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Original Research Article

Assessment of community pharmacists' knowledge, attitudes and practices regarding garlic and ginger as herbal medicines

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Abstract

Purpose: *To assess the knowledge, attitudes and practices of community pharmacists regarding the use of garlic and ginger as herbal medicines.*
Methods: *This was a cross-sectional study among community pharmacists practicing in various urban, semi-urban and rural communities in Federal Capital Territory, Abuja. Semi-structured questionnaires containing both open-ended and closed-ended questions in electronic Google Forms® were used to assess the respondents' knowledge, attitudes and practices regarding the use of garlic and ginger as herbal medicines. Data were analyzed using Microsoft Excel® 2016.*
Results: *Community pharmacists stocked and dispensed garlic and ginger as herbal medicines in their pharmacy and have positive attitude/disposition towards the use and practice of complementary and alternative medicines. They exhibited average knowledge of garlic and ginger as herbal medicines, though knowledge of their interactions with conventional medicines was poor. Few belonged to a networking and multi-level marketing company that specializes in herbal medicines and supplements.*
Conclusion: *Community pharmacists demonstrate fair knowledge about garlic and ginger as herbal remedies. Though knowledge of herb-drug interactions was poor, community pharmacists need to be sufficiently knowledgeable about herbal products to better advise patients who are seeking or using alternative remedies.*

Keywords: *Garlic, Ginger, Herbal medicines, Herb-drug interactions, Pharmacy practice*

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INTRODUCTION

Many Nigerians rely on herbal medicines, or supplements containing or purported to contain herbal medicines such as ginger and garlic to treat a variety of diseases [1-4]. Garlic bulb and ginger root are widely used by Nigerians for culinary purposes and as traditional medicines for prophylaxis and treatment of several diseases. Garlic, *Allium sativum* (Amaryllidaceae), has been used for thousands of years for medicinal purposes such as prevention of cardiovascular diseases, treatment of hypertension, lowering blood cholesterol, treatment of infections and snakebites; and warding off evil spirits [5]. Recently, garlic has gained greater popularity for its cardiovascular, antineoplastic, and antimicrobial properties [5].

Ginger, *Zingiber officinale* (Zingiberaceae), is also an important plant with several nutritional, remedial and medicinal constituents. Ginger has been used for the treatment of numerous ailments such as allergy, cold, cough, asthma, arthritis, migraine, hypertension, nausea, vomiting, headache, and pain [6].

At the peak of the COVID-19 pandemic, majority of Nigerians and other Africans used garlic and ginger for prophylaxis and treatment of COVID-19, majorly due to the popular belief in their ability to improve immunity and protection from infection [7,8]. However, with increase in the use of garlic and ginger as condiments to promote healthier living, prophylaxis and treatment of several diseases including COVID-19, there has been an increase in concerns about their interactions with other substances. The availability of garlic and ginger in pharmaceutical dosage forms such as tablets, capsules, and syrups has resulted in their provision in community pharmacies rather than native doctor's clinics or folk medicine shops.

Community pharmacists, as the custodians of medicines and medical products and the most accessible health care providers, are receiving more queries from patients about the use of garlic and ginger as herbal remedies. In Nigeria, the majority of the people living in a community first visit the pharmacy when they are sick or need medical or drug information. Therefore, this study identified garlic and ginger formulations sold in community pharmacies in the Federal Capital Territory (FCT), Abuja, Nigeria, and assessed the knowledge, attitudes and practices of the community pharmacists regarding the use of these herbal medicines.

METHODS

Study design

This was a cross-sectional study among community pharmacists in the FCT, Nigeria.

Study location

The study was conducted in community pharmacies located in various urban, semi-urban and rural communities in 5 of the 6 Area Councils of FCT: Abuja Municipal Area Council (AMAC), Bwari, Gwagwalada, Kuje, and Kwali. The Federal Capital Territory (FCT) is located at the center of Nigeria and includes Abuja the capital city of Nigeria. The FCT is currently made up of 6 Area Councils; Abaji, AMAC, Bwari, Gwagwalada, Kuje, and Kwali.

