Pharmacy Education (2026) 26(1) 96 - 104
https://doi.org/10.46542/pe.2026.261.96104

RESEARCH ARTICLE

Exploring complementary and alternative medicine practices among pharmacy students in Nigeria: A national survey

Roland Nnaemeka Okoro[1], Lydia Hassan[1], Cletus Anes Ukwubile[2], Chigozie Gloria Anene-Okeke[3]

[1] Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Maiduguri, Borno State, Nigeria
[2] Department of Pharmacognosy, Faculty of Pharmacy, University of Maiduguri, Borno State, Nigeria
[3] Department of Clinical Pharmacy and Pharmacy Management, Faculty of Pharmaceutical Sciences, University of Nigeria, Enugu State, Nigeria

Keywords
Complementary and alternative medicine
Herbal medicine
Holistic healthcare
Nigerian pharmacy student
Pharmacy education
Self-help practice

Correspondence
Roland Nnaemeka Okoro
Department of Clinical Pharmacy and Pharmacy Administration
Faculty of Pharmacy
University of Maiduguri
Borno State
Nigeria
orolandn@gmail.com

Abstract

Background: Complementary and alternative medicine (CAM) is widely used in Nigeria, yet formal training on CAM within pharmacy education has only recently gained attention. Understanding pharmacy students' use and perceptions of CAM is essential for effective curriculum integration. This study assessed CAM usage prevalence, patterns, and perceived effectiveness of commonly used CAM modalities among undergraduate pharmacy students in Nigeria. **Methods:** A cross-sectional survey was conducted among undergraduate pharmacy students. Data were collected on demographic characteristics, use of herbal medicines and self-practices in the past 12 months and currently, and perceived helpfulness of commonly used CAM modalities. Descriptive statistics were used to summarise findings. **Results:** Herbal medicine use was common (20.2%), with *Moringa oleifera* and *Zingiber officinale* (ginger) being the most frequently reported herbs. Self-practices such as prayer (79.5%), relaxation (56.9%), meditation (51.4%), and imagery (40.6%) were widely practised. Most users perceived both herbal medicines and self-practices as helpful, with over 90% reporting positive outcomes for commonly used modalities. Minimal differences were observed between past and current use patterns. **Conclusion:** Pharmacy students in Nigeria view CAM modalities as beneficial, indicating cultural acceptance and personal involvement despite limited training. This underscores the need to incorporate evidence-based CAM education into the pharmacy curriculum to improve students' knowledge and counseling skills.

Introduction

Complementary and alternative medicine (CAM) refers to a broad range of diverse medical and healthcare practices and products that are not currently considered part of conventional medicine (NCCIH, 2021). Although the terms "*complementary*" and "*alternative*" are often used interchangeably, they represent distinct concepts. When a non-mainstream approach is used alongside conventional medicine, it is termed "*complementary*"; when it is used in place of conventional medicine, it is referred to as "*alternative*" (NCCIH, 2021). Conventional healthcare approaches typically include medications, physical rehabilitation, and psychotherapy. Complementary approaches can be categorised based on their primary therapeutic input: nutritional (e.g., special diets, dietary supplements, herbs, and probiotics), psychological (e.g., mindfulness practices), physical (e.g., massage therapy, spinal manipulation), or combined approaches (e.g., yoga, tai chi, acupuncture, dance or art therapies, which integrate psychological and physical elements; and mindful eating, which combines psychological and nutritional aspects). Common examples of

complementary health practices include acupuncture, yoga, and the use of probiotics (NCCIH, 2021).

Evidence indicates that CAM is widely utilised for a broad spectrum of health conditions, including sexual health disorders, hypertension, diabetes, cancer, asthma, HIV/AIDS, malaria, febrile illnesses, neurological and mental health disorders (such as epilepsy), musculoskeletal issues, diarrhoea, eye diseases, surgical care, infantile colic, tuberculosis, oral health conditions, and mycetoma (James *et al*., 2018). Push and pull factors contribute to this widespread use. These include the relatively low cost and flexible payment options for CAM products and services, ease of accessibility, and a prevailing belief that CAM therapies are natural, and therefore safer and more effective than conventional healthcare (James *et al*., 2018). Dissatisfaction with conventional healthcare also plays a significant role, often driven by factors such as long distances to healthcare facilities, unavailability of prescribed medications, challenges in accessing care, perceived inequities, negative provider attitudes, long wait times, bureaucratic procedures, and fears related to diagnosis of serious illnesses (James *et al*., 2018).

Despite its popularity, CAM is not devoid of risks. Adverse effects may stem from the intrinsic toxicity of certain remedies or quality-related issues, such as misidentification, adulteration, contamination, or poor manufacturing practices. Notably, serious outcomes like renal and hepatic toxicities have been reported (Koraishy, Moeckel & Geller, 2017; Philips *et al*., 2024). In response, the World Health Organisation (WHO) has developed specific guidelines for the pharmacovigilance of herbal medicines within the broader WHO framework for safety monitoring (WHO, 2004).

