

Cognitive Levels, Perceptions, and Attitudes of Pharmacists Toward Herbal Medicine

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ABSTRACT

Over the past decade, more than 50% of advanced countries and 80% of developing countries have used herbal medicines for primary care. Pharmacists provide strategic herbal medicine information, but their cognition, perceptions, and attitudes determine their effectiveness. This meta-analysis of studies from multiple countries examines pharmacists' cognition, perceptions, and attitudes toward herbal medicines. A qualitative meta-analysis was performed on seven cross-sectional studies from Indonesia, Malaysia, Spain, Saudi Arabia, and the US published between 2014 and 2024. Overall, 1,255 community pharmacists responded. Pharmacy cognition varied, with clinical effectiveness scoring highest (3.9/5) and mechanism of action scoring lowest (2.8/5). Only 36% of pharmacists routinely provided counseling, but 72% and 68% of pharmacists viewed herbal medicines as safe and effective. Service practices were influenced by cognitive level ($r=0.68$, $p<0.05$), practical experience ($\beta=0.45$), and continuing education training availability (OR=2.3, 95% CI: 1.8–2.9). This study shows that pharmacists need better education, ongoing training, side effect tracking systems, and collaboration with other professionals and the right policies to improve their skills. This multi-faceted approach can help to improve herbal medicine pharmaceutical services.

INTRODUCTION

The use of herbal medicines has increased significantly in both advanced and developing countries over the past decade. The World Health Organization (WHO) reports that more than 50% of the population in advanced countries has experience using herbal medicines, while 80% of the population in developing countries considers traditional medicine, including herbal medicines, as their primary choice for primary healthcare. This trend is driven by several factors, including positive perceptions of herbal medicines, increased public awareness regarding their use, and the ease of access to information on herbal medicines (Harjanti *et al.*, 2014).

Pharmacists, as healthcare professionals who interact directly with the community, hold a strategic position in providing comprehensive information on the use of herbal medicines (Sari *et al.*, 2023). This aligns with the increasing

demand for herbal medicines, since the public requires complete, accurate, and reliable information regarding their efficacy and safety (Irawati & Ayupermata, 2022). However, in practice, pharmacists' ability to fulfil this role is highly dependent on their level of cognition, perceptions, and attitudes toward herbal medicines (J. Ahmed & Khan, 2019).

The selection process for articles included in this meta-analysis study was conducted systematically through multiple stages. During the initial identification phase, 245 articles published between 2014 and 2024 were identified. These articles then underwent a screening process based on titles and abstracts, resulting in 156 potential articles for further review. Of these, 124 articles were excluded based on the following criteria: 45 were not primary research studies, 38 did not focus on herbal medicines, and 41 were not conducted in a community pharmacy setting. Subsequently,

the remaining 32 articles were assessed for eligibility based on full-text analysis. At this stage, 25 articles were excluded for the following reasons: 8 had incomplete data, 7 had unclear methodologies, and 10 had irrelevant results to the objectives of the meta-analysis. Ultimately, 7 articles met all inclusion criteria and were selected for further analysis. The inclusion criteria required that the studies be primary research evaluating pharmacists' cognition, perceptions, or practices regarding herbal medicines, conducted in community pharmacies, published in English or Indonesian in peer-reviewed articles between 2014 and 2024, and have clear methodologies with complete data.

Several studies conducted between 2014 and 2024 across at least five countries—Indonesia, Malaysia, Spain, Saudi Arabia, and the United States—have examined the role of pharmacists in relation to herbal medicines. Harjanti *et al.* (2014) and Saibi & Betha (2016) in Indonesia explored the role of pharmacists in pharmaceutical services related to herbal medicines. In Saudi Arabia, Alnaim *et al.* (2018) assessed pharmacists' cognition and attitudes toward complementary and alternative medicine. In the United States, Santanello & Carr (2019) investigated pharmacists' cognition, perceptions, and practices regarding herbal medicines. In the United States, Stayduhar *et al.* (2023) examined pharmacists' and pharmacy students' cognition and perceptions of herbal supplements and natural products. In Malaysia, Tahir *et al.* (2020) analyzed community pharmacists' cognition of herbal medicines and their reporting of adverse effects (Tahir *et al.*, 2020). In Spain, Figueroa-Rodríguez & Sánchez-Mateo (2024) conducted a study on the exploration, perceptions, and cognition of herbal medicine among community pharmacists in Spain.

The studies conducted over the past decade have provided valuable findings and insights regarding the role of herbal medicines in pharmaceutical practice. While numerous studies have contributed valuable cognition, no comprehensive analysis has yet synthesized these findings to provide a broader global perspective. This meta-analysis study provides a comprehensive analysis by integrating these findings, thereby offering a clearer global overview of pharmacists' cognition, perceptions, and attitudes toward herbal medicines (Clarke *et al.*, 2015). The results of this meta-analysis are expected to serve as a strong scientific basis for developing policies and programs to enhance pharmacists' competencies and as an important

reference for future research in the field of herbal pharmacy.

METHODS

This qualitative meta-analysis approach synthesizes and analyzes findings from multiple primary studies that evaluated pharmacists' knowledge, attitudes, and practices regarding herbal medicines in community pharmacies. The researchers selected qualitative meta-analysis for its ability to integrate research findings from diverse geographic and cultural contexts, providing a more comprehensive understanding of the phenomenon. This approach enabled the identification of patterns, recurring themes, and relationships between variables while considering each study's specific context.

The analysis included seven cross-sectional studies published between 2014 and 2024, originating from five countries: Indonesia, Malaysia, Saudi Arabia, Spain, and the United States.

The researchers collected literature following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines (Page *et al.*, 2021) through a systematic search and selection process using major electronic databases: PubMed/MEDLINE (biomedical), Scopus (multidisciplinary peer-reviewed journals), Google Scholar (academic search engine), and Garuda (Indonesian scientific publication portal). They applied search strategies combining English keywords with Boolean operators, covering population ("pharmacist*" OR "community pharmacist*"), intervention/exposure ("herbal medicine*" OR "traditional medicine*" OR "phytomedicine*" OR "natural product*" OR "complementary medicine*"), outcome ("knowledge" OR "attitude*" OR "perception*" OR "practice*" OR "behavior*"), and setting ("community pharmacy" OR "retail pharmacy"). The employed search string was: (pharmacist* OR "community pharmacist*") AND ("herbal medicine*" OR "traditional medicine*" OR phytomedicine* OR "natural product*" OR "complementary medicine*") The search string also included the terms "knowledge, attitude, perception, practice, or behavior" and "community pharmacy" or "retail pharmacy". The search targeted publications from 2014 to 2024.