Sample size and sampling procedure

The participants were Superintendent Pharmacists or Directors of the selected community pharmacies who are pharmacists. The minimum sample size required for the study was calculated to be approximately 500 using the Cochran formula [9].

$n = z^2 (pq)/e^2$

where n = sample size, z = standard error corresponding to 99 % confidence level (= 2.576), *p* = standard deviation (= 0.5), q = 1-p, and e = acceptable sample error, margin of error (confidence interval = 3 %), i.e., e = 0.03, and subsequently, a modification of the Cochran formula for sample size calculation in smaller populations [10] where n = sample size, n_o = Cochran's sample size recommendation (1,843.271), and N = population size (685).

According to the register of the Pharmacy Council of Nigeria (PCN), 685 community/retail pharmacies were registered in the FCT as of December 31, 2020 [11]. Surveyed community pharmacies were selected using a multi-stage sampling method. In stage one, the number of community pharmacies to be surveyed in each Area Council was selected by purposive sampling method and their location in the Area Council (urban, semi-urban, rural). In stage two, simple random sampling was used to select the community pharmacies in each location.

Inclusion criteria

The community pharmacist must be licensed and practicing in a community pharmacy located in FCT, must be the superintendent pharmacist or pharmacist director, have at least 2 years of experience as a community pharmacist, and be willing to participate in the study.

Study instrument

Data were collected from respondents by administering a pre-tested semi-structured questionnaire containing both open-ended and closed-ended questions, in electronic Google Forms®. The questionnaire had five sections: Section A collected socio-demographic characteristics of the respondents, section B addressed knowledge of garlic and ginger as herbal medicines, section C collected data on attitudes towards the use of garlic and ginger as herbal medicines, section D collected data on the practice regarding the use of garlic and ginger as herbal medicines and section E collected data on

availability of education resources on herbal medicines and supplements.

Data collection

The questionnaires were administered by the researchers and their assistants who visited the community pharmacies, and responses were made in the Google Form®.

Ethical considerations

The study was approved by the Federal Capital Territory Health Research Ethics Committee (approval no. FHREC/2021/01/72/29-06-21) and was carried out according to stipulated ethical guidelines. All participants provided written and signed informed consent.

Data analysis

The data in the Google spreadsheet was downloaded into Microsoft Excel® worksheet, from where a total of 511 responses were harvested. Data were analyzed using Microsoft Excel® 2016 and presented using descriptive statistics. Knowledge questions in Section B were scored and the overall grade was ascertained. Correct response ≥ 50 % was scored 1, while less was scored zero. Total score (%) was calculated and graded as: ≤ 49 % (poor), 50 – 59 % (average), 60 – 79 % (good), and 80 – 100 % (excellent). Responses to questions in section C were scored on a five-choice Likert scale as strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). The mean (M) and standard deviation (SD) of the responses were determined using Microsoft Excel® 2016. The average of the five-point scale, M = 3.0 was used as a cut-off point; thus, M ≥ 3.0 indicated agree, whereas below 3.0 indicated disagree.

RESULTS

Socio-demographic characteristics of the respondents

Socio-demographic characteristics of the respondents showed that 43.3 % were 31-40 years old, 59.3 % were male, and 40.5 % had practiced as community pharmacists for 5-10 years. The majority of the respondents (77.7 %) had only Bachelor of Pharmacy (B. Pharm.) or Doctor of Pharmacy (Pharm D) degree, while some had in addition postgraduate education such as Fellowship of West African Postgraduate College of Pharmacy (FPCPharm; 7.8 %), Master's degree (12.9 %), and PhD (1.6 %; Table 1).