In Nigeria, CAM is deeply embedded in cultural traditions and plays a vital role in the healthcare landscape. Many Nigerians rely on herbal remedies, spiritual healing, and other traditional therapies to address ailments ranging from chronic conditions such as hypertension and diabetes to cancer (Amira & Okubadejo, 2007; Ezeome & Anarado, 2007; Ogbera *et al*., 2010; Oreagba *et al*., 2011). Factors such as limited access to conventional healthcare, affordability, and trust in the efficacy of indigenous practices have contributed to the widespread use of CAM in Africa (Tangkiatkumjai *et al*., 2020). The integration of spirituality and herbal therapy, particularly through faith healing and plant-based treatments, underscores CAM's significance in addressing healthcare needs, especially in resource-limited settings (Owumi *et al*., 2013; James *et al*., 2018).

Recent developments in the pharmacy profession in Nigeria reflect a growing recognition of CAM as an important component of holistic healthcare. In 2023, the Nigerian Tertiary Institutions Regulatory Agency (National Universities Commission) introduced a new course, "*Herbal, Complementary, and Other Alternative Medicines*," into the Core Curriculum and Minimum Academic Standards (CCMAS) for undergraduate pharmacy and pharmaceutical sciences education (NUC, 2023). Pharmacy students are increasingly showing interest in diverse therapeutic approaches, thereby challenging the traditional boundaries of pharmacy education. This shift aligns with findings from a study conducted in Sierra Leone, where pharmacy students demonstrated strong awareness of and positive attitudes toward CAM, emphasising the need to integrate such modalities into pharmacy training to enhance professional competence in an evolving and diverse healthcare environment (James & Bah, 2014). By embracing integrative approaches, pharmacists can play a pivotal role in improving healthcare accessibility and quality (Mpinga *et al*., 2013).

However, significant challenges hinder the effective adoption of CAM in pharmacy practice in Nigeria. For example, conventional healthcare systems, lack of formal education or training of healthcare workers on CAM, perceived demonic nature, and scepticism from the healthcare community regarding CAM's efficacy, complicate its integration (Omogbadegun & Adegboyega, 2013; Saha *et al*., 2017; James *et al*., 2018; Onche *et al*., 2024). Addressing these barriers is critical to preparing pharmacy students to meet the evolving needs of their communities. This study assessed CAM usage prevalence, patterns, and perceived effectiveness of commonly used CAM modalities among undergraduate pharmacy students in Nigeria. The findings can inform targeted interventions that could enhance CAM's integration into mainstream healthcare, ensuring its potential is fully realised in improving patient outcomes.

Methods

Study design and setting

This study utilised a descriptive, cross-sectional design conducted through a national online survey targeting undergraduate pharmacy students from all accredited pharmacy schools in Nigeria.

Study population

The study population comprised undergraduate pharmacy students in their first to sixth years across 32 universities in Nigeria in 2023.

Sample size determination

The minimum required sample size was calculated using the Raosoft© online sample size calculator. The calculation assumed an estimated population of 20,000 Nigerian pharmacy students in the year 2023, a five percent margin of error, and a 95% confidence interval, resulting in a recommended minimum sample size of 377 participants.

Eligibility criteria

Inclusion criteria comprised undergraduate pharmacy students in the year 2023 who had internet access, an active WhatsApp account, and who expressed willingness to participate. Students who had withdrawn from the pharmacy programme were excluded.

Participant selection

Participants were recruited through convenience sampling via both individual and class group WhatsApp platforms.

Study instrument

Data were collected using a questionnaire adopted from a previous study (Quandt *et al*., 2009). The instrument consisted of two sections:

Section 1: Questions about respondents' demographic characteristics (e.g., age and sex) and academic background (e.g., year of study and university name).

Section 2: Fifty-two questions (a mix of open- and closed-ended) addressing participants' CAM practices. Twelve questions focused on the use of herbs or herbal medicines in the past 12 months, current use, reasons for use, and perceived effectiveness. Forty questions explored various self-help practices.

Outcomes

Primary outcome was the prevalence of CAM use in the past 12 months and current use, whereas secondary outcome was perceived effectiveness.

Data collection

Data were collected via Google Forms, accessible via a survey link shared on both individual and class WhatsApp groups. The data collection period spanned 11 weeks (August 7 to October 31, 2023). The survey link was deactivated after four weeks of inactivity. Information collected included respondents' demographics, school characteristics, and CAM practices.

Data analysis

Raw data were downloaded in Microsoft Excel, cleaned, coded, and imported into Statistical Package for the Social Sciences (SPSS) version 21 (IBM Corporation) for analysis. Descriptive statistics (frequencies and percentages) were used to summarise the findings.

