características y factores clave asociados con el uso de plantas medicinales en Honduras. Estos hallazgos ofrecen información valiosa para los funcionarios de salud pública y los formuladores de políticas, especialmente en países con contextos culturales y socioeconómicos similares dentro de América Central. Comprender la prevalencia y los tipos de plantas medicinales en Honduras. La medicina utilizada en poblaciones urbanas y rurales puede ayudar a guiar las intervenciones de salud e integrar la medicina tradicional en las estrategias de salud pública.

Palabras Clave: medicina alternativa; Honduras; plantas medicinales; medicina tradicional.

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INTRODUCTION

In most countries of the world, medicinal plants have been used throughout history for the treatment of diseases and infections as traditional healing remedies due to their wide therapeutic use with effects minimal secondaries or none (Dhama et al., 2018).

In a large part of developing countries, the use of medicinal plants for the management of diseases remains an important alternative; whether due to cultural aspects, access to health services, or the costs of pharmacological drugs on the market, this practice is more accentuated among ethnic groups.

According to the World Health Organization (WHO), Around 65-80% of the World's population in developing countries, due to poverty and lack of access to medicine, are essentially dependent on plants for their medical care. However, few plants have been scientifically studied for the evaluation of their quality, safety, and efficacy. The WHO includes among the products of Traditional Chinese Medicine (TCM). These include herbs, materials, preparations, and herbal products, which contain active ingredients in parts of plants or other plant materials or combinations of those ingredients (WHO, 2023).

Following the COVID-19 pandemic, most developing countries looked to medicinal plants as an alternative to treat the disease. Without effective treatment, experimental vaccines, and ancestral practices were used to manage symptoms, while many people turned to traditional treatments, through the use of medicinal plants, to relieve pain or symptoms caused by the COVID-19 virus (Regalado-Chamorro et al., 2023).

Honduras is a country of more than ten million people where 60% of the population is covered by the public health system, 16.8% by social security, and only 5% by the private sector (Instituto Nacional de Estadísticas, 2019) and 18.2% have no access to health at all, so we believe it is important to know the characteristics and factors of the use of medicinal plants among the Honduran population in order to identify the situation of medicinal plants as a health alternative among the population.

More than 1547 plant specimens have been identified in Honduras, of which 68% have medicinal use, and 8% have edible use, which are recorded in the Paul R. House herbarium located in the University City of the National Autonomous University of Honduras (Dueñas-Rosales and Ferrufino, 2022).

Whether due to different economic situations or cultural traditions, traditional medicine continues to be used by women, older people, and people with low income and education who use medicinal plants the most. Although medicinal plants can be used safely, there is often no correct identification of the species, origin, preparation, or the appropriate dose for each case for the management of different diseases in Latin America and Peru in the treatment of urinary tract infection, gastritis, COVID-19, nephropathy and hepatitis and for symptoms: cough, phlegm, burning when urinating, gas and sore throat (Córdova Silipú and León Osorio, 2023).

A fragmented health system and the inequity of these have increased the use of medicinal plants in recent years among the Honduran population, coupled with this is the false sense of security, magnifying only the benefits without knowing the risks they may represent for health, so the purpose of the research was to find out the use that the population has in order to propose measures for a rational use of them.

MATERIAL AND METHODS

A cross-sectional, associative study was conducted in the Honduran population over 18 years of age, taking a maximum prevalence of knowledge about the use of medicinal plants of 50% and a minimum value of 5%, with 80% statistical power and 95% confidence level, 70 people (women or men) >18 years of age are required for each MSS (225), the sampling was non-probabilistic.

Inclusion criteria: man/woman >18 years of age, living in the area of influence of the MSS, identity card or birth certificate, members of the community or study population involved in natural treatments who wish to participate in the study and have informed consent.

Exclusion criteria: man/woman >18 years of age suffering from some mental illness that makes it impossible to give the information, being intoxicated or having consumed drugs during the interview, who do not speak Spanish, and who have disability problems that are a limitation for them to fill out a survey or respond to an interview, or who did not want to participate through an online survey created by the authors, which was validated in each workplace by each MSS and which was then distributed in their work area, and consolidated by departments.

