

Attitude and Practice of Pharmacy Students Toward Traditional Herbal Medicines, Sudan

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Purpose: Traditional herbal medicines (THMs) are widely used in Sudan, but there is scarcity of research on pharmacy students' attitudes and utilization of THMs. This study aims to assess the attitudes and practices of pharmacy students toward THM.

Methods: A descriptive cross-sectional study was conducted among randomly selected undergraduate pharmacy students at the University of Khartoum (Sudan). Data were collected using a validated self-administered questionnaire adapted from previous studies. A statistical package for the social sciences was used for data analysis.

Results: Among the 264 respondents, the average age was 21.8 years, and 84.8% of them were females. Nearly 85% of respondents were residents of Khartoum. The overall respondent's attitudes towards THMs were positive, it ranged from high (19.7%), moderate (79.9%). About 87.8% of respondents are interested in learning more about THMs. In addition, 36.4%, and 50.4% of respondents strongly agreed or agreed that THMs should be officially licensed and controlled. A 17.8% and 63.3% of respondents, respectively, reported using traditional herbal remedies either always or occasionally. Supermarkets (35.2%) and friends/family (36.4%) were the main sources of THMs for the participants, and oral administration was the most used route (87.1%). More than 90% of respondents said they would suggest THMs to others, and the most common justifications for doing so were their accessibility (46.6%) and affordability (16.3%). The most widely used herbs were *Mentha spicata*, *Zingiber officinale*, *Acacia nilotica*, *Hibiscus sabdariffa*, and *Syzygium aromaticum*. Data revealed a significant association between attitude levels and respondents' gender ($p=0.046$), year of study ($p=0.000$), and residence ($p=0.017$).

Conclusion: Most undergraduate pharmacy students had a positive attitude and utilized THMs. Development of effective educational initiatives, research, and regulations are recommended to ensure the appropriate utilization of traditional herbal remedies.

Keywords: traditional herbal medicines, attitude, practice, pharmacy students, Sudan

Introduction

The use of herbal remedies has increased dramatically during the last three decades on a global scale.¹ Approximately 80% of the population in African countries depend on traditional medicine for their primary health care. In Sudan, since access to conventional medicines and hospital admission are limited, and a significant portion of the population is nomadic. About 90% of Sudanese adults relies mainly on traditional herbal medicines.² The growing use of herbs for self-medication is also attributed to several other factors, including low trust in the safety and effectiveness of conventional medicines, fear of incorrect diagnosis and treatment, feeling anxious about discussing their health issues, and being worried confidentiality of their health information.³

Sudanese traditional herbal medicine is a unique blend of indigenous cultures of Islamic, Arabic, and African traditions, and it is rich with claimed therapies for various endemic and epidemic diseases.⁴ Moreover, Sudan's diverse climate contributes to its richness with diverse medicinal plants.⁵ In line with the current gap in the safety and pharmacovigilance of herbal remedies,⁶ it can hurt consumers' health. Therefore, it is essential to equip future pharmacists with relevant competencies for rational utilization of herbal medicines. Furthermore, in Sudanese culture, people value medical professionals' advice greatly, particularly when it comes to determining whether medical intervention is necessary or if herbal remedies will suffice. Exploring pharmacy

students' opinions and practices helps in identifying where efforts should be focused and providing effective interventions. Thus, the current study aimed to assess the attitudes and practices toward traditional herbal medicine among pharmacy students at the University of Khartoum.

Patients and Methods

Study Design and Setting

A descriptive cross-sectional study was conducted among undergraduate pharmacy students at the University of Khartoum, Khartoum, Sudan. The faculty remained the sole faculty of pharmacy in Sudan for three decades since it was stabilized. The study was conducted from October 2022 to March 2023.

Study Population

The study population was undergraduate pharmacy students of both genders. The study included 2nd, 3rd, 4th, and 5th year students who were registered and studying during the study period. First-year students were excluded because, in the first year, the curriculum focuses on basic sciences. Thus, first-year students still lack adequate awareness of the pharmacy profession.

Sample Size and Sampling

The sample size was calculated using "Survey system software",⁷ with 95% confidence interval and 5% margin of error. Based on the study population size (N: 575 students), the minimum sample size needed was 258 students.

The sampling was conducted using two probability sampling methods: stratified sampling and systematic sampling. Initially, the study population was grouped into four strata according to the year of study (2nd year, 3rd year, 4th year, 5th year). Then, a sample size proportional to the stratum size was obtained from each stratum by systematic random sampling.