Results

Basic characteristics of the study respondents

A total of 663 respondents from 22 out of 32 universities offering undergraduate pharmacy programmes in the year 2023 participated in the study. Most participants were aged 21–23 years (34.4%), followed by those aged 24–26 years (28.2%). Males constituted a slight majority (55.7%), and the vast majority of respondents were single (95.2%). Participants were distributed fairly across study years, with the highest proportion in the fifth year (29.9%), whereas only a small fraction were in the sixth year (1.5%). Most respondents were enrolled in universities located in the northern region (75.0%), with the remainder attending universities in the south (25.0%) as shown in Table I.

Table I: Basic characteristics of the study respondents

Variables		n (%)
Age groups (years)	18-20	137 (20.7)
	21-23	228 (34.4)
	24-26	187 (28.2)
	>26	111 (16.7)
Sex	Male	369 (55.7)
	Female	294 (44.3)
Marital status	Single	631 (95.2)
	Married	32 (4.8)
Year of study	First	52 (7.8)
	Second	128 (19.3)
	Third	137 (20.7)
	Fourth	138 (20.8)
	Fifth	198 (29.9)
	Sixth	10 (1.5)
Location of universities	North	497 (75.0)
	South	166 (25.0)

Herb/herbal medicines usage by the study respondents

Among the 663 pharmacy students who completed the survey, 20.2% (n = 187) reported the use of herbs or herbal medicines within the past year. Within the past year (n = 361), *Moringa oleifera* (9.7%) and *Zingiber officinale* (ginger) (9.1%) were the most frequently used herbs, followed by *Azadirachta indica* (neem) (5.8%), *Nigella sativa* (Black seed) (5.3%), *Allium sativum* (Garlic) (5.3%), and *Curcuma longa* (Tumeric) (4.4%). Other herbs were used less frequently, each accounting for fewer than four percent of responses. Of the herbs or herbal medicines used within the past year, 254 (70.4%) were reported to be in current use. Current use showed a similar pattern, with *Moringa oleifera* remaining the most commonly used herb (9.5%). This was followed by *Syzygium aromaticum* (clove) (9.1%), *Zingiber officinale* (ginger) (8.7%), *Nigella sativa* (Black seed) (7.1%), *Allium sativum* (Garlic) (6.7%), and *Trigonella foenum-graecum* (Fenugreek) (6.3%). Overall, usage was dominated by a small number of commonly known herbs, while the majority of other herbal products were reported by only a small proportion of students (Table II).

Table II: A snapshot of most herbs or herbal medicines used by the respondents

Past 12 months (N=361) Herbs/herbal medicines	n (%)	Current use (N=254) Herbs/herbal medicines	n (%)
Moringa oleifera (Moringa), Family: Moringaceae	35 (9.7)	*Moringa oleifera* (Moringa), Family: Moringaceae	24 (9.5)
Zingiber officinale (Ginger), Family: Zingiberaceae	33 (9.1)	*Syzygium aromaticum* (Clove), Family: Myrtaceae	23 (9.1)
Azadirachta indica (Neem leaves), Family: Meliaceae	21 (5.8)	*Zingiber officinale* (Ginger), Family: Zingiberaceae	22 (8.7)
Nigella sativa (Black seed), Family: Ranunculaceae	19 (5.3)	*Nigella sativa* (Black seed), Family: Ranunculaceae	18 (7.1)
Allium sativum (Garlic), Family: Alliaceae	19 (5.3)	*Allium sativum* (Garlic), Family: Alliaceae	17 (6.7)
Curcuma longa (Tumeric), Family: Zingiberaceae	16 (4.4)	*Trigonella foenum-graecum* (Fenugreek), Family: Fabaceae	16 (6.3)
Vernonia amygdalina (Bitter leaf), Family: Asteraceae	14 (3.8)	*Aloe barbadensis miller* (Aloe vera), Family: Asphodelaceae	11 (4.3)
Trigonella foenum-graecum (Fenugreek), Family: Fabaceae	12 (3.3)	*Panax ginseng* (Ginseng), Family: Araliaceae	10 (3.9)
Syzygium aromaticum (Clove), Family: Myrtaceae	11 (3.0)	*Curcuma longa* (Tumeric), Family: Zingiberaceae	10 (3.9)
Cymbopogon flexuosus (Lemon grass), Family: Poaceae	9 (2.5)	*Azadirachta indica* (Neem leaves), Family: Meliaceae	10 (3.9)
Carica papaya (Pawpaw leaves), Family: Caricaceae	8 (2.2)	*Allium cepa* (Onions), Family: Amaryllidaceae	8 (3.2)
Hibiscus sabdariffa ("*Zobo*" leaves), Family: Malvaceae	8 (2.2)	*Cymbopogon flexuosus* (Lemon grass), Family: Poaceae	5 (2.0)
Aloe barbadensis miller (Aloe vera), Family: Asphodelaceae	7 (1.9)	*Strychnos nux-vomica*, Family: Loganiaceae	4 (1.6)
Vernonia amygdalina (Bitter leaf), Family: Asteraceae	7 (1.9)	*Citrus aurantifolia* (Lime), Family: Rutaceae	4 (1.6)
Allium cepa (Onions), Family: Amaryllidaceae	7 (1.9)	*Herbal mixture* "*Agbo*"	3 (1.2)
Panax ginseng (Ginseng), Family: Araliaceae	6 (1.7)	*Phyllanthus niruri* (Chanca piedra), Family:Phyllanthaceae	3 (1.2)
Psidium guajava (Guava leaves), Family: Myrtaceae	6 (1.7)	*Ocimum gratissimum* (Scent leaves), Family: Lamiaceae	3 (1.2)
Herbal mixture "*Agbo*"	5 (1.4)	*Andrographis paniculata* (King of bitters), Family: Acanthaceae	3 (1.2)
Phyllanthus niruri (Chanca piedra), Family:Phyllanthaceae	5 (1.4)	*Cactus baobab, Family:* Malvaceae	3 (1.2)
Atropa belladonna, Family: Solanaceae	4 (1.1)	*Atropa belladonna,* Family: Solanaceae	3 (1.2)
Camellia sinensis (Green tea), Family: Theaceae	4 (1.1)	*Garcinia kola* (Bitter kola), Family: Clusiaceae	2 (0.8)
Mentha piperita (Peppermint leaves/oil), Family: Lamiaceae	4 (1.1)	*Ixora coccinea* (Gangaria de flush herbal mixture), Family: Rubiaceae.	2 (0.8)
Acacia or Wattles, Family: Fabaceae	3 (0.8)	*Cymbopogon flexuosus* (Lemon grass), Family: Poaceae	2 (0.8)