The inclusion criteria covered primary studies with cross-sectional, cohort, or experimental designs that involved pharmacists working in community pharmacies. Each study needed to assess at least one outcome variable

related to knowledge, attitudes/perceptions, or practices concerning herbal medicine. Eligible studies had to be conducted in community or retail pharmacy settings, published in peer-reviewed journals in English or Indonesian between 2014 and 2024, and provide extractable quantitative data. The researchers excluded reviews, meta-analyses, case reports, editorials, studies involving pharmacy students, hospital pharmacists, or other healthcare professionals as the primary population, studies irrelevant to the research focus, articles lacking complete quantitative data or clear methodology, non-English/Indonesian articles, and articles inaccessible in full text.

The study selection process followed the PRISMA 2020 guidelines, comprising identification, screening, eligibility, and inclusion stages. The initial search yielded 254 articles. After removing duplicates using reference manager software, the researchers screened 156 articles based on title and abstract relevance. Two independent reviewers performed the screening, resolving disagreements through discussion and consultation with a third reviewer. They assessed 24 full-text articles against the inclusion and exclusion criteria, with each exclusion reason documented. Ultimately, seven studies from five countries—Indonesia (2), Malaysia (1), Saudi Arabia (1), Spain (1), and the United States (2)—were included in the final analysis.

The researchers extracted data using a standardized form that recorded study characteristics (author, publication year, country, setting, study design, study period, and

research objectives); sample characteristics (sample size, sampling method, respondents' demographics such as age, gender, work experience, education, and inclusion/exclusion criteria); methodological aspects (data collection instruments, instrument validity and reliability, and statistical analysis methods); and key outcomes (pharmacists' knowledge of herbal medicines, attitudes and perceptions, practice patterns, information sources, and factors influencing knowledge, attitudes, and practices). Two independent reviewers extracted the data, resolving discrepancies through discussion and consensus, and compiled it in spreadsheet format for analysis.

The researchers assessed the methodological quality of each study using an adapted version of the Joanna Briggs Institute (JBI) Critical Appraisal Tools (Moola *et al.*, 2020) for cross-sectional studies, evaluating nine parameters: clarity of research objectives, appropriateness of the target population, suitability and representativeness of sampling methods, adequacy and justification of sample size, detailed description of subjects and setting, sufficient data analysis coverage, validity and reliability of data collection instruments, appropriateness of statistical methods, and adequacy and reporting of response rates. Each criterion was scored as Yes (1 point), No (0 points), Unclear (0 points), or Not Applicable (N/A), with total scores ranging from 0 to 9 points. Studies were classified as high quality (7–9 points), moderate quality (4–6 points), or low quality (0–3 points).

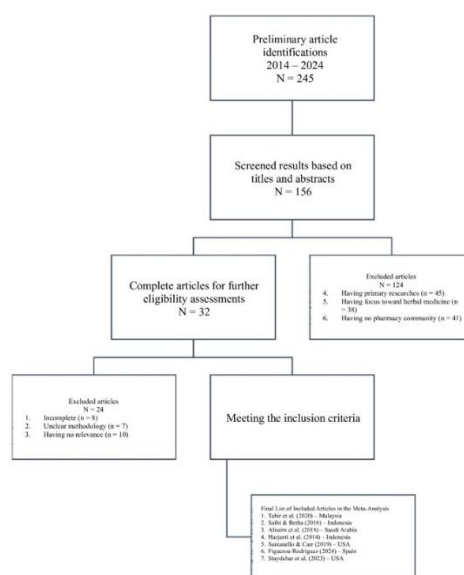


Diagram 1. The article screening diagram

Current review summarizes some related research.

1. Tahir *et al.* (2020) conducted a cross-sectional survey of 103 community pharmacists in Kedah, Malaysia, to assess their cognition and reporting of herbal medicine reactions. The study concluded that pharmacists had a relatively excellent level of cognition (68.5%) and a highly positive attitude (75.2%) toward herbal medicines. However, access to information sources remained limited (52.3%), indicating the need for better information systems to support the practice of herbal medicine services in Malaysian community pharmacies.
2. Saibi & Betha (2016) conducted interviews with 30 community pharmacists in East Ciputat, Indonesia, to examine the role of pharmacists in implementing pharmaceutical service standards. This study found that pharmacists in Indonesia exhibited the highest positive attitude (78.6%) toward herbal medicines, reflecting the strong influence of the traditional *jamu* and herbal medicine culture. However, cognition scores (62.3%) and access to information sources (45.8%) were relatively lower, suggesting the need to strengthen technical aspects and information infrastructure to support herbal medicine services in Indonesian community pharmacies.
3. Alnaim *et al.* (2018) conducted a cross-sectional survey of 507 pharmacists in Saudi Arabia, with 199 pharmacists (approximately 20%) completing the survey, to evaluate their cognition and attitudes toward herbal and complementary medicine. The study demonstrated a balanced level of cognition (65.8%) and a positive attitude (70.4%), with moderate access to information sources (58.6%). These findings reflect the growing integration of modern and traditional medicine in the Middle East. However, the low response rate highlights the need to increase awareness and pharmacist participation in developing herbal medicine services in Saudi Arabia.
4. Harjanti *et al.* (2014) conducted a survey of 60 pharmacists in Yogyakarta, Indonesia, to examine the relationship between cognition, perceived quality, and pharmacists' intention to recommend phytopharmaceuticals. The study found a positive correlation between pharmacists' cognition of phytopharmaceuticals and their intention to recommend them. Pharmacists' cognitive levels were influenced by practical experience and the availability of continuing education. This study concluded that enhancing pharmacists' cognition through continuous training is a key factor in increasing pharmacists' confidence in recommending phytopharmaceuticals to patients.
5. Santanello & Carr (2019) conducted an online survey of 183 pharmacists in the United States to assess their cognition, perceptions, and practices related to herbal medicines. The study revealed that pharmacists' cognition and confidence in handling herbal medicines were still limited, particularly regarding their interactions with conventional drugs. Although pharmacists acknowledged the importance of understanding herbal medicines due to their increasing use in the community, they rarely proactively inquired about and documented patients' use of herbal medicines. The study recommended improving continuing education, developing practical guidelines for patient counseling, and integrating herbal medicine content into pharmacy education curricula to optimize pharmaceutical services and ensure patient safety.
6. Figueroa-Rodríguez & Sánchez-Mateo (2024) conducted a descriptive cross-sectional study on 610 pharmacists working in community pharmacies in Tenerife, Spain, using a questionnaire covering demographic data, perceptions, professional practices, and cognition of herbal medicine. The study revealed that community pharmacists in Spain had a positive attitude toward herbal medicines but still faced cognition and practice limitations, particularly regarding herb-drug interactions. It also recommended enhancing professional training, improving documentation systems, and standardizing practice guidelines to improve the quality of pharmaceutical services related to herbal medicines.
7. Stayduhar *et al.* (2023) conducted a descriptive cross-sectional study using two questionnaires, one for 73 pharmacists and another for 92 pharmacy students in the United States. The questionnaires covered

demographics, attitudes/perceptions, educational experience, resource availability, and objective cognition of herbal supplements/natural products. The study found that both pharmacists and pharmacy students had limited cognition of herbal supplements and natural products. Although both groups recognized the importance of understanding these products, there remained significant gaps in practical cognition and confidence in providing counseling. The study also recommended increasing education on herbal supplements in pharmacy curricula and developing continuing education programs to enhance practitioners' competencies.