Data Collection

A structured, self-administered questionnaire adapted from pre-standardized questionnaires^{8,9} was used to collect data. The questionnaire consisted of four sections. The first section includes demographic information (age, gender, year of study, income, and residence). The second section consists of a five-point Likert scale (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree), with nine questions designed to explore participants' attitudes toward traditional herbal medicine. The attitude score can range from 9 to 45, and respondent scores were divided into three percentile ranks: 33% (9–21) were considered to have a poor attitude, 66% (22–33) had a moderate attitude, and 100% (34–45) had a high attitude. The third and fourth sections assessed the participants' practices toward traditional herbal medicines. The third section contained six semi-structured questions, while the fourth section contained a checklist and open-ended questions about traditional herbal medicine participants use and its intended uses.

To ensure validity, the questionnaire was revised by three experts, and pre-tested in 21 students. Feedback gathered from experts and pre-tests was considered in preparing the final draft. Google form was used to collect responses from each pre-selected study participant.

Data Analysis

The Statistical Package for Social Sciences (SPSS) version 26 software (Armonk, NY, USA: IBM Corporation) was used to analyze the data. The results were presented using frequencies and percentages in tables. Chi-square test was used to determine the association between independent socio-demographic variables and attitude. Statistical significance was defined as p-values of 0.05 or less.

Ethical Considerations

The study proposal was approved by the Research Ethics Committee of the Faculty of Pharmacy, University of Khartoum (FPEC-07-2022). After explaining the purpose and the plan of the study, written informed consent was obtained from

students who voluntarily agreed to participate in the study. The anonymized data were used, and confidentiality of information was maintained.

Results

Socio-Demographic Characteristics of Respondents

The study enrolled 264 students. The mean age of respondents was 21.8 years old, with 84.8% of them being female. Almost 85% of respondents lived in Khartoum city, while 14.8% lived in the countryside. The income of 60.6% of respondents ranged between 100,000 and 400,000 SDG. Details of the socio-demographic characteristics of the respondents are shown in [Table 1](#).

Attitude of Respondents Toward Traditional Herbal Medicines

According to our findings, the overall respondent's attitude towards THMs ranged from high (19.7%), moderate (79.9%), to low (0.4%). [Table 2](#) summarizes participants' responses to attitude items. Approximately 20% and 59.5% of respondents strongly agreed and agreed that THMs are as useful as conventional medicines, and 24.2% and 37.9% of respondents strongly agreed and agreed that THMs have fewer side effects than CM. About 87.8% of respondents are interested in learning more about THMs. In addition, 36.4%, and 50.4% of respondents strongly agreed and agreed that THMs should be officially licensed and controlled. Concerning respondent's attitudes toward the importance of THM for their future career, 55.7%, and 39% of respondents strongly agreed or agreed that THMs are important for their future practice as pharmacists, and more than 80% of respondents believed that THMs courses should be incorporated in their academic curriculum.

The Practice of Respondents Toward Traditional Herbal Medicines

As shown in [Table 3](#), among 264 respondents, 17.8%, and 63.3% have used THMs always or sometimes, and only 3.0% of them have never used it. The majority of respondents obtained THMs from friends/family (36.4%) and supermarkets (35.2%). The most common route of administration was oral (87.1%). More than 90% of respondents recommended others to use THMs, and the most likely reason for encouraging others to use THMs products was their availability (46.4%) and low cost (16.3%). While 39.8% of respondents were most likely recommend THMs for adults, only 6.4% and 8.0% of respondents recommended THMs for chronic and acute diseases, respectively.

Table 1 Socio-Demographic Characteristics of Respondents (N:264)

Characteristics		Frequency	Percent
Gender	Female	224	84.8
	Male	40	15.2
Year of Study	Second year	63	23.9
	Third year	80	30.3
	Fourth-year	73	27.7
	Fifth year	48	18.2
Income/month (SDG)	Less than 100.000	36	13.6
	Between 100.000–400.000	160	60.6
	More than 400.000	86	25.8
Residence	Urban	225	85.2
	Rural	39	14.8

