

Original Article

Knowledge, Attitudes, and Practices of Community Pharmacists Regarding Herbal Medicines in Sulaimani City

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ABSTRACT

Herbal medicines are widely used for primary healthcare globally, yet their safe use requires proper knowledge, regulation, and professional guidance. As accessible healthcare professionals, community pharmacists are in a key position to ensure safe and effective use of herbal products. This study aimed to assess the knowledge, attitudes, and practices (KAP) of community pharmacists in Sulaimani city, Iraq, regarding herbal medicines, and to identify gaps in training and information sources. A descriptive, cross-sectional survey was conducted among 138 licensed community pharmacists in Sulaimani city using a structured, self-administered online questionnaire. The survey gathered data on demographics, knowledge, attitudes, and practices related to herbal medicines. Descriptive statistics were used to summarize the responses. Among 138 pharmacists, most were female (68.1%), aged 25–34 years (61.6%), and had 1–5 years' experience (50.7%). Knowledge of herbal medicines and their potential side effects was high (>94%), and 84.1% recognized herb–drug interactions, yet only 16.7% knew of national regulations. Pharmacists strongly supported professional training (4.55 ± 0.89) and patient education (4.40 ± 0.95). While 74.6% dispensed herbal medicines and typically recommended them “sometimes,” only 34.8% documented side effects; 69.6% had refused dispensing due to safety concerns. Main information sources were personal reading and university education. Community pharmacists in Sulaimani city demonstrate strong awareness and positive attitudes toward herbal medicine use. However, gaps in regulatory knowledge and pharmacovigilance practices suggest a need for targeted professional training and structured educational interventions.



1. Introduction

Herbal medicines (HMs) are industrially produced preparations that contain naturally derived plant substances as their active components. These substances are unmodified by chemical processes and are responsible for the therapeutic

effects of the product (Alostad et al., 2020). Although the public often perceives herbal medicines as safe due to their natural origin, safety concerns remain because many products lack sufficient scientific evidence for efficacy and quality assurance. Moreover, the U.S. Food and Drug Administration (FDA) does not formally classify most herbal

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products as drugs, primarily due to limited clinical data supporting their safety and therapeutic effectiveness (Garfield et al., 2022). Over the past three decades, the popularity of herbal supplements and medicinal items has grown significantly, and at least 80% of people worldwide now rely on them for some aspect of their fundamental medical care (Ekor, 2014). Over the past few years, an increasing number of patients have reported on the perceived effectiveness of herbal medications, praising their good tolerance and lack of undesirable side effects (Salm et al., 2023). The World Health Organization states that community pharmacists, often referred to as retail pharmacists, are the healthcare professionals whom the general public can reach the easiest. Given the rise in sales of herbal medicines and the dearth of trustworthy information the public has access to, pharmacists must understand these products and be able to provide informed advice on their potential risks and applications (Santanello et al., 2019). Whether they are used as nutritional supplements or medications, pharmacists are essential in educating patients about herbal products. To guarantee appropriate assistance, many pharmacists support the sale of herbal treatments within pharmacies and confirm their safety and effectiveness. They must comprehend how herbs can interact with prescription drugs, especially how they affect drug pharmacokinetics and pharmacodynamics, to optimize therapeutic benefits and reduce dangers (Saad et al., 2025). Limited knowledge of herbal medicines among pharmacists has been linked to several clinical and safety challenges. Insufficient understanding of herbal pharmacology can lead to inappropriate recommendations, unrecognized herb-drug interactions, and underreporting of adverse effects, all of which may contribute to therapeutic failure and preventable patient harm. Evidence from previous studies and international reports highlights that knowledge gaps among healthcare professionals weaken pharmacovigilance systems and reduce the safe integration of herbal products into patient care (Mai et al., 2025; Posadzki et al.,

2013; Walji et al., 2009; "WHO guidelines, 2004). Given their close connection to the community and the continuity of care, pharmacists are in an exceptional position to interact with the public. They can also follow up with the user for extended periods of time. As a result, they may inform patients about the application, effectiveness, adverse effects, and possible interactions between these items and prescription drugs (Dores et al., 2023). Nevertheless, despite their crucial function, pharmacists continue to confront multiple barriers in efficiently handling herbal medicines. Dietary and herbal supplements (DHSs) are not well known or understood by pharmacists for several reasons, such as a lack of education and training in the subject, a lack of rules about DHSs, and a lack of resources for DHS information in the pharmacy (Ng et al., 2021).