The researchers extracted data using standardized instruments that covered study characteristics (author, year, country, study design), sample size and characteristics, measured variables, main outcomes, and reported limitations. They evaluated each study's methodological quality based on criteria such as clarity of research objectives, appropriateness of sampling methods, validity of data collection instruments, and completeness of results reporting.

They conducted the qualitative meta-analysis using a thematic synthesis approach. This process began with familiarizing themselves with the data through repeated readings of all the included studies and identifying each study's key findings. They performed inductive coding by coding research findings line by line and generating initial codes directly from the empirical data. The researchers then developed descriptive themes by grouping similar codes and forming themes that represented primary study findings. They further developed analytical themes by interpreting descriptive themes to generate higher-level concepts and construct a new theoretical framework.

The analysis variables included pharmacists' knowledge of basic herbal medicine concepts, mechanisms of action, indications, interactions with conventional drugs, side effects, and identified knowledge gaps. The researchers analyzed attitudes and perceptions concerning the perceived effectiveness and safety of herbal medicines, pharmacists' willingness to integrate herbal products into practice, trust in evidence-based practice, and factors influencing these attitudes. They also evaluated practice variables, including

counseling frequency, documentation practices, product availability and sales, referrals to other healthcare providers, adverse event monitoring and reporting, and interprofessional collaboration.

The data analysis examined pharmacists' level of understanding of herbal medicines and information sources and identified knowledge gaps. It also assessed their perceptions of effectiveness and safety, willingness to counsel patients, factors influencing their attitudes, monitoring and reporting of adverse drug reactions, and collaboration with other healthcare professionals. The analysis focused on identifying patterns, recurring themes, and interrelationships between variables while considering each study's specific context.

The researchers ensured internal validity through strict and consistent selection criteria, data extraction by multiple reviewers, data verification through cross-checking, and systematic documentation of the research process. They enhanced external validity by including studies from diverse geographic and cultural settings, considering sample representativeness, and conducting sensitivity analyses to test the robustness of findings. Reliability strategies included using standardized protocols for study selection and data extraction, inter-rater reliability assessments for screening and extraction, triangulating findings through multiple data sources, and member checking with expert panels.

They identified potential biases, such as selection bias in primary study inclusion, publication bias due to the non-publication of negative findings, language bias from restricting articles to English and Indonesian, and cultural bias stemming from the dominance of studies from certain countries. To mitigate these biases, they conducted comprehensive searches across multiple databases, included relevant grey literature, applied systematic methodological quality assessments, and transparently reported study limitations.

The researchers acknowledged several limitations, including heterogeneity across studies due to differences in methodology, instruments, and populations; varying methodological quality; limited geographic and cultural representation; and possible selective reporting in primary studies.

As a secondary analysis of published data, the study did not require ethical clearance. Nevertheless, the researchers upheld research ethics by properly crediting original authors,

reporting findings accurately and objectively, maintaining transparency in methods and limitations, and considering the practical implications of the results. They reported their findings according to PRISMA 2020 for systematic reviews, ENTREQ for meta-ethnography and qualitative synthesis, and STROBE for relevant observational study elements, presenting the results narratively with supporting tables and diagrams to clarify outcomes and facilitate interpretation.

RESULTS AND DISCUSSION

The meta-analysis integrated and examined seven cross-sectional journals that focused on evaluating pharmacists' knowledge, perceptions, and attitudes toward herbal medicines in five countries—Indonesia, Spain, Saudi Arabia, Malaysia, and the United States—over the period of 2014–2024. This analysis provided in-depth insights into the dynamics of herbal-based pharmaceutical services across diverse global contexts. The total number of respondents reached 1,255 community

pharmacists, which gave the findings a high level of significance. The included studies reported varying response rates, ranging from the lowest at 39.2% (Alnaim *et al.*, 2018) to the highest at 100% (Saibi & Betha, 2016), with an average response rate of approximately 61.7%. The analysis yielded Table 1.

The demographic profile of respondents in this meta-analysis reflected a representative diversity of the global community pharmacist population. Most respondents fell within the productive age range of 24 to 68 years, with the majority concentrated in the 25–35 age group. From a gender perspective, female pharmacists tended to dominate, comprising 45% to 68% of participants, with an average of 58%. This trend mirrors the feminization of the pharmacy profession observed in many countries (Alnaim *et al.*, 2018; Saibi & Betha, 2016). Respondents' years of practice ranged from 1 to 40 years, with an average of 10.8 years, indicating a mix of both experienced and relatively new pharmacists in the field.

Table 1. The characteristics of the analyzed study

Authors (Years)	Countries	Research Designs	Respondents	Data Collection Technique	Response Rate (%)
Harjanti <i>et al.</i> (2014)	Indonesia	Cross-sectional	150 community pharmacists	Survey	85
Saibi & Betha (2016)	Indonesia	Cross-sectional	31 community pharmacists	Interview	100
Alnaim <i>et al.</i> (2018)	Saudi Arabia	Cross-sectional	31 community pharmacists	Survey	39.2
Harjanti <i>et al.</i> (2014)	Indonesia	Cross-sectional	234 community pharmacists	Survey	75
Santanello & Carr (2019)	The United States	Cross-sectional	268 community pharmacists	Survey online	45.7
Figuerola-Rodriguez & Sanches-Mateo (2024)	Spain	Cross-sectional	610 community pharmacists	Survey	82
Stayduhar <i>et al.</i> (2023)	The United States	Cross-sectional	73 pharmacists and 92 pharmaceutical students	Survey online	58