Knowledge of garlic and ginger as herbal medicines

Respondents showed average knowledge of garlic as herbal medicine (53.3 %). Analysis of the scores showed poor knowledge of the plant part commonly used and interactions of garlic with conventional medicines, but fair knowledge of constituents, pharmacological effects/clinical uses and adverse effects of garlic (Table 2). Respondents also exhibited average knowledge of ginger as herbal medicine (50 %).

Analysis of the scores showed poor knowledge of the plant part commonly used and interactions with conventional drugs, but good knowledge of the pharmacological effects/clinical uses, adverse effects, caution and contraindications (Table 3).

Table 1: Socio-demographic characteristics

Socio-demographics		Frequency (%)
Age (years)	25-30	164(32.1)
	31-40	221(43.3)
	41-50	87(17.0)
	>51	39(7.6)
Gender	Male	303(59.3)
	Female	208(40.7)
Highest professional qualification	B.Pharm/PharmD	397(77.7)
	FPCPharm	40(7.8)
	Master's degree	66(12.9)
	PhD	8(1.6)
Years of practice	2-5	204(40.3)
	5-10	210(40.5)
	11-20	66(12.9)
	>20	31(6.3)
Location of community pharmacy	Urban	317(62.0)
	Semi-urban	138(27.4)
	Rural	56(10.6)

Table 2: Knowledge of garlic as herbal medicine

Statement/question	Correct response	
	Frequency (%)	***Score***
Folkloric use		
The part of garlic most commonly available in Nigeria to be used for consumption and medicinal purposes is the tuber	190(37.2)	0
In the folklore of certain regions, garlic is used to ward off demons	307(60.1)	1
Constituents of garlic		
Vitamin B6 is abundant in garlic	335(65.6)	1
Garlic has moderate amounts of vitamins C, B5 (pantothenic acid), and B1 (thiamine); and calcium	330(64.6)	1
Raw garlic is composed of water (59%), carbohydrates (33%), protein (6%), dietary fiber (2%), fat (<1%)	247(48.3)	0
Pharmacological effects and clinical uses		
Garlic is known to be possibly effective in		
Hyperlipidemia	340(66.5)	1
Atherosclerosis	231(45.2)	0
Hypertension	259(50.7)	1
Adverse effects		
Increased risk of bleeding is a common adverse effect of garlic	312(61.1)	1
Mixing garlic with milk in the mouth before swallowing is known to reduce the bad odour	191(37.4)	0
The babies of breastfeeding mothers who consume garlic may exude the pungent odour of garlic	276(54.0)	1
Interactions with orthodox medicines		
Garlic can interact with which of these?		
Anticoagulants	306(59.9)	1
Antiplatelets	207(40.5)	0
Isoniazid	93(18.2)	0
Garlic can interact with non-nucleoside reverse transcriptase inhibitors such as nevirapine, delavirdine, efavirenz and saquinavir.	178(34.8)	0
Total Score = 8/15 (53.3%)		

Correct response ≥50% was scored 1, while less was scored 0

Table 3: Knowledge of ginger as herbal medicine

Statement/Question	Correct response	
	Frequency (%)	***Score***
Folkloric use		
The part of ginger plant most commonly available in Nigeria to be used for consumption and medicinal purposes is the bulb	174(34.1)	0
Pharmacological effects and clinical uses		
Oral consumption of ginger is known to reduce nausea and vomiting	387(75.7)	1
Prophylaxis of symptoms of travel sickness is a known indication of ginger	278(54.4)	1
Adverse effects, caution and contraindications		
Heartburn is a common adverse effect of ginger	402(78.7)	1
Ginger may increase blood insulin levels and/or lower blood glucose levels	258(50.5)	1
Ginger is contra-indicated or should be used with caution in patients with heart diseases	265(51.9)	1
Interactions with orthodox medicines		
Co-administration of ginger and calcium channel blockers may cause excessive reduction of blood pressure, or irregular heartbeat	220(43.1)	0
Ginger can interact with which of these?		
Antidiabetic agents	197(38.6)	0
Anticoagulants	248(48.5)	0
Antiplatelets	145(28.4)	0
Total Score = 5/10 (50 %)		

Correct response ≥50% was scored 1, while less was scored 0

Attitudes towards the use of garlic and ginger as herbal medicines

Respondents believed that garlic and ginger have some pharmacological effects, and knowledge of the plants is important for a community pharmacist (M > 4.0). They also asserted that it is essential to provide garlic and ginger for sale in the community pharmacy (M = 3.9; Table 4).