The study was conducted under the Declaration of Helsinki. The preparation and execution of this investigation fully complied with the fundamental ethical principles of autonomy, justice, beneficence, and non-maleficence. It was approved by the Biomedical Re-

search Ethics Committee (CEIB) of the National Autonomous University of Honduras (UNAH), meeting on March 20, 2020. Dictamen number (2020-010).

The survey was conducted on Google Forms, and a record was kept with a code for each MSS; the sample collection period was in the months of June and July 2020 in the 18 departments of the country (supplementary data, Annex 1). The variables to be evaluated were sex, age, ethnicity, schooling, used medicinal plants, naturally treated, and medicinal plant costs.

For the statistical analysis, the data were analyzed using Stata V16.0 software (license acquired by the group's statistician). A descriptive table of the population was first obtained, followed by one that showed the use and the way of learning about medicinal plants; in both, the frequencies and percentages of the categorical variables were obtained, as well as the median and interquartile ranges of age (this is due to the fact that it showed no normality when evaluated with the Shapiro Wilk test). The difference between the groups can be observed in the results of Table 3, and a varied or multivariate analysis can be observed in Table 4.

We started with the bivariate analysis. It is here where the statistical power of the 10 crosses was obtained (of the dependent variable versus each of the 10 independent variables shown in Table 3), and it was found that the statistical power was 100% in each of the cases. Therefore, it is certain that the associations had a sufficient number of respondents for analytical statistics. In this step, p-values were obtained with the chi-square test and the sum of ranges (for age). Finally, prevalence ratios, 95% confidence intervals, and p-values were obtained with generalized linear models (Poisson family, log link function, models for robust variances, and adjusted by the department of residence). For a variable to move from the bivariate model to the multivariate model and be considered statistically significant, it had to show a $p<0.05$ value.

RESULTS

Of the 16,379 respondents, 87.9% (14,398) mentioned that they had used medicinal plants, 65.0% (10,639) were women, the median age was 30 years (interquartile range: 25-40 years), 8.8% were Indigenous or African American ethnicity, 19.2% resided in a rural area, 43.1% had received natural treatment from a health person, and 75.9% had recommended medicinal plants (Table 1).

The most commonly used medicinal plants are chamomile (85.7%), lemon (77.8%) and ginger (66.4%). The main means of finding out about this type of treatment are the recommendations they receive from other people (54.4%), the Internet (35.1%), and the personal experience they may have (32.9%) (Table 2).

Having used medicinal plants was associated with sex, age, ethnicity, place of residence, being a traditional agent, being treated with natural medicine, recommending medicinal plants, perception of the cost of using medicinal plants, and natural care (all p-values were <0.001), In addition, it was associated with perceiving that the health facility was very far away (p=0.003) (Table 3).

In the multivariate analysis, it was found that women used more medicinal plants (aPR: 1.05; 95% CI: 1.04-1.06; p<0.001 value), those living in rural areas (aPR: 1.02; 95% CI: 1.01-1.03; p<0.001 value), which at some point had been treated naturally (aPR: 1.03; 95% CI: 1.02-1.04; p<0.001 value), those who recommended that others be treated with medicinal plants (aPR: 1.71; 95% CI: 1.65-1.78; p<0.001) and those who thought that plants are cheaper than pharmacological treatments (aPR: 1.03; 95% CI: 1.00-1.05; p-value=0.042), on the other hand, those who thought that the drugs were cheaper (p<0.001), those who did not know about the prices (p<0.001) and those who perceived that natural medicine care was cheaper (p<0.001) used fewer natural treatments; adjusted for four variables (Table 4).

DISCUSSION

The purpose of this study was to characterize and find the factors associated with the use of medicinal plants in Honduras as alternatives for the prevention and treatment of diseases since there are few recent studies in the country.