Table 2 The Attitude of Respondents Toward Traditional Herbal Medicines

Statement	Response				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
THMs (traditional herbal medicines) are useful as CM (conventional medicines)	50 (18.9%)	157 (59.5%)	29 (11%)	27 (10.2%)	1 (0.4%)
THMs can cure some diseases that cannot be treated by CM	26 (9.8%)	103 (39%)	56 (21.2%)	67 (25.4%)	12 (4.5%)
THMs have fewer side effects than CM	64 (24.2%)	100 (37.9%)	35 (13.3%)	51 (19.3%)	14 (5.3%)
There is no severe interaction between THMs and CM	11 (4.2%)	54 (20.5%)	68 (25.8%)	92 (34.8%)	39 (14.8%)
THMs should be given with CM to improve healthcare coverage	33 (12.5%)	107 (40.5%)	64 (24.2%)	46 (17.4%)	14 (5.3%)
THMs should be officially licensed and controlled	96 (36.4%)	133 (50.4%)	22 (8.3%)	10 (3.8%)	3 (1.1%)
Some knowledge about THMs is important for my future practice as a pharmacist	147 (55.7%)	103 (39%)	11 (4.2%)	3 (1.1%)	0
I am interested to know more about THMs	116 (43.9%)	114 (43.9%)	19 (7.2%)	13 (4.9%)	2 (0.8%)
THMs courses should be included as part of my academic curriculum	102 (38.6%)	127 (48.1%)	23 (8.7%)	7 (2.7%)	5 (1.9%)

Table 3 The Practice of Respondents Toward Traditional Herbal Medicines

Practice		Frequency	Percent
Have you ever used THMs products?	Always	47	17.8
	Sometimes	167	63.3
	Rarely	42	15.9
	Never	8	3.0
From where do you most obtain THMs?	Family/friend	96	36.4
	Pharmacy	5	1.9
	Supermarket	93	35.2
	Traditional practitioner / herbal shop	71	26.9
In which form do you most use THMs?	Oral	230	87.1
	Topical	31	11.7
	Inhaler	3	1.1
Do you encourage others to use THMs products?	Always	38	14.4
	Sometimes	152	57.6
	Rarely	66	24.6
	Never	8	3.4

(Continued)

Table 3 (Continued).

Practice		Frequency	Percent
Why do you most likely encourage others to use THMs products?	Availability	123	46.6
	Low cost	43	16.3
	More effective	33	13.3
	Influence	27	12.5
	Health facilities too far	7	2.7
	Others	23	5.1
For whom do you most likely recommend THMs?	Pediatric	36	13.6
	Adult	105	39.8
	Elderly	39	14.8
	Specific women	35	13.3
	Chronic disease	17	6.4
	Acute disease	21	8.0
	Others	8	3

Concerning respondents' practice toward the use of selected plants used in THMs. As shown in Table 4, *Mentha spicata* was the most commonly used by participants for gastrointestinal tract disorders, followed by *Acacia nilotica*, *Hibiscus sabdariffa*, and *Zingiber officinale* for management of respiratory diseases.

In addition, cross-tabulation showed a statistically significant association between attitude levels and participants' gender ($p=0.046$), year of study ($p=0.000$), and residence ($p=0.017$), as shown in Table 5.

Table 4 Medicinal Plants Used Traditionally by Respondents

Medicinal Plant/Herb	Traditional Use Frequency (Percent)						
	Respiratory System	Gastro-Intestinal	Skin Disorders	Anti-Infection	Weight Control	Pain Relieve	I Do not Use
<i>Syzygium aromaticum</i>	39 (15%)	33 (13%)	7 (3%)	15 (6%)	0	127 (48%)	66 (25%)
<i>Guiera senegalensis</i>	8 (3%)	23 (9%)	2 (1%)	1 (0.4%)	2 (1%)	4 (2%)	228 (86%)
<i>Sonchus oleraceus</i>	10 (4%)	28 (11%)	1 (0.4%)	10 (4%)	2 (1%)	1 (0.4%)	214 (81%)
<i>Cinnamon sp.</i>	28 (11%)	75 (28%)	17 (6%)	15 (6%)	38 (14%)	79 (30%)	58 (35%)
<i>Ambrosia maritima L.</i>	7 (3%)	19 (8%)	2 (1%)	2 (1%)	2 (1%)	0	234 (89%)
<i>Mentha spicata L.</i>	58 (22%)	186 (71%)	6 (3%)	14 (5%)	11 (4%)	35 (13%)	24 (9%)
<i>Acacia nilotica</i>	161 (61%)	18 (7%)	12 (5%)	52 (20%)	0	14 (5%)	53 (20%)
<i>Moringa oleifera</i>	12 (5%)	23 (9%)	6 (2%)	3 (1%)	8 (3%)	1 (0.4%)	215 (81%)
<i>Cymbopogon schoenanthus</i>	7 (3%)	70 (26%)	7 (3%)	15 (6%)	4 (2%)	17 (6%)	154 (58%)
<i>Hibiscus sabdariffa</i>	131 (50%)	42 (16%)	10 (4%)	31 (12%)	6 (2%)	11 (4%)	59 (22%)
<i>Sesamum indicum</i>	104 (39%)	17 (6.4%)	72 (27%)	14 (5%)	0	28 (11%)	76 (29%)
<i>Tamarindus indica</i>	12 (4.5%)	100 (38%)	15 (6%)	23 (9%)	6 (2%)	7 (2.7%)	119 (45%)
<i>Zingiber officinale</i>	135 (51%)	73 (28%)	7 (3%)	23 (9%)	26 (10%)	21 (8%)	31 (11%)
<i>Punica granatum</i>	12 (4.5%)	102 (39%)	22 (8%)	11 (4%)	4 (2%)	5 (2%)	125 (47%)
<i>Nigella sativa</i>	63 (24%)	71 (27%)	15 (6%)	16 (6%)	3 (1%)	12 (5%)	122 (46%)