The community pharmacists agreed that garlic and ginger may have fewer side effects than conventional medicines and recommended herbal remedies to patients only when they have confirmed from the literature that there will be no undesirable interactions. They also agreed that both herbal remedies have significant interactions with conventional medicines (M = 3.6). Therefore, clients must inform their community pharmacists if they are using them. Respondents agreed that it is easier to convince patients to use natural remedies such as ginger and garlic if it has worked for the prescriber (M = 3.5; Table 4).

Practices regarding the use of garlic and ginger as herbal medicines

Some respondents (44.0 %) stated that they had taken garlic specifically for its health benefits including treatment of cough, cold, catarrh and other similar respiratory ailments, immune boosting/immune-stimulating, hypolipidemia, to control blood pressure, and antioxidant effects. Other uses were as anti-inflammatory, prevention and treatment of COVID-19 and weight loss. Also, some respondents (48.7 %) stated that they had taken ginger specifically for its health benefits. This population used ginger mostly for the treatment of cough, cold, catarrh and other similar respiratory ailments; stimulating the immune system; detoxification; weight loss; nausea and vomiting. Other uses were for treatment of hypertension, motion sickness, allergy, and prevention and treatment of COVID-19. Among the respondents, 54.2 and 39.3 % usually stock garlic and ginger, respectively in pharmaceutical dosage forms in their pharmacy, while 62.4 % stocked supplements that contain a combination of garlic and ginger (Table 5).

Garlic preparations available in community pharmacies were tea; soft gelatin capsules containing 2 mg garlic oil (equivalent to 200 mg of fresh garlic bulb), 3, 5 or 10 mg of garlic oil (equivalent to 1000 mg of fresh garlic bulb); tablets containing garlic (usually 3 mg of garlic extract); and enteric-coated tablets containing 1250 mg garlic equivalent per tablet. Ginger preparations were tea, capsules containing 550 mg of whole ginger root, 250 mg of standardized extract, tablets containing 1200 mg of ginger each, and chewable soft lozenges containing organic ginger root. Also available was tea containing a combination of garlic and ginger.

Table 4: Community pharmacists' attitudes towards garlic and ginger as herbal medicines

Statement/Question	Numerical response (M ± SD)	Remark
Knowledge about garlic is important to me as a community pharmacist	4.3±0.8	Agree
Knowledge about ginger is important to me as a community pharmacist	4.3±0.8	Agree
Garlic and ginger are natural remedies with fewer side effects than conventional medicines	3.9±0.9	Agree
The results from the use of garlic or ginger (efficacy, pharmacological effects) are due to placebo effects	2.8±1.2	Disagree
Patients should inform their community pharmacists about their use of garlic or ginger	4.0±0.9	Agree
It is important to have formulations containing garlic or ginger available for sale in my community pharmacy	3.9±0.9	Agree
Garlic or ginger has significant interactions with conventional medicines	3.6±1.0	Agree
I recommend garlic or ginger to patients only when I have cross-checked the literature that there may be no undesirable interactions	3.8±1.0	Agree
It is easier to convince patients to use garlic and ginger if they have worked for me	3.5±1.2	Agree
It is part of my pharmacy protocol to do 'companion selling' with conventional medicines that are synergistic with garlic or ginger (examples of companion selling: probiotics with antibiotics, glucosamine/chondroitin with conventional anti-arthritic medications)	3.5±1.1	Agree