In 1989, a popular book of 50 medicinal plants was published, based on the wisdom about their use that the Honduran rural population has kept for generations. A study in three municipalities of the Yeguare-Honduras region was conducted based on the knowledge that communities have about the uses and properties of wild or cultivated plants. A manual of medicinal plants in the area was written, selecting the 30 most frequently named plants (Preza Díaz, 2001).

A high percentage of the World's population uses herbal medicines in primary health care, and plants are used as a source of medicine to cure various diseases (Barbhuiya et al., 2022) or as a source of medicine or complementary therapies for various disorders (Rajabian et al., 2022). This study found high consumption of medicinal plants; nine out of ten respondents said they did, and many had been treated or had recommended such plants to other people, which shows the great acceptance of this type of treatment in the population of Honduras.

Table 1. Characteristics of the surveyed population in Honduras.

Variable	Frequency (n)	Percentage (%)
Sex		
Male	5,740	35.0
Female	10,639	65.0
Age (years completed) *	30	25-40
Ethnicity		
Other ethnicities	14,752	91.2
Indigenous or African American	1,423	8.8
Reside in area		
Urban	1,3240	80.8
Rural	3,139	19.2
EESS is a long way from home		
No	15,961	97.5
Yes	418	2.5
It's a traditional agent		
No	14,664	89.5
Yes	1,715	10.5
Has used medicinal plants		
No	1,981	12.1
Yes	14,398	87.9
Naturally treated		
No	9,290	56.9
Yes, health personnel	7,048	43.1
Recommended medicinal plants		
No	3,942	24.1
Yes	12,437	75.9
Medicinal plant costs		
Just like drugs	1,373	8.4
Drugs Are Cheaper	441	2.7
Plants are more economical	11,241	68.6
Do not know	2,930	17.9
No Comments/Other	394	2.4
Natural care costs		
Same as medical consultation	2,000	12.2
Cheapest Doctor	2,079	12.7
More economical than a natural	4,506	27.5
Do not know	7,794	47.6

*Median and interquartile range shown. EESS: Health Facility.

Table 2. Frequency of use and how to find out about medicinal plants in Honduras.

¿What do you consume/use?	Frequency (%)	¿How did you find out?	Frequency (%)
Chamomile	14,031 (85.7)	Others recommend me	8,904 (54.4)
Lemon	12,734 (77.8)	Internet	5,746 (35.1)
Ginger	10,872 (66.4)	Personal experience	5,395 (32.9)
Cinnamon	9,549 (58.3)	TV Advertising	725 (4.4)
Aloe	8,290 (50.6)	Almanacs	596 (3.6)
Eucalyptus	7,908 (48.3)	Books	513 (3.1)
Garlic	7,895 (48.2)	Courses	416 (2.5)
Green tea	5,690 (34.7)	Other media	260 (1.6)
Anise	5,419 (33.1)		

Table 3. Association between the use of medicinal plants according to ten sociocultural variables in Honduras.

Variable	Use of medicinal plants		p-value
	No n (%)	Yes n (%)	
Sex			
Male	1,045 (18.2)	4,695 (81.8)	<0.001
Female	936 (8.8)	9,703 (91.2)	
Age (years completed) *	28 (25-34)	30 (25-42)	<0.001
Ethnicity			
Other ethnicities	1,837 (12.5)	12,915 (87.6)	<0.001
Indigenous or African American	112 (7.9)	1,311 (92.1)	
Reside in area			
Urban	1,693 (12.8)	11,547 (87.2)	<0.001
Rural	288 (9.2)	2,851 (90.8)	
EESS It is a long way from home			
No	1,950 (12.2)	14,011 (87.8)	0.003
Yes	31 (7.4)	387 (92.6)	
It is a traditional agent			
No	1,872 (12.8)	12,792 (87.2)	<0.001
Yes	109 (6.4)	1,606 (93.6)	
Naturally treated			
No	1,595 (17.2)	7,695 (82.8)	<0.001
Yes, health personnel	380 (5.4)	6,668 (94.6)	
Recommended medicinal plants			
No	1,802 (45.7)	2140 (54.3)	<0.001
Yes	179 (1.4)	12,258 (98.6)	
Medicinal plant costs			
Just like drugs	190 (13.8)	1,183 (86.2)	<0.001
Drugs are cheaper	137 (31.1)	304 (68.9)	
Plants are more economical	681 (6.1)	10,560 (93.4)	
Do not know	931 (31.8)	1,999 (68.2)	
No comments/other	42 (10.7)	352 (89.3)	

Table 3. Association between the use of medicinal plants according to ten sociocultural variables in Honduras (continued ...)