Table 2. The characteristics of respondent demography

Authors (years)	Sample size	Age (years old)	Sex types (%female)	Years of service (Years)	Educational levels (% S1/S2/S3)
Harjanti <i>et al.</i> (2014)	60	25-45 (averagely 32)	62%	1-20 (averagely 8.5)	60/0/0
Saibi & Betha (2016)	30	24-50 (averagely 30)	68%	1-15 (averagely 6.4)	30/0/0
Alnaim <i>et al.</i> (2018)	199	23-58 (averagely 35)	53%	1-30 (averagely 10.5)	157/39/3
Santanello & Carr (2019)	183	25-65 (averagely 42)	58%	2-35 (averagely 14.6)	142/43/2
Tahir <i>et al.</i> (2020)	103	24-55 (averagely 34)	45%	1-25 (averagely 9.2)	75/26/2
Stayduhar <i>et al.</i> (2023)	73	25-68 (averagely 40)	56%	1-40 (averagely 13.8)	58/15/2
Figuerola-Rodríguez & Sánchez-Mateo (2024)	310	24-62 (averagely 38)	61%	1-38 (averagely 12.3)	272/36/2

Based on Indonesia regulation concerning the implementation of pharmacovigilance, it regulates the implementation of pharmacovigilance activities in pharmaceutical industries. However, there is one part in the regulation that mentions about how the pharmacovigilance process is in the healthcare facility. Due to that regulation, this study involved all health professionals, both in healthcare facilities and pharmaceutical companies. By the end of the study, the result shows that the percentage of pharmacists as respondents is higher than other healthcare professionals, about 76%. This is due to the fact that the pharmacist's scope of work is wider than other healthcare professionals and is always related to the administration process of medication. The pharmacist may work in any of the following 6 (six) fields: pharmacy, *Puskesmas*, clinic, hospital, pharmaceutical industry, and drug distributor.

In terms of formal education, over 90% of respondents held a Bachelor of Pharmacy (pharmacist) degree, while only 15–30% pursued higher education (master's or doctoral degrees). Less than 25% of pharmacists reported having received specialized training in herbal medicine. This finding highlights a significant gap in formal pharmacy education concerning herbal treatments, which likely contributes to variations in pharmacists' knowledge and confidence in related practice. This gap becomes even more critical given pharmacists' key role as

gatekeepers of drug information in the community, where they are expected to provide comprehensive, evidence-based counseling on all aspects of drug therapy, including the increasingly popular herbal products.

The Cognition of Pharmacists

A comprehensive analysis of pharmacists' knowledge revealed a consistent yet concerning pattern across all evaluated aspects. Overall, pharmacists demonstrated low to moderate knowledge levels, with very few reaching high levels. This finding is particularly significant given pharmacists' role as trusted sources of drug information for the public. The weakest area was knowledge of interactions between herbal and conventional medicines; no country reported moderate or high knowledge in this domain, with scores ranging from 32% to 48%. This scenario poses serious patient safety risks due to the potential for harmful interactions when patients use herbal and conventional medicines concurrently. Table 3 presents the pharmacists' knowledge levels on herbal medicines.

The research findings based on the table

The weakest knowledge areas involved drug interactions and side effects, with all studies reporting low scores (<50%), except for the Spanish study, which showed a moderate score for side effects. The strongest knowledge areas included indications and contraindications, with

Table 3. The Cognitive Levels of the Pharmacists about Herbal Medicine

Cognition	Harjanti <i>et al.</i> (2014)	Saibi & Betha (2016)	Alnaim <i>et al.</i> (2018)	Santanello & Carr (2019)	Tahir <i>et al.</i> (2020)	Stayduhar <i>et al.</i> (2023)	Figuroa-Rodríguez & Sánchez-Mateo (2024)
Mechanism of action	Moderate (65%)	Low (42%)	Moderate (60%)	Low (38%)	Moderate (55%)	Moderate (68%)	Low (48%)
Drug interaction	Low (38%)	Low (35%)	Low (40%)	Low (32%)	Low (45%)	Low (48%)	Low (42%)
Consumption safety	Moderate (58%)	Moderate (52%)	Moderate (62%)	Low (45%)	Moderate (60%)	Moderate (65%)	Moderate (53%)
Clinical effectiveness	Moderate (55%)	Low (48%)	Moderate (58%)	Low (40%)	Low (47%)	Moderate (63%)	Low (46%)
Standardized regulation	Moderate (57%)	Low (45%)	Low (48%)	Low (42%)	Moderate (56%)	Moderate (62%)	Moderate (52%)

Assessment Criteria:

- Low: <50% correct answers.
- Moderate: 50–75% correct answers
- High: >75% correct answers

Table 4. The Mean Scores of Pharmacists' Cognitive Levels Dealing with Herbal Medicine

Cognitive Aspect	Mean Score (1-5 scale)
Mechanism of action	2.8
Drug interaction	3.1
Consumption safety	3.4
Clinical effectiveness	3.9
Standardized regulation	3.7

two studies even reporting high knowledge levels (>75%). Geographical variation emerged, with studies from Indonesia and Spain showing higher knowledge scores, while the study from Saudi Arabia reported the lowest scores.

Further analysis based on average scores on a 1–5 scale showed that knowledge of clinical effectiveness ranked highest (3.9), followed by understanding of regulations and standards (3.7) and safety of use (3.4). In contrast, knowledge of drug interactions (3.1) and mechanisms of action (2.8) ranked lowest. These significant knowledge gaps in technical areas are critical for ensuring safe clinical practice. Geographic differences were also apparent: studies from Indonesia and Spain reported relatively higher scores compared to those from Saudi Arabia and the United States. These variations likely reflect differences in pharmacy curricula, the extent of herbal medicine use in daily practice, and cultural influences on the acceptance of

traditional medicine. Table 4 presents the detailed knowledge levels of pharmacists across various aspects.

A deeply concerning finding emerged from the consistently low scores in pharmacists' knowledge of interactions between herbal and conventional medicines across all analyzed studies. None of the countries demonstrated moderate or high knowledge levels in this area, with scores ranging from 32% to 48%. This situation poses serious implications for patient safety, given the potential for harmful interactions when patients use herbal and conventional medicines simultaneously (Alnaim *et al.*, 2018; Figuroa-Rodríguez & Sánchez-Mateo, 2024; Harjanti *et al.*, 2014).