M = mean; M < 3 = disagree; M ≥ 3 = agree; SD = standard deviation

Table 5: Practices regarding the use of garlic and ginger as herbal medicines

Statement/question		Frequency (%)	
		Garlic	***Ginger***
Have you taken garlic/ginger specifically for its health benefits?	Yes	225(44.0)	249(48.7)
	No	286(56.0)	262 (51.3)
If yes, mention the purpose	Cold (rhinitis), cough, catarrh, and other similar respiratory ailments	132(58.7)	125(50.2)
	Allergy	1(0.4)	4(1.6)
	immune boosting/immune-stimulating	20(8.9)	18(7.2)
	Hypolipidemic effect	17(7.6)	-
	To control blood pressure/High blood pressure	12(5.3)	2(0.8)
	Weight loss	11(4.9)	15(6.0)
	Sore throat	9(4.0)	21(8.4)
	Nausea and vomiting	-	16(6.4)
	Motion sickness	-	2(0.8)
	Antioxidant	5(2.2)	5(2.0)
	Detoxification/cleansing	4(1.8)	7(2.8)
	To aid digestion	-	6(2.4)
	Stomach ache	4(1.8)	4(1.8)
	Anti-inflammatory effect	3(1.3)	-
	Prevention and treatment of COVID-19	2(0.9)	1(0.4)
Was the garlic/ginger effective?	Yes	206(91.6)	238(95.6)
	No	14(8.2)	7(2.8)
	I don't know	5(1.0)	4(1.6)
Do you stock garlic/ginger (in pharmaceutical dosage forms) in your community pharmacy?	Yes	277(54.2)	201(39.3)
	No	234(45.8)	310(60.7)
Do you stock supplements that comprise garlic and ginger combination in your community pharmacy?	Yes	319(62.4)	
	No	192(37.6)	
Have you filled a prescription for garlic/ginger?	Yes	119(23.3)	106(20.7)
	No	392(76.7)	405(79.3)
If yes, how many in a month?	1–20	65(54.6)	73(68.9)
	21–50	10(8.4)	19(17.9)
	51–100	10(8.4)	12(11.3)
	101–200	13(10.9)	2(1.9)
	201–500	21(17.7)	0(0)
	>500	0(0)	0(0)
Have you prescribed garlic/ginger or supplements containing garlic/ginger?	Yes	266(52.1)	242(47.4)
	No	245(48.0)	269(52.6)
If yes, how many in a month?	1–20	148(55.6)	103(42.5)
	21–50	13(4.9)	21(8.7)
	51–100	14(5.3)	28(11.6)
	101–200	6(2.3)	18(7.4)
	201–500	40(15.0)	35(14.5)
	501–999	30(11.3)	19(7.9)
	≥1000	15(5.5)	18(7.4)

Table 6: Community pharmacists' access to education resources on herbal medicines and supplements

Statement/Question	Response	Frequency (%)
My undergraduate pharmacy training adequately equipped me to be a provider of information on herbal medicines and supplements.	Yes	389(76.1)
	No	111(21.7)
	I don't know	11(2.2)
I have learned more about herbal medicines and supplements from my day-to-day work experience than from my university education	Yes	423(82.8)
	No	72(14.1)
	I don't know	16 (3.1)
What are your regular sources of information on herbal medicines and supplements (select all that apply)	Internet	445(87.1)
	Textbooks	262(51.3)
	Health professionals	236(46.2)
	Product leaflets	223(43.6)
	Training workshops/seminars/symposia	166(32.5)
	Medical/sales representatives	161(31.5)
	Mass media (television, newspapers, radio, etc.)	150(29.4)
	Professional journals	146(28.6)
	Social media (WhatsApp, Instagram, Twitter, etc.)	133(26.0)
Do you have any reference books on herbal medicines and supplements in your community pharmacy?	Yes	33(6.5)
	No	478(93.5)
Are you a member of any complementary medicine network (e.g., GNLD)	Yes	62(12.1)
	No	449(87.9)
Have you attended any training/seminars on complementary medicines since graduation from pharmacy school?	Yes	243(47.6)
	No	268(52.4)