Variable	Use of medicinal plants		p-value
	No n (%)	Yes n (%)	
Natural care costs			
Same as medical consultation	171 (8.6)	1,829 (91.4)	<0.001
Cheapest doctor	325 (15.6)	1,754 (84.4)	
More economical than a natural	460 (10.2)	4,046 (89.8)	
Do not know	1,025 (13.2)	6,769 (86.8)	

P-values were obtained with the chi-square test and the sum of ranges (for age). *Median and interquartile ranges are shown.

Table 4. Bivariate and multivariate analysis of the factors associated with the use of medicinal plants in the Honduran population.

Variable	Bivariate analysis	Multivariate analysis
Female	1.12 (1.10-1.13) <0.001	1.05 (1.04-1.06) <0.001
Age (years completed) *	1.003 (1.002-1.003) <0.001	1.000 (0.999-1.000) 0.427
Indigenous or African American ethnicity	1.05 (1.03-1.07) <0.001	1.01 (0.99-1.02) 0.078
Reside in a rural area	1.04 (1.03-1.05) <0.001	1.02 (1.01-1.03) <0.001
EESS It is a long way from home	1.05 (1.02-1.09) 0.001	1.03 (0.99-1.06) 0.069
It is a traditional agent	1.07 (1.06-1.09) <0.001	0.99 (0.98-1.07) 0.322
Naturally treated**	1.14 (1.12-1.15) <0.001	1.03 (1.02-1.04) <0.001
Recommended medicinal plants	1.82 (1.76-1.86) <0,001	1.71 (1.65-1.78) <0.001
Medicinal plant costs		
Just like drugs	Comparison category	Comparison category
Drugs are cheaper	0.80 (0.76-0.84) <0.001	0.89 (0.85-0.93) <0.001
Plants are more economical	1.09 (1.06-1.12) <0.001	1.03 (1.00-1.05) 0.042
Do not know	0.79 (0.76-0.83) <0.001	0.89 (0.86-0.91) <0.001
No comments/other	1.04 (0.99-1.09) 0.137	0.99 (0.96-1.01) 0.385
Natural care costs		
Same as medical consultation	Comparison category	Comparison category
Cheapest doctor	0.92 (0.90-0.95) <0.001	0.99 (0.98-1.01) 0.224
More economical than a natural	0.98 (0.96-1.01) 0.146	0.98 (0.97-0.99) <0.001
Do not know	0.95 (0.94-0.96) <0.001	1.01 (0.99-1.02) 0.152

EESS: Health facility. *Quantitative variable. **A doctor or other health care personnel. The values on the left are the prevalence ratios (crude for the bivariate model and adjusted for the multivariate model), in parentheses the 95% confidence intervals, and on the right the p-values; all obtained with generalized linear models (Poisson family, log link function, models for robust variances and adjusted by the department of residence).

In Peru, a study was carried out on the population between 20 and 70 years old, obtaining 1,747 respondents of which 80.2% reported that they used medicinal plants as preventives, 71% to treat respiratory symptoms (Villena-Tejada et al., 2021), as well as Córdova Silipú and León Osorio (2023), with a sample of 216 Peruvian users of medicinal plants over 18 years of age, reported that 73.6% of 100% of the population claim to relieve their ailments using medicinal plants (Córdova Silipú and León Osorio, 2023). Both studies report similar percentages to the Honduran population, which uses medicinal plants to manage their diseases.