Geographic variation also clearly appeared in these knowledge patterns. Studies from Indonesia (Harjanti *et al.*, 2014) and Spain

Table 5. Pharmacists' Perceptions and Attitudes Toward Herbal Medicines

No	Authors (years)	Positive perceptions toward safety	Positive perceptions toward effectiveness	Doubt against standardization	Willingness to provide counselling	Lack of self-confidence while giving counseling
1	Harjanti <i>et al.</i> (2014)	Yes—most respondents considered phytopharmaceuticals safe.	Yes—most respondents believed herbal medicines are effective.	Yes—respondents expressed concern about product quality standards	Yes—they were willing to provide counselling.	Yes—some respondents felt unsure of themselves.
2	Tahir <i>et al.</i> (2020)	Yes—pharmacists' knowledge positively influenced their perception of safety.	Yes—although some doubts remained, the majority trusted their efficacy.	Yes—they raised issues regarding regulation and quality.	Yes—they expressed a desire to provide information if adequate data were available.	Yes—their lack of training caused self-doubt.
3	Saibi & Betha (2016)	Yes—although not stated explicitly, respondents tended to view herbal medicines as safe.	Yes—they expressed belief in effectiveness when supported by scientific evidence.	Yes—they worried about the quality of herbal products.	Yes—they considered counseling part of standard service.	The topic was not specifically addressed.
4	Alnaim <i>et al.</i> (2018)	Yes—they expressed trust in the general safety of CAM (complementary and alternative medicine).	Yes—most agreed that CAM is effective.	Yes—they mentioned concerns over standardization.	Yes—they showed interest in counseling.	Yes—they felt inadequately trained.
5	Santanello & Carr (2019)	Yes—pharmacists showed positive perceptions toward herbal medicine safety.	Yes—they believed herbal medicines can be effective.	Yes—most respondents doubted the consistency of herbal products.	Yes—they were willing to counsel if requested.	Yes—many felt uncertain due to insufficient training.
6	Figuroa-Rodríguez & Sánchez-Mateo (2024)	Yes—the majority stated that herbal medicines are safe.	Yes—they believed in effectiveness provided there is sufficient evidence.	Yes—they highlighted the lack of regulation.	Yes—they supported patient education.	Yes—they felt the need for additional training.
7	Stayduhar <i>et al.</i> (2023)	Yes—respondents generally perceived herbal medicines as safe.	Yes—although some remained skeptical	Yes—they considered standardization a major issue in practice.	Yes—both pharmacists and students were willing to provide information.	Yes—pharmacy students reported greater self-doubt than practicing pharmacists

(Figueroa-Rodríguez & Sánchez-Mateo, 2024) reported relatively higher scores, particularly in understanding mechanisms of action and safety of use. In contrast, studies from Saudi Arabia (Alnaim *et al.*, 2018) and the United States (Santanello & Carr, 2019) showed lower scores in several areas. These differences likely stem from variations in national pharmacy education curricula, the extent to which herbal medicines are integrated into daily clinical practice, and cultural influences on the acceptance of traditional treatments.

Pharmacists' Perceptions and Attitudes

An in-depth analysis of pharmacists' perceptions and attitudes revealed a complex, multifaceted picture. Overall, 72% of pharmacists expressed positive perceptions of herbal medicine safety, and 68% believed in its effectiveness. However, 59% voiced concerns about standardization and quality control. These findings reflect a professional duality: while pharmacists recognize the therapeutic potential of herbal medicines, they remain deeply concerned about the consistency and quality of products on the market.

Meta-analysis data from the reviewed journals show that most pharmacists hold positive views regarding the safety and effectiveness of herbal medicines, even though they express concerns about standardization and regulation (Harjanti *et al.*, 2014; Alnaim *et al.*, 2018; Figueroa-Rodríguez & Sánchez-Mateo, 2024). The majority of pharmacists also expressed willingness to provide counseling and recommendations on herbal medicine use; however, they admitted feeling a lack of confidence in doing so. Cultural background, exposure to information, and personal experience with herbal medicine significantly shaped their perceptions and attitudes.

Most pharmacists (72%) reported a positive perception of herbal medicine safety, while 68% believed in its effectiveness. Nevertheless, 59% of respondents expressed doubts about standardization and quality

control. Cultural values and personal use experience played a notable role in shaping these views. Table 6 summarizes the distribution of pharmacists' perceptions and attitudes.

Pharmacists' willingness to provide counseling on herbal medicines reached a notably high proportion (81%), reflecting their recognition of their professional role as comprehensive sources of drug-related information (Harjanti *et al.*, 2014; Alnaim *et al.*, 2018). However, a contradictory finding reveals that 43% of pharmacists admitted to lacking confidence when delivering such counseling. This discrepancy highlights the "willingness-capacity gap"—a disconnect between readiness and capability—which likely stems from limited formal training and practical experience.

Multiple complex and interrelated factors influence the development of these perceptions and attitudes. Cultural background plays a significant role, with countries that possess strong herbal medicine traditions, such as Indonesia and Malaysia, exhibiting more positive perceptions (Saibi & Betha, 2016). Access to up-to-date scientific information also contributes, as exposure to evidence-based literature correlates with more critical yet appreciative attitudes. Equally important, pharmacists' personal experiences with herbal medicine consumption shape their professional perceptions and attitudes, as revealed in several of the analyzed studies.

Pharmaceutical Service Practices Related to Herbal Medicine

In practice, a significant gap exists between normative ideals and actual implementation. Although most pharmacists expressed willingness to provide herbal medicine services, only 36% routinely offered counseling—far lower than the 81% who reported desire. Several factors contributed to this implementation gap, including limited knowledge, safety concerns, and lack of confidence. Table 7 presents an overview of pharmacists' service practices.

Table 6. Summary of Pharmacists' Perception and Attitude Percentages

Indicators	Pharmacists' Percentages
Positive perceptions toward safety	72%
Positive perceptions toward safety	68%
Positive perceptions toward safety	59%
Positive perceptions toward safety	81%
Positive perceptions toward safety	43%

Table 7. Pharmacists' Service Practices Toward Herbal Medicine

No	Authors (years)	Counseling of herbal medicine	Monitoring the side effects	Reporting the side effects	Collaborating with other health workers
1	Harjanti <i>et al.</i> (2014)	Yes—pharmacists provided counseling when requested	Not mentioned	Not mentioned	Not mentioned
2	Tahir <i>et al.</i> (2020)	Yes—pharmacists offered counseling when needed.	Yes—they acknowledged the importance of monitoring side effects.	Yes—they reported low levels of adverse effect reporting.	Not mentioned
3	Saibi & Betha (2016)	Yes—they considered counseling a part of standard service.	Not mentioned	Not mentioned	Yes—they collaborated in pharmaceutical services.
4	Alnaim <i>et al.</i> (2018)	Yes—they expressed willingness to counsel on CAM.	Not mentioned	Not mentioned	Not mentioned
5	Santanello & Carr (2019)	Yes—pharmacists actively engaged in patient education.	Yes—some monitored side effects	Not all pharmacists reported side effects.	Yes—respondents recognized the need for collaboration
6	Figueroa-Rodríguez & Sánchez-Mateo (2024)	Yes—the majority provided counseling.	Yes—some monitored side effects	Yes—reporting remained limited.	Yes—they supported interprofessional collaboration
7	Stayduhar <i>et al.</i> (2023)	Yes—especially among practicing pharmacists.	Yes—they recognized its importance but had not optimized it.	Yes—reporting was conducted but remained limited	Not mentioned

In practice, pharmacists still infrequently provide counseling and recommendations regarding herbal medicine, mainly due to limited knowledge and doubts about its safety. Pharmacists also rarely conduct monitoring and reporting of herbal medicine side effects, largely because they lack understanding of the mechanisms involved and face limitations in the existing reporting systems. Furthermore, pharmacists need to enhance their collaboration with other healthcare professionals, such as physicians, in managing herbal medicine use. Only 36% of pharmacists routinely provide counseling on herbal medicine—significantly

lower than the 81% who express willingness to do so. This implementation gap stems from several factors, including limited knowledge, safety concerns, and a lack of self-confidence, as previously discussed. Table 8 presents a summary of pharmacists' service practices.