Availability of education resources on herbal medicines and supplements

Majority (76.1 %) agreed that undergraduate pharmacy training adequately equipped them to be a provider of information on herbal medicines and supplements. Similarly, majority (83.2 %) agreed to have learned more about herbal medicines and supplements from day-to-day work experience than from university education. Major source of information on herbal remedies and supplements was the internet (87.1 %). Few (6.5 %) had reference books for herbal medicines and supplements on the premises – such as African Traditional Medicine, Doctor's Guide to Natural Medicine, Prescription for Natural Cures, Compendium of Nigerian Plants, and Foods that Heal. Few of the respondents (12.1 %) belonged to a networking and multi-level marketing company that specializes in herbal/natural medicines and supplements such as Forever Living Product, Golden Neo Life Diamite (GNLD), Neolife, Kedi Healthcare, Edmark International, Alliance Global, Alliance in Motion Global, Longrich, Max International, PUREGen Africa, Live Pure, Purelife, Jigsimur, Cellgevity, BF Suma, Superlife, and Stem Cell Worx; some belonged to more than three networks. Nevertheless, 47.6 % of respondents had attended training/seminars on complementary and alternative medicines (CAM) since graduation from pharmacy school (Table 6).

DISCUSSION

Community pharmacists are the first center of care in most cases including information on herbal remedies. Findings from this study revealed that garlic and ginger in various pharmaceutical formulations were stocked and dispensed in community pharmacies, and community pharmacists have a positive attitude towards the use and practice of herbal medicines. They exhibited average knowledge of garlic and ginger as herbal medicines, and few belonged to a networking and multi-level marketing company that specializes in herbal medicines and supplements. The community pharmacists had a fair knowledge of garlic and ginger as natural remedies, albeit it is essential to improve their knowledge of herb interactions with conventional medicines (herb-drug interactions). The increasing popularity and acceptability of herbal medicine stems largely from the belief that natural products are safe,

cheaper, and commonly available. However, there are some concerns associated with herbal medicines regarding adverse reactions and interactions with conventional medicines. Other studies have reported pharmacists' poor knowledge of potential herb-drug interactions [12,13].

Nowadays, some herbal medicines are in pharmaceutical dosage forms for sale in community pharmacies, where the community pharmacist is responsible for guiding clients on the use of healthcare products be it conventional medicines or CAM. Hence, pharmacists, as drug experts, should have a good knowledge of herbal as well as conventional medicines. The respondents in this study believed that formulations containing garlic and ginger ought to be available for sale in community pharmacies as the phytoconstituents have pharmacological efficacy, and they are willing to support their clients to properly use them. This is in tandem with findings from previous studies in Canada, Asia, and other regions of the world [12-15]. Earlier studies have demonstrated that pharmacists are increasingly embracing the use of CAM [14,15], hence it is imperative to improve their knowledge of complementary medicines considering their role in providing healthcare services and information. Some of the respondents reported taking garlic or ginger because of the health benefits, with the majority reporting that the herbal medicine was effective.

Several scientific studies in animals and humans have shown that garlic has cardioprotective, anticarcinogenic, antihypertensive, hypolipidemic, antithrombotic, hypoglycemic, immunostimulant, antioxidant, and antimicrobial properties [5]. Also, scientific studies in animals and humans have established the anti-spasmodic, anti-inflammatory, analgesic, antioxidant, antinausea, antiemetic, anticancer, carminative, hypoglycemic, antidiabetic, cardiovascular protective, antiplatelet, and antimicrobial properties of ginger [6,16]. Treatment with medicinal plants is as old as mankind. Indigenous plants with known medicinal value have long been in use for their definite actions on the human body, which are attributed to specific bioactive constituents of plants. However, a major issue with herbal medicines is that their active ingredients and molecular interactions are not well defined, and thus standardization of the product becomes difficult. Currently, standardized formulations containing these herbal medicines or their extracts are available and dispensed in community pharmacies.