In Iraq, especially in Sulaimani city, little is known about how well-prepared community pharmacists are to offer knowledgeable counseling, despite the growing popularity of herbal medicine. Although a few studies have been conducted in other parts of Iraq to evaluate pharmacists' knowledge and practices regarding herbal products (Humadi et al., 2024; Ilyas et al., 2024), Similar research has not yet been carried out in the Kurdistan Region. Therefore, this study aims to assess knowledge, attitudes, and practices (KAP) of community pharmacists based in Sulaimani city toward herbal medicines, examine their main sources of information, and identify educational gaps to support safer and more effective patient care.

2. Methodology

2.1. Study Design and Setting

A descriptive, cross-sectional survey was conducted among community pharmacists practicing in Sulaimani city, Iraq. The study aimed to assess pharmacists' KAP regarding herbal medicines, as well as identify gaps in education and training.

2.2. Study Population and Sampling

The target population included licensed pharmacists working in community pharmacies within Sulaimani city. A convenience sampling method was used to recruit participants who consented to voluntarily complete the questionnaire during the study period. Inclusion criteria were holding a valid pharmacy license and currently or previously working in a community pharmacy setting. Pharmacists working in hospitals, academia, or non-dispensing roles were excluded.

2.3. Sample Size

Although the estimated minimum sample size was 168 based on a 95% confidence level and a 5% margin of error, a total of 138 pharmacists participated in the study. This represents a substantial sample of the target population and provides valuable insight into the current state of herbal medicine knowledge and practices among community pharmacists in the region.

2.4. Data Collection

Data were collected using a structured, self-administered questionnaire that was developed based on previously published studies on similar topics (Ahmed et al., 2019; Khmour et al., 2016). The questionnaire was reviewed by a panel of pharmacy academics to ensure content validity and was pilot-tested among five pharmacists. Modifications were made based on feedback to improve clarity and relevance.

The final questionnaire consisted of four sections assessing pharmacists' sociodemographic characteristics, knowledge, attitudes, and practices regarding herbal medicines. The knowledge section included questions on familiarity with herbal medicines, awareness of side effects, herb-drug interactions, and local regulation. The attitude section used a five-point Likert scale to measure perceptions of safety, professional responsibility, and regulation. The practice section explored the frequency of recommending herbal products, information sources, documentation of side effects, and refusal to dispense unsafe products. The

questionnaire was distributed electronically via Google Forms. The survey link was shared through professional pharmacist networks and social media platforms, allowing participants to access and complete the form at their convenience. Data were collected from June to August 2025. Participation was voluntary, and all respondents provided informed consent before beginning the questionnaire. Anonymity and confidentiality were ensured throughout the data collection process.

2.5. Data Analysis

Responses were exported from Google Forms into Microsoft Excel for analysis. Descriptive statistics were used to summarize the data. Categorical variables were expressed as frequencies and percentages, and continuous variables were presented as means and standard deviations. Knowledge scores were calculated based on the number of correct responses. The attitude section used a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). For analysis, responses were coded numerically (1–5), and were used to compute mean and standard deviation scores for each domain (knowledge, attitude, and practice). Mean scores were interpreted as follows: 1.00–2.33 = low level, 2.34–3.66 = moderate level, and 3.67–5.00 = high level. For further analysis, the Likert-scale data were treated as interval data, and appropriate statistical tests (including independent t-test, one-way ANOVA, and Pearson correlation) were applied to examine relationships between variables such as demographic characteristics and KAP scores.

2.6. Ethical Approval

The study received ethical approval from the Ethics Committee of the College of Medicine, University of Sulaimani, under approval number (No: 28 in 25/10/2024).

3. Results

A total of 138 community pharmacists participated in the study. The majority of respondents were female, with the predominant age

group being 25–34 years. Most participants reported having 1–5 years of experience working in community pharmacies, and the most frequently held educational qualification was a bachelor's degree in pharmacy (Table 1).

Regarding knowledge, 97.10% of respondents indicated familiarity with the term "herbal medicine," and 94.93% were aware that herbal medicines can cause side effects (Table 2). Among the reported or recognized side effects of herbal medicines, the most commonly identified were gastrointestinal discomfort and allergic reactions

(76.1% and 73.9% of respondents, respectively). Interactions with prescription drugs were also frequently acknowledged (63.8%), followed by liver toxicity (43.5%) (Figure 1).

Awareness of herb-drug interactions was also high, reported by 84.06% of participants. However, only 23 pharmacists (16.67%) stated that they were aware of national regulations concerning herbal medicines in Kurdistan, while 61 (44.20%) were unsure, and 54 (39.13%) believed no such regulations exist (Table 2).