The monitoring and reporting of side effects related to herbal medicine are performed very rarely, which indicates a weak pharmacovigilance system for these products. In fact, monitoring plays a vital role in ensuring the long-term safety of herbal medicine use. This limitation primarily results from the lack of standardized reporting systems and pharmacist'

Table 8. Summary of Pharmacists' Service Practices

Practice Indicators	Percentage/Frequency
Provision of herbal medicine counselling	36% pharmacists did
Monitoring of side effects	Rarely done
Reporting of side effects	Rarely done
Collaboration with other healthcare professionals	Needs improvement

Table 9. The Barriers in Herbal Medicine Service Practice

No	Authors (Years)	Lack of formal training	Limited Evidence-based Information Access	Limited counselling time	Unstandardized documentation system	Lack of confidence	Limited regulation
1	Harjanti <i>et al.</i> (2014)	Yes—pharmacists need more training.	Yes—scientific references remain limited.	Not mentioned	Not mentioned	Yes—some feel unsure.	Yes—regulation remains weak.
2	Tahir <i>et al.</i> (2020)	Yes—pharmacists receive minimal herbal training.	Yes—scientific information remains scarce.	Yes—time becomes a constraint.	Not mentioned	Yes—low self-confidence.	Yes—regulations remain unclear.
3	Saibi & Betha (2016)	Not mentioned	Not mentioned	Yes—pharmacies face time limitations.	Not mentioned	Not mentioned	Not mentioned
4	Alnaim <i>et al.</i> (2018)	Yes—pharmacists need formal training.	Yes—information remains hard to access.	Yes—pharmacists have limited time.	Not mentioned	Yes—pharmacists lack confidence.	Yes—policy remains weak.
5	Santanello & Carr (2019)	Yes—training remains insufficient.	Yes—scientific references are lacking.	Yes—time becomes the main constraint.	Yes—documentation remains inconsistent.	Yes—pharmacists feel uncertain.	Yes—regulatory standards remain lacking.
6	Figueroa-Rodríguez & Sánchez-Mateo (2024)	Yes—pharmacists require further training.	Yes—pharmacists have limited access to evidence-based info.	Yes—actual time constraints exist.	Yes—recordkeeping systems lack standardization.	Yes—pharmacists need confidence training.	Yes—regulation is deemed inadequate.
7	Stayduhar <i>et al.</i> (2023)	Yes—students are not adequately trained.	Yes—difficulty accessing scientific sources	Yes—pharmacists report time limitations.	Yes—no standard documentation exists.	Yes—students express more hesitation.	Yes—policies remain incomplete.

limited knowledge of the mechanisms behind herbal side effects.

Interprofessional collaboration among healthcare professionals for managing herbal therapy still requires significant improvement. Several analyzed research papers emphasize the value of a multidisciplinary team approach to optimize benefits and minimize the risks of herbal medicine use, yet actual implementation remains limited. Factors such as poor communication, differences in professional paradigms, and the lack of formal structures for collaboration contribute to this limitation.

Barriers in Herbal Medicine Service Practice

An analysis of seven studies involving 1,255 community pharmacists across five countries identified several major barriers, categorized into knowledge and competency barriers, system and facility barriers, and time and workload barriers. Lack of formal training emerged as the most frequently reported obstacle (75.8% of respondents), reflecting the limited coverage of herbal medicine in formal pharmacy curricula. Limited access to evidence-based information affected 55.3% of respondents, including the absence of integrated herbal medicine databases (82.3%), unstandardized documentation systems (45.2%), and a lack of standardized practice guidelines (68.9%). Table 9 presents the barriers to herbal medicine service practice.

Lack of formal training ranked as the most frequently reported barrier, with 75.8% of respondents identifying it as a primary constraint. This knowledge gap reflects the minimal inclusion of herbal medicine education in formal pharmacy curricula. Only 25% of respondents reported having received any specific training in herbal medicine. This knowledge gap particularly relates to

1. Drug-herbal interactions (knowledge score: 30–55%)
2. Regulation and standardization of herbal products (understanding: 45–60%)
3. Evidence-based practice in herbal medicine use (familiarity: 25–45%)

As many as 55.3% of respondents reported limited access to evidence-based sources as a significant barrier. More specifically, system-related barriers included:

- The absence of an integrated herbal medicine database (82.3%)
- Unstandardized documentation systems (45.2%)
- Inadequate regulatory frameworks (38.9%)
- Lack of standardized practice guidelines (68.9%)

The meta-analysis of the aforementioned journals revealed that 42.7% of pharmacists encountered psychological barriers, primarily a lack of confidence in providing herbal medicine counseling. This phenomenon stems from several interrelated factors. First, pharmacists face uncertainty in evaluating the effectiveness and safety profiles of herbal products due to limited scientific evidence and product standardization variability. Second, they express deep concerns about their professional responsibility, especially regarding safe and appropriate herbal medicine recommendations. Third, their lack of practical experience in handling herbal-related cases restricts their ability to deliver comprehensive and evidence-based counseling. These factors create a reinforcing loop: limited practical experience increases uncertainty, which in turn undermines daily professional confidence.

Cross-country comparative analysis revealed striking differences in the barriers faced by community pharmacists. In developing countries, the main challenges revolve around limited access to reliable information sources and the lack of comprehensive training opportunities. In contrast, pharmacists in developed nations face time management issues and documentation system complexity. Meanwhile, countries with strong traditional herbal medicine roots—such as several Asian nations—report regulatory constraints as more prominent, reflecting the complexity of integrating traditional practices with modern pharmaceutical standards.

Temporal analysis of recent studies (2020–2024) highlights an evolving urgency across three crucial areas. First, the need for integrated digital information systems has grown in line with pharmacy's digitalization. Second, the standardization of documentation has become a critical priority to ensure consistency and quality in service. Third, the demand for structured continuing professional development programs is rising, showing increased awareness of the need for sustained competency updates.