We found that Honduran women are the ones who used this type of treatment the most, similar to what was reported in southern Mexico: women know more names, more edible and medicinal plants, and also use more plants than men (Aparicio Aparicio et al., 2021). In another South American country, González-Garrido et al. (2022) reported in a sample of 361 Chileans (281 women and 80 men) that 94.7% reported having used medicinal plants to treat some dis-

comfort and/or disease (González-Garrido et al., 2022). Regarding the knowledge and attitude towards the use of antifungal plants of Peruvian workers who work in pharmaceutical offices, both professionals and non-professionals, I report that most of those evaluated were women (70.5%), pharmacy technicians (53.3%) with training and/or education in the use of medicinal plants (91.5%) (Acaro Chuquicaña et al., 2023).

The native groups, due to their own characteristics, continue to transmit the management of their diseases from generation to generation through traditional medicine.

The knowledge about the uses they give to medicinal plants corresponds to ancestral knowledge transmitted from one generation to another for many years, keeping them alive. These are required as remedies to cure and prevent diseases and discomforts. These traditional medicines are consumed in teas, infusions, smoothies, ointments, creams, compresses, and inhalations (Peralta-González et al., 2019).

In this study, those of Indigenous or African American ethnicity were the ones who used this type of treatment the most. Ferrufino Acosta et al. (2018) showed in a study carried out in the Archaeological Park of Copán, Honduras, cohabited by the heirs of the Mayan civilization and mestizos, that native flora with potential for medicinal, industrial, and forest use. The native Pech of Honduras reported 92 plants used in the traditional pharmacopeia of the neighboring mestizo peoples of the center of the country. The results showed that 19 of the extracts from medicinal plants revealed signs of antifungal activity, 22 demonstrated an antibacterial effect, and bioactivity could be detected in 35% of the Honduran medicinal plants analyzed (Lentz et al., 1998).

A study on the use of medicinal plants in urban and rural populations in Uruguay was conducted mainly in descending order to treat conditions of the digestive system, sensory system, musculoskeletal system, and nervous system. The origin of the medicinal plants mentioned by the declared descendants of Indigenous peoples, as used by their Indigenous ancestors, represents 70% of native origin and 30% of introduced (Tabakian, 2019).

In Mexico, the national health registrations of herbal products from 2001 to 2020 were analyzed in order to identify the Mexican native plants that are most used in products. Mexico is herbal products, home to approximately 10-12% of the World's biodiversity and at least 21,989-23,424 vascular plants, 3350 of which are traditional medicinal flora. The most frequent therapeutic indications were respiratory diseases, anti-inflammatories, anxiolytics, and digestive disorders (Rodríguez-Hernández et al., 2022). Traditional uses of medicinal plants are essential to the Oaxaca region. Twelve ethnic groups (63%) maintain the historical memory of medicinal plants and, in their daily practices, maintain the knowledge and use of these species (Cruz-Pérez et al., 2021).

The use of medicinal plants was more common among those who had at some point been treated naturally and those who recommended others to treat themselves with medicinal plants. In a study in Bolivia, the results suggest that social organization, specifically kinship and gender relations, significantly influences the exchange patterns of medicinal plants (Díaz-Reviriego et al., 2016).

In a study on the use and effect of medicinal plants in the treatment of COVID-19, 55.8% used them preventively, while 44.2% used them curatively. Among these, eucalyptus (*Eucalyptus globulus*) was used much more frequently in 48.4%, followed by 44.2% who used garlic (*Allium sativum*), in addition to kion (*Zingiber officinale*) and cat's claw (*Uncaria tomentosa*) were used in 33.7% and 26.3%, the main reason for its consumption in 55.8% of cases were preventive and thus avoid the consumption of medicines to combat COVID-19 (Churango Valdez et al., 2022).

A study in Ethiopia revealed that the use of traditional medicine among the Hamer ethnic group is very high. Women preferred traditional medicine more than men. The main reasons for this preference included effectiveness, low cost, and ease of availability (Paulos et al., 2016). The number of herbal remedies is enormous, and their use for the treatment of tuberculosis is common practice (Getachew et al., 2022).