Table 1. Participant Demographics (n = 138).

Characteristics		Frequency (n)	Percentage (%)
Gender	Male	44	31.88
	Female	94	68.12
Age Group	Under 25	33	23.91
	25-34	85	61.59
	35-44	19	13.77
	45 and above	1	0.72
Years of experience in community pharmacy	<1 year	26	18.84
	1-5 years	70	50.72
	6-10 years	24	17.39
	>10 years	18	13.04
Educational Qualification	Bachelor's	111	80.43
	Master's	23	16.67
	Ph.D.	4	2.90

Note: Values are presented in frequency and percentage, using descriptive statistics

Table 2. Pharmacists' Knowledge Regarding Herbal Medicines (n = 138).

Questions		Frequency (n)	Percentage (%)
Are you familiar with the term "herbal medicine?"	Yes	134	97.10
	No	4	2.90
Do you know that herbal medicines can cause side effects?	Yes	131	94.93
	No	3	2.17
	Not sure	4	2.90
Are you aware of any herb-drug interactions?	Yes	116	84.06
	No	22	15.94
Do you know if herbal medicines are regulated by national authorities in Kurdistan?	Yes	23	16.67
	No	54	39.13
	Not sure	61	44.20

Note: Values are presented in frequency and percentage, using descriptive statistics

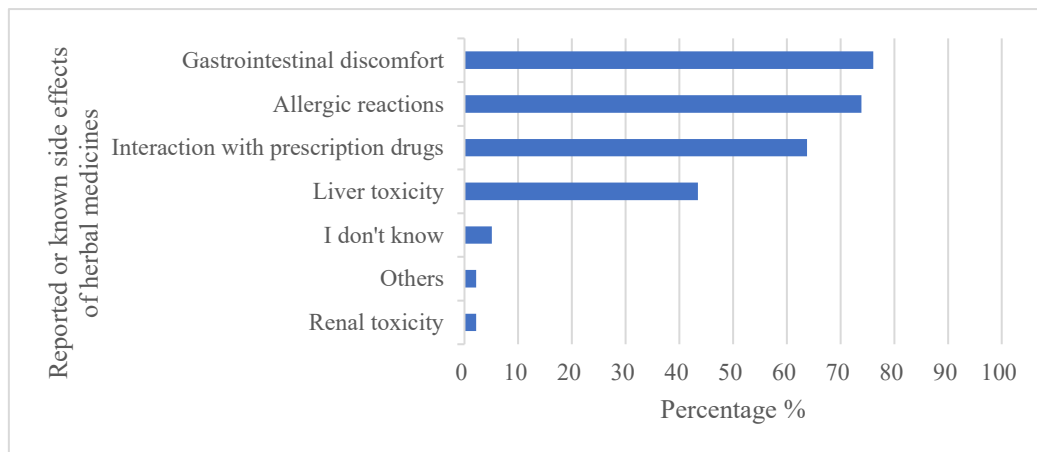


Figure 1. Awareness of Side Effects Related to Herbal Medicines (n = 138).

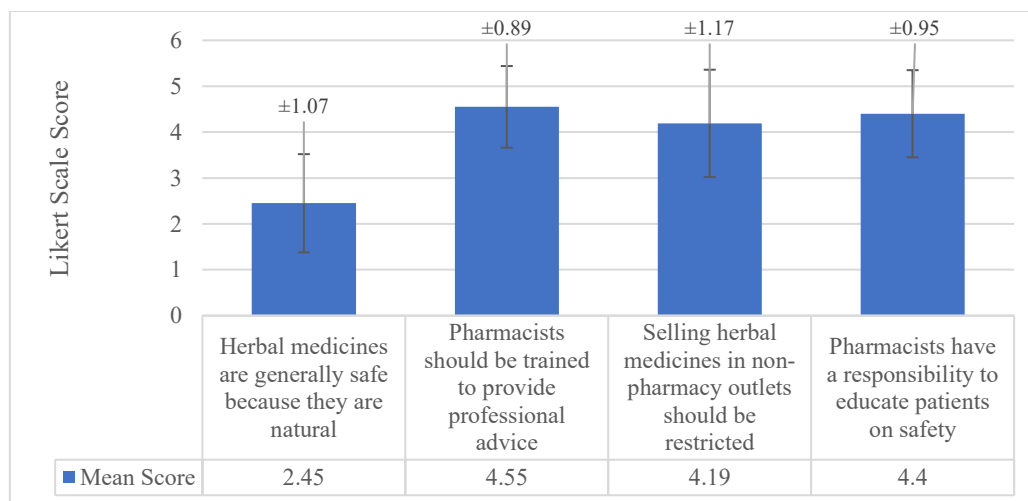


Figure 2. Pharmacists' Attitudes Toward Herbal Medicine.