Table 5 Association Between Socio-Demographic Characteristics of Respondents and Attitude Levels Toward Traditional Herbal Medicines

Characteristic		Attitude Level				P- value
		Low	Moderate	High	Total	
Gender	Female	0	178 (79.5%)	46 (20.5%)	224	0.046
	Male	1 (2.5%)	33 (82.5%)	6 (15%)	40	
Year of study	Second	1 (1.6%)	55 (87.3%)	7 (11.1%)	63	0.000
	Third	0	69 (86.3%)	11 (13.8%)	80	
	Fourth	0	67 (91.8%)	6 (8.2%)	73	
	Fifth	0	20 (41.7%)	28 (58.3%)	48	
Income	Less than 100.000	0	34 (94.4%)	2 (5.6%)	36	0.064
	100,000–400.000	0	127 (79.4%)	33 (20.6%)	160	
	More than 400.000	1 (0.4%)	50 (73.5%)	17 (25%)	68	
Residence	Rural	1 (2.6%)	27 (69.2%)	11 (28.2%)	39	0.017
	Urban	0	184 (81.8%)	41 (18.2%)	225	

Discussion

This study explored the attitude and practice of pharmacy students toward traditional herbal medicines. Female respondents (84.8%) outnumbered male respondents (15.2%), and this is expected due to the high percentage of female students compared to male students in the faculty of pharmacy University of Khartoum where the study was conducted. The majority of the respondents (85.2%) are from urban areas, and 60.6% of them have incomes between 100.000 and 400.000 SDG/month.

Our study revealed that most respondents have a positive attitude toward THMs (high 19.7%, moderate 79.9%), which is similar to the findings of a study conducted among pharmacy students in Malaysia.¹⁰ The positive attitude of respondents could be attributed to the fact that people living in many African developing countries often have limited access to mainstream medications which encourages them to have optimistic views and rely on THMs.^{3,11}

According to the study, the percentage of respondents who used THMs either always or occasionally was 62.9% and 18.2%, which is higher than that of studies conducted in Ethiopia.⁸ Family/friends (36.4%) and supermarkets (35.2%) were the most important sources of THMs, which is contradictory to findings of the study conducted in Ethiopia, where retailers (31.88%) and parents (31.56%) were the top two major sources.⁸ Moreover, the majority of respondents use THMs orally (87.1%), this is not surprising, since herbal remedies are widely for systemic disorders including gastrointestinal disorders, cancer, malaria, diabetes, rheumatoid arthritis, respiratory system disorders, jaundice, urinary system disorders, and various systemic microbiological infections.²

Furthermore, the majority of the respondents (72%) either always or occasionally urged others to use THMs, which is higher than that reported in a similar study conducted in Ethiopia, where 35.8% of participants were inspired to encourage others.⁸ In the current study, respondents showed that the main reasons for motivating other people to use THM products were the availability of the products (46.6%), and their low cost (16.3%). These findings are in line with another study conducted in Ethiopia.⁸ Importantly, only 13.3% of the respondents stated that the effectiveness of THMs was the reason behind encouraging others to utilize them. This finding indicates the scarcity of healthcare services. Unfortunately, there are no evidence-based treatment guidelines, monographs, or formal solid training programs for THMs in Sudan. THMs practice is mostly rooted in folklore and local traditions.² Efforts should be focused on the development and registration of standardized herbal medicines and the integration of THMs into the national health care system, along with providing affordable distribution of healthcare services.