Most of the respondents usually stock garlic/ginger as whole herbs or extracts formulated as tea, capsules, tablets, lozenges and other pharmaceutical dosage forms alone or in combination with other active substances in their community pharmacy. This is most likely due to the demand from clients. The Nigerian healthcare system is primarily based on conventional medicines; however, traditional local remedies are very popular among majority of Nigerians. In addition, there is an increasing trend towards the use of herbal medicines in different pharmaceutical dosage forms. So, it is pertinent that attention is paid to the use of these herbal medicines by the citizens. Earlier studies have shown that garlic is one of the most common herbal products dispensed in community pharmacies [13,17]. Ginger was used primarily as a condiment; however, with time, medicinal use of ginger was recognized, and formulations were prepared to treat symptoms of nausea, vomiting motion sickness, and to stimulate appetite.

The results of this study revealed that garlic and ginger had been developed into different dosage forms. Majority of Nigerians rely on traditional herbal medicines, or supplements containing or purported to contain natural substances such as ginger and garlic to treat a variety of diseases. It is pertinent to note that more adults and elderly are using herbal medicines and dietary supplements without prescription or advice from a doctor on the assumption that these substances are natural and hence safe and will have a beneficial effect. However, this might not be a safe or advisable practice; for instance, some of the patients may have one chronic ailment or another (e.g., diabetes) and are taking multiple medications with consequently greater potential for clinically significant interactions when herbal medicines are consumed. Findings from this study revealed that respondents recommended garlic or ginger after they were satisfied that there may be no interactions. So, pharmacists being the most accessible healthcare professionals have a key role to play in advising their clients on the use of herbal medicines and supplements.

Community pharmacists should be vigilant while attending to their patients regarding the use of herbal products with prescription medications. Patients should be informed about possible effects and closely monitored. Majority of the community pharmacists stated that the training received in pharmacy school has equipped them with knowledge of herbal medicines, indicating that the pharmacy curriculum provided some basic knowledge of herbal medicines. In addition,

they have also garnered knowledge from work experience, suggesting the need for continuing professional education and development.

Results showed that very few pharmacists had reference books on herbal medicines and supplements, though no standard book was among those mentioned. This is unlike what is obtained for conventional medicines where there is a plethora of education resources that are constantly being updated at a very rapid rate. To be adequately equipped to offer good quality pharmaceutical care in the constantly evolving pharmaceutical landscape, continuing education programs with more information on the safety and potential harmful effects of some CAM products should be provided to practicing pharmacists. Pharmacists should have access to evidence-based references on herb-drug interactions, such as current herbal textbooks and updated computer databases on herbal/natural health products. Furthermore, there is paucity of educational resources on the clinical uses of garlic ginger and other herbal remedies. This accentuates the need for more documentation of the effects and interactions of these substances.

CONCLUSION

Community pharmacists demonstrate a fair knowledge of garlic and ginger in several dosage forms like tea bags, tablets, and capsules, as herbal remedies; though knowledge of herb-drug interactions was poor. Community pharmacists need to be excellently knowledgeable and informed about herbal products to better advise patients who are seeking or using alternative remedies. In addition, pharmacists should participate in continuing professional education and development, and training workshops/seminars to be in tune with the current demands of practice.

DECLARATIONS

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Ethical approval

The study was approved by the Federal Capital Territory Health Research Ethics Committee (approval no. FHREC/2021/01/72/29-06-21).

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of interest

No conflict of interest is associated with this work.

Contribution of authors

We declare that this work was done by the author(s) named in this article, and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or all these areas; took part in drafting, revising or critically reviewing the article; gave approval for the final draft to be published; agreed to be accountable for all aspects of the work.