The mean Likert scale scores for attitude-related items are shown in [Figure 2](#). Pharmacists showed strong agreement on the need for professional training (4.55 ± 0.89), their responsibility to educate patients (4.40 ± 0.95) and restricting non-pharmacy sales of herbal medicines (4.19 ± 1.17), while agreement was low regarding the belief that herbal medicines are safe because they are natural (2.45 ± 1.07).

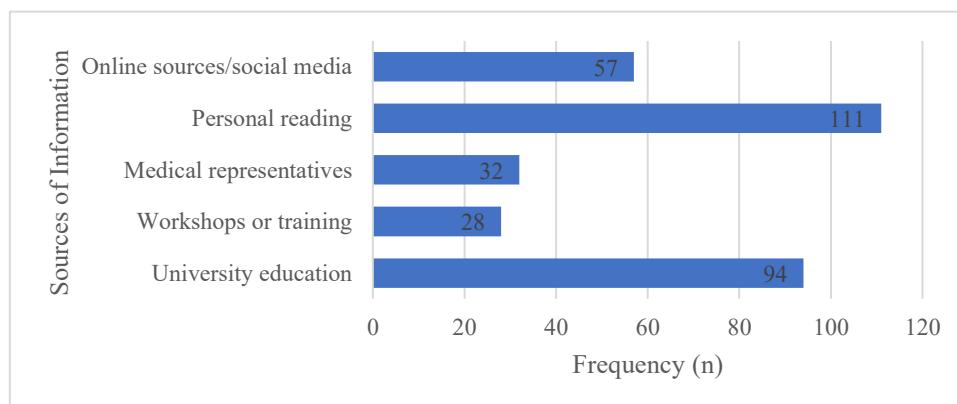
In terms of practice, most pharmacists (74.64%) dispensed herbal medicines, with recommendations typically given “sometimes” (52.90%), followed by “rarely” (31.16%) and “often” (11.59%). Numerical values were assigned to the response categories (1 =

Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Always), and the median score was 3, indicating an overall tendency toward occasional advice. While 34.78% of pharmacists reported documenting side effects internally within their pharmacies, there was no evidence of a formal national pharmacovigilance or reporting authority for herbal products in the Kurdistan Region. Meanwhile, 69.57% of participants stated that they had refused to dispense a herbal product due to safety concerns ([Table 3](#)).

Table 3. Participants' Practices and Safety Measures Related to Herbal Medicine Dispensing.

Questions about practicing herbal medicine among participants	Frequency (n)	Percentage (%)
Do you dispense herbal medicines in your pharmacy?		
Yes	103	74.64
No	35	25.36
How often do you recommend herbal products to customers?		
Never	6	4.35
Rarely (About 10–29% of the time; infrequently or seldom)	43	31.16
Sometimes (About 30–69% of the time; occasionally or inconsistently)	73	52.90
Often (About 70–90% of the time; in most cases or regularly)	16	11.59
Always (100% of the time; every time the situation arises)	0	0.0
Do you report or document side effects from herbal products?		
Yes	48	34.78
No	90	65.22
Have you ever refused to dispense a herbal product due to safety concerns?		
Yes	96	69.57
No	42	30.43

Note: Values are presented in frequency and percentage, using descriptive statistics.

**Figure 3.** Pharmacists' Main Source of Knowledge on Herbal Medicines.

Regarding the sources of information about herbal medicines, most commonly reported sources were personal reading and university education, cited by over 110 and 94 pharmacists respectively. Online sources were mentioned by about 57 respondents, while fewer pharmacists relied on medical representatives or workshops. These findings suggest a preference for self-directed and academic learning over structured professional training (Figure 3).