Regarding medicinal plants used by respondents, *Mentha spicata* was the most popular one, it is used by almost 91% of respondents, and 70.5% of them used it for gastrointestinal system disorders, and 22% for respiratory system disorders. *Mentha spicata* (Peppermint) perennial widely distributed herb, with a long history of folkloric use, and characteristic essential oil.¹² The potential value of *Mentha spicata* constituents was confirmed in many preclinical and clinical studies, its activities include smooth muscle relaxation, modulation of visceral sensitivity, and anti-inflammatory activity via different mechanisms. Its application in functional dyspepsia, postoperative nausea, childhood functional abdominal discomfort, and irritable bowel syndrome is supported by controlled studies.¹³

The second most popular remedy is *Zingiber officinale* (Ginger), it is used by 89% of respondents, and it is used mainly for respiratory illnesses (51%), and gastrointestinal disorders (28%). Recent studies have shown that *Zingiber officinale* has a wide range of pharmacological activities, with a focus on effects that prevent obesity, cancer, and first-trimester nausea and protect the gastrointestinal tract.¹⁴ *Acacia nilotica* is used by 80% of respondents, and, 61% of them for respiratory system disorders, and 20% for microbial infections. *Acacia nilotica* fruits and bark have wide traditional applications for microbial and respiratory diseases including COVID-19.¹⁵ Although many studies reported the medicinal value of *Acacia nilotica*, further clinical studies are crucial to investigate its therapeutic efficacy and safety.¹⁶ Approximately 78% of respondents used *Hibiscus sabdariffa* (Roselle) and it is used mainly for respiratory and gastrointestinal tract disorders. Several in vitro studies and clinical trials reported that *Hibiscus sabdariffa* exerts antihypertensive, antidyslipidemic, hypoglycemic, body fat mass reduction, nephroprotective, antianemic, antioxidant, anti-inflammatory, and anti-xerostomic activities.¹⁷ Almost 75% of respondents used *Syzygium aromaticum* (Clove), and it is mainly used to relieve pain. Components of clove showed analgesic, antibacterial, antioxidant, anti-inflammatory, and anesthetic properties.¹⁸ These activities are primarily attributable to eugenol and other polyphenolic compounds.¹⁹

In addition, cross-tabulation (Table 5) showed a statistically significant association between attitude levels and respondents' gender ($p=0.046$), since 20.5% of females had high attitudes, and 15% of males had high attitudes. This may be anticipated given that women may use THMs differently from men, for example, in cosmetics like face masks and skin moisturizers, as well as for menstrual cramps. In addition, data analysis revealed a significant association between attitude level and year of study ($p=0.000$). While 58.3% of the fifth-year students had high attitudes, only 8.2% to 13.8% of 2nd, 3rd, and 4th-year students had high attitudes. The apparent more positive attitude of the final-year students is possibly due to their in-depth knowledge of medical plants and their therapeutic potential since they filled out the questionnaire during the implementation of the phytotherapy course. Also, data showed a statistically significant association between attitude and residence ($p=0.017$), 18% of urban and 28% of rural resident respondents had high attitudes.

In its strategy for 2014–2023, the World Health Organization (WHO) emphasizes traditional African medicine development as an essential part of healthcare systems.²⁰ However, most traditional herbal medicines lack scientific credibility for clinical effectiveness, quality, and safety. Thus, to ensure the appropriate utilization of herbal remedies, it is necessary to establish good educational programs, and regulations as well as conduct research to investigate the therapeutic value and safety of traditional herbal remedies.

Conclusion

Most respondents had a positive attitude and utilized traditional herbal medicines. A 19.7% of the respondents had a high attitude, and 79.9% of them had moderate attitude. A 17.8% and 63.3% of respondents have used THMs always or sometimes, and 14.4% and 57.6% of them have recommended others to use THMs always or sometimes. The most commonly utilized herbs were *Mentha spicata*, *Zingiber officinale*, and *Acacia nilotica*. Effective educational initiatives and clinical research are recommended to develop standardized herbal medicines from traditional herbal remedies. The establishment of regulations for the training and registration of THMs practitioners, as well as the integration of THM into the national health care system, are vital to ensuring the appropriate and safe utilization of THMs.

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Disclosure

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