Finally, in this study, the perception of the cost of medicinal plants and their treatment, in this way, also greatly influenced their use. Since those who perceived a lower cost of medicinal plants consumed them the most. In the Lenca population, due to extreme poverty and difficult access to the health system, medicinal plants are the first option for medical care. 77.9% were women, and the use of traditional medicine in their families was reported in 100% of the people, used for digestive, respiratory, integumentary, sensory, nervous, and other systems conditions. The oral route was the most frequent, followed by topical application in the form of ointment or poultice. Contraindications and side effects reported were few, and the most commonly used mode of preparation was cooking, followed by infusion (Valle et al., 2018).

With the COVID-19 pandemic, limited access to markets and health services in forest areas has made Indigenous peoples in these regions particularly vul-

nerable. Mobility restrictions have made it impossible for them to sell their products and buy food, which in some cases has led to critical situations of food insecurity (ECLAC, 2021).

During the COVID-19 pandemic in Brazil, there was a 27% increase in the consumption of medicinal plants and a 21.9% increase in the consumption of medicinal herbs; the medicinal plants listed were mint, chamomile, ginger, cinnamon, garlic, and rosemary. The medicinal herbs are used in syrups, oils, florals, extracts, creams, tinctures, and capsules (Braga and Da Silva, 2021).

Traditional medicine has a long history. It is the sum total of knowledge, skills, and practices based on theories, beliefs, and experiences of different cultures, whether explainable or not, used to maintain health and prevent, diagnose, improve, or treat physical and mental illnesses.

Limitations

The study had the limitation that the sampling was not random due to the beginning of the COVID-19 pandemic, which does not allow the data to be extrapolated to the entire Honduran population or to the total inhabitants of each department. However, this is a partial limitation since the study did not have this objective; rather, what was tried was to have a sufficient number of respondents to be able to find statistical associations (which was achieved, being supported by the adequate power of each of the analytical crosses). Because it is such a broad topic, only some important variables were considered, but it is recommended that we investigate many other variables that could be relevant to the consumption of medicinal plants. The results presented could be of interest as preliminary to start more lines of research and inquiries in this regard.

CONCLUSION

Based on all of the above, it is concluded that the percentage of Hondurans surveyed who had consumed medicinal plants is high. Many had been treated or had recommended such plants to other people. The use of plants was associated with sex, with the area of residence, among those who had at some point been treated naturally, those who recommended to others to be treated with medicinal plants, according to the perception of the cost of medicinal plants and of treating themselves with this type of traditional medicine.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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AUTHOR CONTRIBUTION:

Contribution	Espinoza-Turcios E	Rush M	Zambrano LI	Ávila B	Rubio-Hernández AV	Castro-Ramos HN	Armada J	Mejía CR
Concepts or ideas		x		x	x			
Design	x	x						
Definition of intellectual content	x	x	x	x	x			
Literature search	x	x	x	x	x			
Experimental studies								
Data acquisition								
Data analysis			x			x	x	x
Statistical analysis			x				x	x
Manuscript preparation	x	x	x	x	x	x	x	x
Manuscript editing	x	x	x	x	x	x	x	x
Manuscript review	x	x	x	x	x	x	x	x

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Supplementary data

Annex 1. Data collection was conducted about the use of medicinal plants by the population over 18 years old in the service areas of doctors in social services from 2019 to 2020.

MSS initials: _____

Account code: _____

Department_____

Municipality _____

Neighborhood _____

1. Sex:

1. Male
2. Female

2. Age

Numerical value in years completed

3. Ethnicity:

1. Mestizo (not ethnicity)
2. Pech
3. Tawahka
4. Miskito
5. Islander
6. Afro-descendant
7. Lenca
8. Other

4. Schooling

1. None
2. Primary (complete)
3. Secondary (complete)
4. University (complete)

5. Monthly family income

1. Less than L. 5000.00
2. L 5001.00 to 7,000.00
3. L 7,001-10,000
4. Greater than L10,001.00
5. This information is not shared

6. Address

All 18 country departments are listed, along with their respective municipalities. This is a function of the software.