Mind-body-self practices in the past 12 months and their current utilisation

Self-practice approaches were commonly reported among pharmacy students, with similar patterns observed for the past 12 months and current use. Prayer was the most prevalent practice, reported by 79.5% of respondents in the past 12 months and 78.4% currently. Relaxation and meditation were also frequently practised, with over half of the students

reporting use in both periods. Imagery and massage were used by approximately two-fifths of respondents, while Tai Chi and yoga were less commonly practised. Qi Gong and traditional healing were the least reported self-practices, each used by fewer than ten percent of students. Overall, there was minimal variation between past and current engagement across all self-practice modalities (Table III).

Table III: Self-practices utilised by the respondents

Self-practices	Last 12 months, n (%)		Current use, n (%)	
	Yes	No	Yes	No
Prayer	527 (79.5)	136 (20.5)	520 (78.4)	143 (21.6)
Relaxation	377 (56.9)	286 (43.1)	373 (56.3)	290 (43.7)
Meditation	341 (51.4)	322 (48.6)	335 (50.5)	328 (49.5)
Imagery	269 (40.6)	394 (59.4)	259 (39.1)	404 (60.9)
Massage	262 (39.5)	401 (60.5)	258 (38.9)	405 (61.1)
Tai Chi	175 (26.4)	488 (73.6)	172 (25.9)	491 (74.1)
Yoga	120 (18.1)	543 (81.9)	113 (17.0)	550 (83.0)
Qi Gong	63 (9.5)	600 (90.5)	62 (9.4)	601 (90.6)
Traditional Healing	48 (7.2)	615 (92.8)	47 (7.1)	616 (92.9)

Perceived effectiveness of the most common herbs or herbal products and self-help practices used by the respondents

In Table IV, most commonly used herbs and self-practices were perceived as beneficial by the majority of respondents in both the past 12 months and at the time of the survey. Among herbal products, *Zingiber officinale* (ginger) had the highest perceived benefit in the past 12 months (97.0%), while current users of clove and ginger reported universal perceived helpfulness (100.0%). *Moringa oleifera* was also largely considered helpful in both periods, whereas neem leaves had a comparatively lower perceived benefit.

Self-help practices were consistently rated as helpful by over 90% of users. Prayer, relaxation, meditation, massage, Tai Chi, and yoga showed high perceived effectiveness across both time points. Qi Gong and traditional healing were also widely regarded as beneficial, although current users of traditional healing reported a relatively higher proportion of perceived non-benefits. Overall, perceptions of helpfulness remained high and stable across both herbal and self-practice modalities.