Identifying these barriers offers fundamental implications for the future development of community pharmacy practice. These findings indicate the need for a systematic and integrated approach to designing interventions aimed at improving herbal medicine services in community pharmacies (12). A comprehensive strategy is needed—one that not only enhances individual pharmacists' competencies but also strengthens supporting infrastructure and harmonizes relevant regulations. Table 10 summarizes barrier frequency and ranking in herbal medicine service practice.

Development Needs in Herbal Medicine Services

A meta-analysis of seven studies involving 1,255 community pharmacists revealed a complex and interconnected spectrum of development needs in efforts to improve the quality of herbal medicine services. These findings reflect the dynamic shifts in community pharmacy practice and the growing demand for evidence-based services. Table 11 overviews the development needs in herbal medicine services.

In the area of professional competency development, strong support (85.6%) for continuous training programs reflects a collective awareness of the importance of updating knowledge and skills. Pharmacists

expressed the need for structured training programs that cover not only theoretical aspects of herbal medicine but also practical components such as case management, therapy effectiveness evaluation, and effective counseling skills. They considered the integration of case studies and experiential learning essential to bridge the gap between theoretical knowledge and practical application.

In the dimension of information technology, 82.3% of respondents emphasized the urgency of developing an integrated herbal medicine database. They expected this information system to serve not only as a knowledge repository but also as a dynamic platform to support clinical decision-making. Features such as herbal-drug interaction alert systems, standardized documentation templates, and adverse effect reporting systems were viewed as vital for enhancing the safety and effectiveness of services.

Service standardization emerged as a strategic priority, supported by 75.4% of respondents. This need reflects a growing awareness of the importance of consistency and predictability in herbal medicine services. Pharmacists viewed standardized protocols—from patient screening to therapy outcome monitoring—as critical foundations for ensuring consistent and measurable service quality.

Pharmacists also gave strong support (68.9%) to the development of national regulations and guidelines, reflecting the need for a clear and structured framework. They highlighted the importance of comprehensive practice guidelines that include minimum service standards, safety protocols, and measurable performance indicators. Pharmacists considered a strong regulatory framework essential for providing legitimacy and structure to herbal medicine practice.

Although support was more moderate (55.2%), pharmacists viewed specific certification programs as important tools in professional development.

Table 10. Frequency and Ranking of Barriers in Practice

Barriers	Frequency (%)	Ranks
Lack of formal training	75.81	1
Limited evidence-based information access	55.32	2
Limited counselling time	48.63	3
Unstandardized documentation system	45.24	4
Lack of confidence	42.75	5
Limited regulation	38.96	6

Table 11. Development Needs in Herbal Medicine Services

No	Authors (years)	Sustainable training	Integrated herbal medicine database	Standardized service	Standardized documentation system	National guideline development	Specific certification program
1	Harjanti <i>et al.</i> (2014)	Yes—pharmacists conduct training to improve recommendations.	Not mentioned	Yes—pharmacists provide standardized phytopharmaceutical services.	Not mentioned	Yes—practical guidelines are needed.	Not mentioned
2	Tahir <i>et al.</i> (2020)	Yes—pharmacists urgently need training.	Yes—pharmacists need an information and reporting system.	Not mentioned	Not mentioned	Yes—pharmacists recognize the importance of official guidelines.	Not mentioned
3	Saibi & Betha (2016)	Yes—pharmacists receive training to support service standards.	Not mentioned	Yes—pharmacists include it as part of pharmaceutical care standards.	Not mentioned	Not mentioned	Not mentioned
4	Alnaim <i>et al.</i> (2018)	Yes—pharmacists need CAM-related training.	Yes—pharmacists believe data access supports services.	Yes—pharmacists report the need for service protocols.	Yes—pharmacists require clear documentation.	Yes—pharmacists call for national policy.	Yes—pharmacists propose CAM-related certification.
5	Santanello & Carr (2019)	Yes—pharmacists consider current training insufficient.	Yes—pharmacists require integrated references.	Yes—pharmacists need standardized counseling.	Yes—pharmacists report inconsistent documentation.	Yes—pharmacists report that guidelines are unavailable.	Not mentioned
6	Figueroa-Rodríguez & Sánchez-Mateo (2024)	Yes—pharmacists highly desire advanced training.	Yes—pharmacists consider integrated information systems essential.	Yes—pharmacists recognize the need for service guidelines.	Yes—pharmacists report the absence of standardized documentation.	Yes—pharmacists call for regulations from authorities.	Yes—pharmacists consider certification an added value.
7	Stayduhar <i>et al.</i> (2023)	Yes—pharmacists and students find it important.	Yes—pharmacists require data access.	Yes—pharmacists recommend national standards.	Yes—pharmacists observe unstruct	Yes—pharmacists seek support through	Yes—pharmacists suggest certified

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Table 12. Priority Development Areas

Development areas	Priority	Support percentage (%)
Sustainable training	High	85.6
Integrated herbal medicine database	High	82.3
Standardized service	Moderate	75.4
Standardized documentation system	Moderate	72.8
National guideline development	Moderate	68.9
Specific certification program	Low	55.2

Table 13. Cross-Country Comparison

Countries	Cognitive score (%)	Positive attitude (%)	Information Source Access (%)
Malaysia	68.5	75.2	52.3
Indonesia	62.3	78.6	45.8
Saudi Arabia	65.8	70.4	58.6
The United States	71.2	68.9	62.4
Spain	69.4	72.8	60.2

They perceived certification not only as a mechanism to standardize competencies but also as a pathway for career development that can promote specialization and excellence in herbal medicine practice.

These findings have wide-ranging effects across education, professional practice, and regulation. In education, the results underscore the need to revise curricula and develop continuing education programs that are responsive to real-world practice demands. In professional practice, the findings highlight the urgency of developing robust documentation systems and effective evaluation mechanisms. In terms of regulation, the results point to the importance of establishing a comprehensive legal framework and an effective monitoring system.

Overall, the identification of these development needs provides a strong empirical foundation for designing holistic and sustainable strategies to improve the quality of herbal medicine services in community pharmacies. Table 12 presents a summary of priority development areas in herbal medicine service delivery.

Cross-Country Comparison

The cross-country comparison of herbal medicine services reveals intriguing and

significant variations across multiple aspects. From the data analysis of five studied countries (Malaysia, Indonesia, Saudi Arabia, the United States, and Spain), the results identified both differences and similarities that reflect each country's unique healthcare system and pharmaceutical culture.

In Malaysia, pharmacists demonstrated a fairly strong level of knowledge (68.5%) and a highly positive attitude (75.2%) toward herbal medicines. This result likely reflects the deep-rooted tradition of herbal medicine in the local culture. However, access to information sources remained relatively limited (52.3%), highlighting a gap in supporting infrastructure.