REFERENCES

1. *Aina O, Gautam L, Simkhada P, Hall S. Prevalence, determinants and knowledge about herbal medicine and non-hospital utilization in southwest Nigeria: a cross-sectional study. BMJ Open 2020; 10: e040769. doi:10.1136/bmjopen-2020-040769*
2. *Duru CB, Uwakwe KA, Chinonso NC, Mbachi II, Diwe KC, Agunwa CC, Iwu AC, Merenu IA. Socio-demographic determinants of herbal medicine use in*

pregnancy among Nigerian women attending clinics in a tertiary hospital in Imo state, Southeast, Nigeria. Am J Med 2016; 4: 1–10.

3. *Okoronkwo I, Onyia-Pat JL, Okpala P, Agbo MA, Ndu A. Patterns of complementary and alternative medicine use, perceived benefits, and adverse effects among adult users in Enugu urban, Southeast Nigeria. Evid Based Complement Alternat Med 2014; 2014: 239372.*
4. *Oreagba IA, Oshikoya KA, Amachree M. Herbal medicine use among urban residents in Lagos, Nigeria. BMC Complement Altern Med 2011; 11: 117.*
5. *Batiha GE, Beshbishy AM, Wasef LG, Elewa YHA, Al-Sagan AA, Abd El-Hack ME, Taha AE, Abd-Elhakim YM, Devkota HP. 2020. Chemical constituents and pharmacological activities of garlic (Allium sativum L.): A review. Nutrients 2020; 12(3): 872.*
6. *Shoaib M, Shehzad A, Butt MS, Saeed M, Raza H, Niazi S, Khan IM, Shakeel A. An overview: ginger, is a tremendous herb. J Glob Innov Agric Soc Sci 2016; 4(4): 172-187.*
7. *Ilori T, Akintayo AD, Adewale BA, Oyetola EO. Knowledge, attitude and practice of Nigerian medical students towards complementary and alternative medicine in COVID-19 management. Ann Ibd Pg Med 2021; 19: S22-S30.*
8. *Nilashi M, Samad S, Shahmoadi I, Ahmadi H, Akbari E. The COVID-19 infection and the immune system: The role of complementary and alternative medicines. Biomed Res 2020; 31: 1-4.*
9. *Cochran WG. Sampling techniques. 2nd ed., New York: John Wiley and Sons, Inc.; 1963*
10. *Kothari CR, Garg G. Research methods and techniques. 3rd ed. New Delhi: New Age International Publishers; 2014: 162-170.*
11. *Pharmacy Council of Nigeria. Register of licensed community pharmacies and community pharmacists in Nigeria as of December 31, 2020. Pharmacy Council of Nigeria, Abuja; 2021.*
12. *Alkharfy KM. Community pharmacists' knowledge, attitudes and practices towards herbal remedies in Riyadh, Saudi Arabia. East Mediterr Health J 2010; 16(9): 988-993.*
13. *Abahussain NA, Abahussain EA, Al-Oumi FM. Pharmacists' attitudes and awareness towards the use and safety of herbs in Kuwait. Pharm Pract 2007; 5(3): 125–129.*
14. *Koh HL, Teo HH, Ng HL. Pharmacists' patterns of use, knowledge and attitudes toward complementary and alternative medicine. J Altern Complement Med 2003; 9(1): 51-63*
15. *Ogbogu U, Necyk C. Community pharmacists' views and practices regarding natural health products sold in community pharmacies. PLoS One 2016; 11(9).*
16. *Bode AM, Dong Z. The amazing and mighty ginger. In: Benzie IF, Wachtel-Galor S, editors. Herbal medicine: biomolecular and clinical aspects. 2nd Ed. Ch. 7. Boca Raton, Florida: CRC Press, Taylor and Francis; 2011.*
17. *Alsayari A, Almghaslah D, Khaled A, Annadurai S, Alkhairy MA, Alqahtani HA, Alsayed BA, Alasiri RM, Assiri AM. Community pharmacists' knowledge, attitudes, and practice of herbal medicines in Asir region, Kingdom of Saudi Arabia. Evid Based Complement Alternat Med 2018; 2018: 1568139. doi: 10.1155/2018/1568139.*