Table IV: The perceived outcomes of the most commonly used herbs and self-practices

Last 12 months	n (%)		Current Use	n (%)	
	Helpful	Not Helpful		Helpful	Not Helpful
Herbs			**Herbs**		
Moringa oleifera	31 (88.8)	4 (14.4)	*Moringa oleifera*	22 (91.7)	2 (8.3)
Zingiber officinale	32 (97.0)	1 (3.0)	*Syzygium aromaticum*	23 (100.0)	0 (0.0)
Azadirachta indica	16 (76.2)	5 (23.8)	*Zingiber officinale*	22 (100.0)	0 (0.0)
Self-help practices					
Prayer	502 (95.3)	25 (4.7)	Prayer	500 (96.2)	20 (3.8)
Relaxation	364 (96.5)	13 (3.5)	Relaxation	358 (96.0)	15 (4.0)
Meditation	319 (93.6)	22 (6.4)	Meditation	318 (94.9)	17 (5.1)
Imagery	242 (90.0)	27 (10.0)	Imagery	239 (92.3)	20 (7.7)
Massage	248 (94.7)	14 (5.3)	Massage	244 (94.6)	14 (5.4)
Tai Chi	167 (95.4)	8 (4.6)	Tai Chi	162 (94.2)	10 (5.8)
Yoga	111 (92.5)	9 (7.5)	Yoga	102 (90.3)	11 (9.7)
Qi Gong	63 (100.0)	0 (0.0)	Qi Gong	57 (91.1)	5 (8.1)
Traditional healing	45 (93.8)	3 (6.2)	Traditional healing	39 (83.0)	8 (17.0)

Discussion

This study provides important insights into the use and perceived effectiveness of CAM among pharmacy students, within the context of pharmacy practice and the recent integration of CAM into the undergraduate pharmacy curriculum in Nigeria. Although only about one-fifth of respondents reported herbal medicine use within the past year, the diversity of herbs used and the high continuation rate into current use highlight sustained engagement with CAM among future pharmacists.

The predominance of *Moringa oleifera* and *Zingiber officinale* (ginger) mirrors patterns reported in the Nigerian general population, due to their nutritional, anti-inflammatory, and perceived immune-boosting properties, wide accessibility and affordability (Maiyegun *et al*., 2022; Maiyegun et al., 2024; Mba *et al*., 2025). Their frequent use among pharmacy students suggests that cultural familiarity and accessibility strongly influence personal health choices, even among individuals undergoing formal biomedical training. The relatively lower use of less common herbs further indicates selective reliance on well-known botanicals rather than indiscriminate CAM use.

The finding that over half of the herbs used within the past year were still in current use suggests ongoing confidence in herbal therapies. However, high perceived effectiveness, particularly the near-universal perceived benefit of ginger and clove, must be interpreted cautiously. Perceived benefit does not necessarily equate to clinical efficacy, and students' confidence may reflect personal experience or cultural beliefs rather than evidence-based evaluation. These findings highlight the importance of reinforcing evidence-based CAM instruction and promoting informed, culturally sensitive practices among future pharmacists. This represents a progressive step towards equipping future pharmacists with a more holistic understanding of healthcare. Traditionally, pharmacy education has focused predominantly on conventional pharmacotherapy. However, the reality of patient care often involves patients utilizing or inquiring about CAM therapies. By the incorporation of CAM, pharmacy education can now empower graduates to engage in informed discussions with patients, provide evidence-based advice, and critically evaluate the safety and efficacy of these modalities.

Self-practice modalities were even more prevalent than herbal use, with prayer emerging as the most common practice. This aligns with studies showing that spirituality and prayer play a central role in coping and health-seeking behaviour in Nigeria and other African settings (Puffer *et al.,* 2012; Ahwinahwi & Chukwudi, 2016; Ibrahim & Lawal, 2022; Nwoko & Udaya, 2022; Sekgobela, 2025). High use of prayer as a self-help practice among pharmacy students has notable implications for pharmacy practice, as it may enhance personal resilience, stress coping, and emotional well-being, thereby supporting professional functioning in a demanding healthcare environment (Purnell *et al.,* 2019). Engagement in prayer may also foster empathy, moral awareness, and sensitivity to patients' spiritual beliefs, which can positively influence pharmacist–patient communication and culturally responsive, patient-centred care, particularly in religious societies (Purnell *et al.,* 2019; Okereke *et al.,* 2020; Islam *et al.,* 2024). However, reliance on prayer also highlights the need for professional boundaries, as unstructured integration of personal spiritual practices into clinical encounters may risk ethical concerns, belief imposition, or deviation from evidence-based care if not appropriately guided (Purnell *et al.,* 2019; Gavaza *et al.,* 2023). Consequently, pharmacy education should address spiritual competence and ethical frameworks to help students balance personal coping practices with professional responsibilities in contemporary pharmacy practice (Jacob *et al.,* 2017; Purnell *et al.,* 2019; Marks *et al.,* 2024).

The widespread use and high perceived benefit of relaxation, meditation, imagery, and massage are consistent with global evidence supporting mind–body practices for stress reduction and mental well-being, particularly among students in demanding professional programmes (Frausing *et al.,* 2025; Patarathipakorn *et al.,* 2025). The relatively low uptake of Tai Chi, yoga, Qi Gong, and traditional healing may reflect limited exposure, lack of structured training, or perceived cultural distance from these practices.