Indonesia displayed a unique profile, with the highest positive attitude toward herbal medicines (78.6%), reflecting the rich heritage of *jamu* and traditional medicine. Nevertheless, the knowledge score (62.3%) and access to information sources (45.8%) were relatively lower, indicating a need to strengthen technical capacity and infrastructure.

Saudi Arabia showed a balanced profile between knowledge (65.8%) and positive attitude (70.4%), with moderate access to information (58.6%). This position reflects a growing integration of modern and traditional medicine in the Middle East region.

The United States recorded the highest knowledge score (71.2%) and the best access to information (62.4%), yet exhibited a relatively lower positive attitude (68.9%) toward herbal medicines. This outcome may reflect a more evidence-based approach in pharmaceutical practice.

Spain showed a well-balanced profile across all aspects, with a knowledge score of 69.4%, a positive attitude of 72.8%, and access to information sources at 60.2%, indicating an integrated approach to herbal medicine service delivery.

These differences provide helpful details about how culture, healthcare systems, and infrastructure influence herbal medicine service practices in community pharmacies. Developing strategies tailored to the specific local context of each country requires an understanding of these distinctions. Table 13 presents the comparative overview across countries.

Implications and Recommendations

The meta-analysis of seven studies involving 1,255 community pharmacists across five countries led to the formulation of the following implications and recommendations to improve the quality of herbal medicine services in community pharmacies:

1. Giving priority to pharmacist competency development due to their limited understanding of herbal drug mechanisms (mean score 2.8/5) and drug interactions (3.1/5). Strengthening the pharmacy curriculum, developing structured continuing education programs, and establishing specialized certification systems for herbal pharmacy represent key strategic actions.
2. Developing an integrated national herbal medicine information and documentation database, as 55.32% of pharmacists reported limited access to evidence-based information. This system should include standardized documentation mechanisms and integrated adverse effect reporting systems.
3. Prioritizing the development of comprehensive national practice guidelines and harmonize service standards across countries to ensure consistency in service quality. Strengthen regulations and practice standards to address the uncertainty in practice, which 38.96% of respondents reported.
4. Enhancing interprofessional collaboration through the establishment of

communication forums among healthcare workers and the development of an integrated referral system. This recommendation is important, as 42.75% of pharmacists reported a lack of confidence in providing counseling.

5. Focusing research and development on international multicenter studies and the development of an evidence-based database to support clinical decision-making. Implementing these recommendations requires support from multiple stakeholders—including educational institutions, professional organizations, regulators, and the government—as well as continuous evaluation to ensure the effectiveness of the implemented interventions.

Contributions and Limitations

This study provides a significant contribution to developing more comprehensive and responsible pharmaceutical practices in managing herbal medicine. The findings point out the need for multifactorial interventions to enhance pharmacist capacity—from strengthening educational curricula and providing continuing education to optimizing reporting systems and interprofessional collaboration. In addition, community education and outreach efforts also constitute crucial aspects that require attention. Empowering consumers with accurate information about the safe and responsible use of herbal medicine can encourage healthier consumption patterns and contribute to the success of pharmacist capacity-building interventions.

The analysis of what skills need to be developed found three main areas to focus on: training about how herbal medicines interact with conventional drugs (84% of respondents), systems for monitoring side effects (76%), and standardizing herbal products (71%). These findings remained consistent across all three countries studied, despite variations in regulatory systems and pharmaceutical practices.

This study also has several limitations, such as methodological heterogeneity among the reviewed studies, differences in geographic and cultural contexts, and variations in operational definitions of the variables used. While efforts have been made to minimize bias and enhance the validity of results, interpreting the findings must still consider these limiting factors.

Overall, this meta-analysis provides a strong empirical foundation for policy

development and human resource capacity-building programs in pharmacy. These findings also offer a valuable reference for future research on comprehensive, patient-centered herbal medicine service delivery.

CONCLUSIONS

A meta-analysis of seven cross-sectional studies involving 1,255 community pharmacists in Indonesia, Spain, Saudi Arabia, Malaysia, and the United States (2014–2024) provides strong empirical evidence on the current status of pharmacists' knowledge, perceptions, attitudes, and practices related to herbal medicines. These comprehensive findings reveal a significant gap between pharmacists' ideal roles and their actual performance in herbal medicine services at community pharmacies.

Pharmacists' knowledge of herbal medicines generally falls within a low to moderate range, with the weakest areas being drug interactions (average score 3.1 out of 5) and mechanisms of action (average score 2.8). This knowledge gap poses serious risks due to potential interactions between herbal and conventional medicines. Despite these gaps, most pharmacists (72%) hold positive perceptions of herbal medicine safety, and 68% believe in its effectiveness, indicating an awareness of the therapeutic potential of herbal treatments in pharmacy practice.

The analysis identifies a "willingness-capacity gap." While 81% of pharmacists expressed willingness to counsel patients on herbal medicines, only 36% actually provide such counseling. Limited knowledge and a lack of formal training undermine their confidence (43%), contributing to this gap. The main barriers to herbal medicine services include insufficient formal training (75.8%), limited access to evidence-based information (55.3%), and limited counseling time (48.6%), reflecting the complex challenges pharmacists face in delivering optimal herbal medicine services.

The competency development needs analysis highlights three priority areas across the countries studied: training on herbal-conventional drug interactions (84% of respondents), adverse event monitoring systems (76%), and herbal product standardization (71%). These priorities underscore the urgent need to strengthen capacity and support systems. Variations across countries in knowledge, attitudes, and access to information reflect the influence of socio-cultural contexts and national healthcare systems on herbal medicine practice. Indonesia shows the most

positive attitudes (78.6%) but the lowest access to information (45.8%).

These findings point out the need for comprehensive interventions to strengthen pharmacists' capacity in handling herbal medicines, including:

1. Strengthening pharmacy education curricula with a focus on practical aspects of herbal medicine management.
2. Providing structured, evidence-based continuing education programs.
3. Developing standardized systems for adverse event monitoring and reporting.
4. Enhancing interprofessional collaboration in herbal medicine management.
5. Educating the public on the safe and responsible use of herbal medicines.

Effective implementation of these measures requires supportive policies and commitment from various stakeholders. Enhancing pharmacists' competencies in herbal medicine will not only improve pharmacy service quality but also promote safer and more rational use of herbal medicines in the community.

This meta-analysis also identifies areas for further research, including evaluating the effectiveness of various training methods, developing standardized adverse event monitoring instruments, and studying the implementation of competency development programs across diverse healthcare systems. These findings provide an empirical foundation for policies and programs aimed at strengthening pharmacists' roles in optimizing herbal medicine use in the community.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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