7. Do you work as a health worker? (clinic, hospital, health center, public or private business)

1. No
2. Nurse
3. Doctor
4. Pharmacist
5. Other

8. Do you work as a traditional health agent in your community?

1. No
2. Healer
3. Naturopathic doctor
4. Midwife
5. Massage therapist
6. Genealogy

9. Do you have any of the following medical conditions or diseases?

1. High blood pressure
2. Heart failure
3. Diabetes mellitus
4. Kidney failure
5. Cancer

6. Pregnancy
7. None
8. Other

10. Have you used medicinal plants yourself to cure any disease, pain, symptoms or discomfort?

1. Yes
2. No

11. Have you ever prescribed medicinal plants to family members or acquaintances to cure any disease, pain, symptoms or personal discomfort?

1. Yes
2. No

12. What do you think about the costs and expenses of buying medicinal plants and buying medicines at the pharmacy?

1. It is cheaper to buy natural medicine
2. It is cheaper to buy medicines at the pharmacy
3. The cost is the same
4. I do not know which medicine is cheaper
5. Other

13. Regarding costs, how do you consider the consultation with a healer, naturopath or midwife in relation to the medical consultation?

1. The consultation with a healer is cheaper
2. It is cheaper to go to the doctor
3. The cost is the same
4. I do not know which is cheaper
5. My family or friends buy medicine for me

14. Has a doctor or nurse prescribed or administered a natural treatment for you?

1. Yes
2. No

15. What is your main source of knowledge about the use of medicinal plants?

1. Oral tradition
2. Courses
3. Calendars
4. Books
5. Internet
6. Commercials or TV or radio ads
7. Personal experience
8. None
9. Other

16. Have you passed on your knowledge of medicinal plants to anyone?

1. Yes
2. No

17. When you get sick, do you usually do the following?

1. You self-medicate with drugs
2. You self-medicate with plants
3. You go to a doctor's office
4. You go to a doctor's office or a midwife's office
5. I go to the doctor and also consume my own medicinal plants
6. I consume medicinal plants; if I do not get better, I go to the doctor
7. I wait for the discomfort to pass without treatment
8. Other

18. What are the reasons why you decide to self-medicate with medicinal plants or go to a healer/naturist/midwife?

1. I do not consult these practitioners
2. It is cheaper
3. You believe more in medicinal plants
4. It is more harmless (does not cause damage)
5. The health facility is very far away
6. Other

19. Select or mention the 5 medicinal plants that you use the most

1. Chamomile
2. Horsetail
3. Anise
4. Ginger
5. Eucalyptus
6. Other

20. For what diseases or ailments have you used treatment with medicinal plants?

1. Asthma
2. Diabetes Mellitus
3. To prevent coagulation (thin the blood)
4. Abdominal pain
5. High blood pressure
6. Urinary tract illness
7. They induce abortions or speed up delivery
8. Other

21. Have you or someone you know had complications (adverse effects) with the use of medicinal plants?

1. Yes
2. No

22. If your previous answer was Yes

1. What plant was it?
2. What was the reason for using it?
3. What was the adverse effect?

23. Do you think that medicinal plants can have health complications (adverse effects)?

1. I am not aware of any complications (adverse effects) from medicinal plants.
2. They do not have adverse effects
3. Adverse effects can occur

24. What complications (adverse effects) do you know of from consuming medicinal plants?

1. They cause asthma
2. They affect glucose or blood sugar
3. Coagulation problems
4. They cause gastritis
5. They cause arrhythmias
6. They induce abortions or bring on early labor
7. I do not know what adverse effects occur
8. Other

25. Do you know if medicinal plants can interfere with pharmacy medications (drug interaction)?

1. I do not know which or how medicinal plants can interfere (drug interactions)
2. They do not have interactions with drugs from the pharmacy
3. Interactions with drugs from the pharmacy can occur

26. What effects do you think can occur when mixing drugs from the pharmacy and medicinal plants?

1. It affects blood sugar (blood glucose)
2. It causes asthma
3. Blood problems (clotting, bleeding, etc.)
4. It causes stomach problems (gastritis, diarrhea, etc.)
5. It affects the absorption of drugs
6. It can cause nausea and vomiting