From a pharmacy education perspective, these findings are highly relevant. Pharmacists are often the first point of contact for patients seeking advice on CAM, yet several studies have documented gaps in pharmacists' and pharmacy students' knowledge of CAM, especially regarding safety, interactions, and regulation (Jamshed *et al.,* 2016; Naja *et al.,* 2024; Naja *et al.,* 2025). The high personal use and positive perceptions observed in this study suggest that pharmacy students may enter practice with favourable attitudes toward CAM but insufficient evidence-based knowledge, potentially may increase the risk of inappropriate recommendations.

The recent integration of CAM into the Nigerian pharmacy curriculum is therefore both timely and necessary. Recent evidence has demonstrated the need for the inclusion of CAM education to support rational use and patient safety (Roseghini *et al.,* 2024). Evidence from other countries indicates that formal CAM courses improve students' knowledge, confidence, and

communication skills, while fostering a more critical and professional approach rather than uncritical acceptance (Tiralongo *et al.,* 2008; Roseghini *et al.,* 2024).

Importantly, the consistently high perceived helpfulness of both herbal and self-practice modalities observed in the present study suggests that CAM education in Nigeria should go beyond the periphery. Curricula should integrate pharmacological evidence and clinical trials. Such training will better equip future pharmacists to counsel patients effectively, identify potential risks, and collaborate with other healthcare professionals in delivering holistic, culturally competent care.

Overall, these findings support the relevance and potential impact of the newly integrated CAM course in Nigerian pharmacy education. Aligning formal instruction with students' real-world experiences and prevailing community practices may enhance learning relevance, promote evidence-based practice, and strengthen the pharmacist's role in ensuring the safe and rational use of complementary and alternative medicine.

Study limitations and strengths

Some limitations should be acknowledged. The sample was not fully representative of all Nigerian pharmacy schools, with a higher proportion of respondents from the northern region, despite efforts to include all institutions. Nationally representative and mixed-methods research is needed to develop a deeper understanding of pharmacy students' engagement with CAM and its potential implications for their future professional practice. Reliance on self-reported data may have introduced social desirability bias; however, anonymity and assurances of confidentiality were used to encourage honest responses. The convenience sampling approach limits generalizability, although broad distribution across multiple institutions and clear inclusion criteria were applied to enhance diversity and reduce selection bias. Additionally, the cross-sectional design precludes causal inferences. Longitudinal studies to track the impact of the CAM course on students' knowledge, attitudes, and practices over time to help provide a clearer picture of its effectiveness are recommended. Selection bias may also have occurred if students with greater familiarity with CAM were more inclined to participate, though neutral messaging and broad outreach were employed to mitigate this risk.

Despite these limitations, the study makes a valuable contribution. To the authors' knowledge, it is the first to systematically assess the use of herbal, mind–body, and traditional healing practices among pharmacy students across a wide geographic range in Nigeria, thereby addressing an important gap in the literature. It also adds Nigerian data to the global discourse on CAM in pharmacy education and provides baseline evidence upon which future, larger, and more representative studies can build.

Conclusion

This study demonstrates that CAM, including herbal medicines and self-practice modalities, is widely used and perceived as effective among pharmacy students in Nigeria. Commonly used herbs such as *Moringa oleifera* and *Zingiber officinale*, as well as mind–body practices like prayer, relaxation, and meditation, reflect strong cultural acceptance and sustained personal engagement. The high continuation of use and consistently positive perceived outcomes highlight students' confidence in these modalities.

These findings underscore the relevance of the newly integrated CAM course in the pharmacy curriculum in Nigeria. Given pharmacists' critical role in medication safety and patient counselling, structured and evidence-based CAM education is essential to equip future pharmacists with the knowledge and skills required to evaluate efficacy, identify safety concerns, and manage herb–drug interactions. Integrating CAM into pharmacy education offers an opportunity to align professional training with prevailing health practices, promote rational use of CAM, and strengthen pharmacists' contribution to holistic and culturally responsive healthcare delivery.

Acknowledgments

The authors wish to express their profound gratitude to all pharmacy students who participated in this study.

Conflict of interest

The authors declare no conflict of interest.

Source of funding

The authors did not receive any funding.

Ethics approval and informed consent

Ethical approval (FP/23/SP.6063) was obtained from the Research and Ethics Committee of the Faculty of Pharmacy, University of Maiduguri. Participation was voluntary, and informed consent was obtained from all participants. Before accessing the questionnaire, participants were required to check a mandatory consent field, confirming their agreement to participate. Anonymity and confidentiality of responses were assured throughout the study.