Table 4 presents the association between pharmacists' demographic characteristics and their knowledge, attitude, and practice (KAP) scores regarding herbal medicines. The independent t-test showed no statistically significant difference in KAP scores between male and female pharmacists ($p \geq 0.05$). One way ANOVA revealed significant differences in both knowledge ($F = 3.216$, $p = 0.043$) and practice ($F = 3.504$, $p = 0.033$) scores among different age groups, suggesting that age may influence pharmacists' understanding and

professional use of herbal medicines. Likewise, a significant association was found between qualification and knowledge scores ($F = 7.242$, $p < 0.001$), indicating that pharmacists with higher qualifications demonstrated better knowledge. However, no significant differences were observed in attitude or practice scores across qualification levels ($p > 0.05$). Pearson's correlation analysis showed weak, non-

significant relationships between years of experience and all three KAP domains ($p > 0.05$).

Overall, these results indicate that age group and qualification were significantly associated with knowledge—and to a lesser extent, practice whereas gender and years of experience showed no significant relationships with pharmacists' KAP toward herbal medicines.

Table 4. Correlation and Comparative Analyses of Pharmacists' KAP Scores According to Demographic Characteristics

Variable	Test	K (t/t/F)	Knowledge score p-value	A (t/t/F)	Attitude score p-value	P (t/t/F)	Practice score p-value	Interpretation
Gender	t-test	t = - 1.009	0.315	t = - 0.063	0.950	t = - 0.393	0.695	≥ 0.05 (not significant)
Age group	ANOVA	F = 3.216	0.043	F = 0.327	0.721	F = 3.504	0.033	Significant for Knowledge and Practice
Qualification	ANOVA	F = 7.242	0.000	F = 1.189	0.316	F = 1.154	0.330	Significant for Knowledge only
Years of experience	Correlation	r = 0.079	0.359	r = - 0.152	0.076	r = - 0.085	0.321	≥ 0.05 (not significant)

Note: Independent t-tests were used for gender comparisons, one-way ANOVA for age group and qualification, and Pearson's correlation for years of experience. $p < 0.05$ was considered statistically significant.

Abbreviations: K, Knowledge score; A, Attitude score; P, Practice score; r, Pearson's correlation coefficient; t, Student's t-test statistic; F, Fisher's F-statistic from ANOVA; p, Probability value (level of statistical significance); ANOVA, Analysis of Variance.

4. Discussion

This study provides valuable insights into the knowledge, attitudes, and practices (KAP) of community pharmacists in Sulaimani city regarding herbal medicines. Overall, the findings indicate a high level of awareness about adverse effects and herb-drug interactions, alongside positive attitudes toward patient education and professional training. Nevertheless, significant gaps remain in regulatory awareness and systematic pharmacovigilance, echoing challenges observed in both regional and international contexts.

The generally strong knowledge base among Sulaimani city pharmacists is encouraging, especially in light of global concerns about insufficient understanding of herbal pharmacology

among healthcare professionals. Respondents commonly identified gastrointestinal disturbances, allergic reactions, and liver toxicity as adverse effects of herbal medicines. These findings are consistent with Ekor and Rapp who reported that these toxicities are among the most frequently observed worldwide (Ekor, 2014; Rapp et al., 2013). However, awareness of hepatotoxicity in this study (43%) was notably lower than in European reports (>60%). In 2023 Salm et al. highlighted that hepatotoxicity remains one of the most underrecognized risks, even in well-resourced regions, pointing to gaps in both professional and public awareness (Salm et al., 2023). These findings underscore the need to integrate herbal pharmacology more comprehensively into pharmacy curricula. Also other finding suggest similarly recommended strengthening education to

bridge regulatory and safety knowledge gaps (Tzouveleakis et al., 2020).

High recognition of herb–drug interactions (84.1%) among participants aligns with international studies. The Alasmari found that 79% of Saudi pharmacists acknowledged the risks of interactions (Saud et al., 2025). In the United States, Santanello likewise reported strong pharmacist support for improved knowledge on herbal safety, though confidence in counselling varied (Santanello et al., 2019). These similarities reinforce the need for training programs that enhance both knowledge and counselling confidence.

The strong agreement among pharmacists regarding their responsibility to educate patients (mean score 4.40 ± 0.95) demonstrates professional commitment to safe practice. Similar attitudes have been documented in Saudi Arabia and Portugal, where pharmacists emphasized counselling as a means to reduce patient risks (Dores et al., 2023; Garfield et al., 2022). Interestingly, participants in this study rejected the notion that herbal medicines are inherently safe because they are “natural.” This contrasts with public perceptions but is consistent with observations by Salm, who noted that pharmacists often serve as key correctors of such misconceptions. This highlights the importance of equipping pharmacists with both the training and regulatory support necessary to address public overconfidence in herbal remedies (Salm et al., 2023).