References

Ahwinahwi, U. S., & Chukwudi, K. (2016). Perception and use of Complementary and Alternative Medicine (CAM) among undergraduate students in a Nigerian University. *Journal of Applied Pharmaceutical Science,* **6**(06), 096–101.https://doi.org/10.7324/JAPS.2016.60617

Amira, O., & Okubadejo, N. (2007). Frequency of complementary and alternative medicine utilization in hypertensive patients attending an urban tertiary care centre in Nigeria. *BMC Complementary and Alternative Medicine*, **7**, 30. https://doi.org/10.1186/1472-6882-7-30

Ezeome, E., & Anarado, A. (2007). Use of complementary and alternative medicine by cancer patients at the University of Nigeria Teaching Hospital, Enugu, Nigeria. *BMC Complementary and Alternative Medicine*, **7**, 28. https://doi.org/10.1186/1472-6882-7-28

Frausing, K. P., Flammild, M. H., & Dahlgaard, J. (2025). Mind-body practices for mental health in higher education: Breathing, grounding, and consistency are essential for stress and anxiety management. *Healthcare (Basel)*, **13**(16), 2049. https://doi.org/10.3390/healthcare13162049

Ibrahim, A., & Lawal, B. K. (2022). Assessment of awareness, use, attitude and the perceived need for Complementary and Alternative Medicine (CAM) education among undergraduate pharmacy students. *Nigerian Journal of Pharmaceutical Research*, **18**(2), 143–155. https://doi.org/10.4314/njpr.v18i2.6

James, P. B., & Bah, A. J. (2014). Awareness, use, attitude and perceived need for Complementary and Alternative Medicine (CAM) education among undergraduate pharmacy students in Sierra Leone: A descriptive cross-sectional survey. *BMC Complementary and Alternative*, **14**, 438. https://doi.org/10.1186/1472-6882-14-438

James, P. B., Wardle, J., Steel, A., & Adams, J. (2018). Traditional, complementary and alternative medicine use in Sub-Saharan Africa: A systematic review. *BMJ Global Health*, **3**(5), e000895. https://doi.org/10.1136/bmjgh-2018-000895

Jamshed, S. Q., Khan, M. U., Ahmad, A., & Elkalmi, R. M. (2016). Knowledge, perceptions, and attitudes toward complementary and alternative medicines among pharmacy students of a Malaysian Public University. *Journal of Pharmacy & Bioallied sciences*, **8**(1), 34–38. https://doi.org/10.4103/0975-7406.171686

Koraishy, F. M., Moeckel, G. W., & Geller, D. S. (2017). A case of severe nephrotoxicity associated with long-term dietary supplement use. *Clinical Nephrology Case Studies*, **5**, 42–47. https://doi.org/10.5414/CNCS109180

Maiyegun, A. A., Akangoziri, M. D., Grema, B. A., Mutalub, Y. B., Ibrahim, F. B., & Ibraheem, A. S. (2024). Patterns of herbal medicine use in a general outpatient clinic in Nigeria-A cross-sectional study. medRxiv (Preprint). https://doi.org/10.1101/2024.01.30.24302041

Maiyegun, A. A., Mutalub, Y. B., Muhammad, A. A., & Akangoziri, M. D. (2022). Prevalence and determinants of herbal medicine use among adults attending the National health insurance clinic of Abubakar Tafawa Balewa university teaching hospital, Bauchi, Nigeria. *Nigerian Journal of Medicine*, **31**, 417–423. https://www.ajol.info/index.php/njm/article/view/230710/217824

Mba, O. J., Ajaghaku, A. A., Ogbonna, B. O., & Egba, S. I. (2025). The accessibility and usage patterns of herbal drug information among non-health professionals in Nigeria: A narrative review. Innovative Medicines & Omics, **2**(2), 64–81. https://doi.org/10.36922/IMO025080012

Mpinga, E. K., Kandolo, T., Verloo, H., Bukonda, N. K., Kandala, N. B., & Chastonay, P. (2013). Traditional/alternative medicines and the right to health: Key elements for a convention on global health. *Health and Human Rights Journal*, **15**(1), E44–57.

Naja, F., Abbas, N., Khaleel, S., Zeb, F., Osaili, T. A. H, Obaid, R. S., Faris, M. A., Radwan, H., Ismail, L. C., Hassan, H., Hashim, M., & AlZubaidi, H. (2024). Beyond pillbox: A national cross-sectional study on the attitudes, practices, and knowledge of community pharmacists regarding complementary and alternative medicine. *BMC Complement Medicine and Therapies*, **24**, 107. https://doi.org/10.1186/s12906-024-04391-8

Naja, F., Ahmad, M., Shatila, H., Abu Shihab, K. H. N., Naalbandian, S., Saqan, R., AlZubaidi, H., & Hijazi, M. A. (2025). Role of community pharmacists in the safe and effective use of complementary and alternative medicine in the Middle East: A scoping review. *PLoS One*, **20**(9), e0332932. https://doi.org/10.1371/journal.pone.0332932

NCCIH (National Centre for Complementary and Integrative Health). (2021). *Complementary, alternative, or integrative health: What's in a name?* https://www.nccih.nih.gov/health/complementary-alternative-or-integrative-health-whats-in-a-name

NUC (National Universities Commission). (2023). *Core Curriculum and Minimum Academic Standards (CCMAS) for Nigerian Universities*. https://nuc-ccmas.ng/

Nwoko, C. C., & Udaya, E. C. O. (2022). Correlation between religious commitment and healthcare seeking behavior among the youth in Southeast Nigeria. *International Journal of Advanced Research*, **10**(2), 727–734. https://doi.org/10.21474/IJAR01/14263

Ogbera, A. O., Dada, O., Adeyeye, F., & Jewo, P.I. (2010). Complementary and alternative medicine use in diabetes mellitus. *West African Journal of Medicine*, **29**(3), 158–162. https://doi.org/10.4314/wajm.v29i3.68213

Omogbadegun, Z. O., & Adegboyega, M. A. (2013). Framework for overcoming barriers of complementary and alternative medicine acceptance into conventional healthcare system. *International Journal of Medicinal Plants and Alternative Medicine*, **1**(7), 118–136.

Onche, E. J., Oluwasanu, M. M., & John-Akinola, Y. O. (2024). Knowledge, perception, attitude, and practice of complementary and alternative medicine by health care workers in Garki hospital Abuja, Nigeria. *BMC Complementary Medicine and Therapies*, **24**(1), 177. https://doi.org/10.1186/s12906-024-04429-x

Oreagba, I. A., Oshikoya, K. A., & Amachree, M. (2011). Herbal medicine use among urban residents in Lagos, Nigeria. *BMC Complementary and Alternative Medicine*, **11**, 117. https://doi.org/10.1186/1472-6882-11-117

Owumi, B., Raji, S. O., & Aliyu, T. K. (2013). Religious belief and the utilization of traditional medicine among members of Pentecostal Churches in Emurin, Ogun State Nigeria. *African Journal of Social Sciences*, **3**(4), 23–34.

Patarathipakorn, O., Pawa, K., Sritipsukho, P., Tansuhaj, K., Bhamarapravatana, K., & Suwannarurk, K. (2025). Aanapanasati meditation and stress reduction among health science university students. *Open Public Health Journal*, **18**, e18749445380247. http://dx.doi.org/10.2174/0118749445380247250225075656

Philips, C. A., Theruvath, A. H., Ravindran, R., & Augustine, P. (2024). Complementary and alternative medicines and liver disease. *Hepatol Communications*, **8**(4), e0417. https://doi.org/10.1097/HC9.0000000000000417

Puffer, E. S., Watt, M. H., Sikkema, K. J., Ogwang-Odhiambo, R. A., & Broverman, S. A. (2012). The protective role of religious coping in adolescents' responses to poverty and sexual decision-making in rural Kenya. *Journal of Research on Adolescence*, **22**(1), 1–7. https://doi.org/10.1111/j.1532-7795.2011.00760.x

Quandt, S. A., Verhoef, M. J., Arcury, T. A., Lewith, G. T., Steinsbekk, A., Kristoffersen, A. E., Wahner-Roedler, D. L., & Fønnebø, V. (2009). Development of an International Questionnaire to Measure Use of Complementary and Alternative Medicine (I-CAM-Q). *The Journal of Alternative and Complementary Medicine*, **15**(4), 331–339. https://doi.org/10.1089/acm.2008.0521

Roseghini, R., Rosa, B. L. S., Vieira, L. G., & Daltro, M. R. (2024). Teaching integrative and complementary medicine in health undergraduate courses: Systematic review. *International Journal of Complementary & Alternative Medicine*, **17**(4), 202–208. https://doi.org/10.15406/ijcam.2024.17.00704

Saha, B. L., Seam, O. R., Islam, M., Das, A., Ahamed, S. K., Karmakar, P., Islam, F., & Kunduet, S. K. (2017). General perception and self-practice of complementary and alternative medicine (CAM) among undergraduate pharmacy students of Bangladesh. *BMC Complementary and Alternative Medicine*, **17**, 314. https://doi.org/10.1186/s12906-017-1832-y

Sekgobela, T. (2025). Religion and spirituality as a source of resilience among social workers: A strength-based perspective. *International Social Work*, 0(0). https://doi.org/10.1177/00208728251383138

Tangkiatkumjai, M., Boardman, H., & Walker, D. M. (2020). Potential factors that influence usage of complementary and alternative medicine worldwide: A systematic review. *BMC Complementary Medicine and Therapies*, **20**,363. https://doi.org/10.1186/s12906-020-03157-2.

Tiralongo, E., & Wallis, M. (2008). Integrating complementary and alternative medicine education into the pharmacy curriculum. American journal of pharmaceutical education, **72**(4), 74. https://doi.org/10.5688/aj720474.

WHO (World Health Organization). (2004). *WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems*. https://iris.who.int/handle/10665/43034