Pharmacists’ occasional recommendation of herbal products (median score 3) reflects a cautious approach, likely linked to concerns about product quality and regulatory oversight. Canadian pharmacists have reported similar hesitancy in recommending herbal remedies without adequate evidence-based information (Ng et al., 2021). The lack of adverse effect documentation observed in this study further emphasizes the need for robust pharmacovigilance systems. Only 34.8% of respondents reported adverse effects, compared with up to 50% in Western countries where

structured systems exist (Ng et al., 2021). The finding that 69.6% of pharmacists refused to dispense herbal medicines due to safety concerns indicates strong professional accountability, yet such refusals do not substitute for systematic reporting.

Regulatory knowledge was limited, with only 16.7% of participants aware of national herbal medicine regulations. This rate is considerably lower than those reported in Saudi Arabia and Europe (30–50%) and likely reflects the absence of clearly disseminated regulatory frameworks in Kurdistan. Structured governmental policies, including guidelines for registration, labelling, and monitoring, are therefore urgently needed. In practice, 74.6% of pharmacists dispensed herbal medicines, a proportion similar to Riyadh, where over 70% also stocked such products (Dores et al., 2023). However, without centralized systems for monitoring, such widespread dispensing increases the risk of underreporting safety concerns and perpetuating knowledge–practice gaps.

Taken together, the results demonstrate that while pharmacists in Sulaimani city have strong knowledge and positive attitudes, their practices are hindered by systemic barriers, including weak regulations, absent reporting systems, and reliance on self-directed learning. Similar gaps have been reported elsewhere (Ng et al., 2021). Bridging this gap requires not only individual-level interventions, such as continuing professional development (CPD), but also structural reforms in healthcare policy and regulation.

The readiness of pharmacists to engage in patient education and their cautious dispensing practices highlight an opportunity for professional growth. However, reliance on personal reading and undergraduate education as primary sources of information indicates insufficient CPD opportunities. Addressing this will require collaborative efforts between universities, professional associations, and health authorities. Local health authorities should prioritize establishing clear regulatory frameworks

for herbal medicines, drawing on models from the European Union and the World Health Organization. Furthermore, creating a centralized pharmacovigilance system would facilitate adverse effect reporting and improve patient safety. By integrating structured training, clear regulations, and effective monitoring systems, pharmacists in Kurdistan can better translate their knowledge and attitudes into safe and effective practices.

This study investigated the relationships between demographic variables (gender, age group, qualification, and years of experience) and Knowledge, Attitude, and Practice (KAP) scores, using statistical tests to uncover potential influences on KAP outcomes. The t-test results showed no significant differences between male and female participants in knowledge, attitude, or practice scores. These findings suggest that gender does not significantly affect KAP scores in this sample, aligning with previous studies that reported no gender-related differences in health knowledge or practices (He et al., 2024; Zhong et al., 2020). This indicates that gender may not be a crucial factor influencing health-related behaviors in certain populations. In contrast, age group was significantly related to both knowledge and practice scores, with no significant effect on attitude scores. Older individuals tended to have higher knowledge and better practice scores. This finding is consistent with studies showing that older individuals may have more exposure to relevant health information and greater experience, which could enhance their knowledge and practices (Alshehri et al., 2025). These results highlight the importance of considering age when designing educational interventions, as tailored approaches may be necessary for different age groups to improve their health-related knowledge and behaviors. Educational qualification had a significant impact on knowledge scores, but not on attitude or practice scores. Higher education levels appeared to be linked to better knowledge, likely due to the ability to comprehend and retain complex information. This finding is consistent with previous research showing

that higher education correlates with improved health literacy (Shareef et al., 2024). However, the lack of effect on attitude and practice suggests that other factors, such as practical experience or external training, may play a larger role in shaping these aspects of KAP. No significant relationships were found between years of experience and KAP scores. This suggests that experience alone may not have a strong impact on KAP scores, possibly due to the homogeneous nature of the sample or a lack of targeted education or training in the study context.

5. Conclusions

Community pharmacists in Sulaimani city demonstrate strong knowledge of herbal medicines and positive attitudes toward patient education, but important gaps remain in regulatory awareness and systematic documentation of adverse events. Addressing these deficiencies through structured training, clear regulatory frameworks, and improved pharmacovigilance systems is essential to ensure safe and effective use of herbal products. Expanding future research to include broader geographic regions and qualitative insights will further guide evidence-based policy and professional practice. The result of this study found that gender did not influence KAP scores, while age group significantly affected knowledge and practice, with older individuals performing better. Educational qualification was linked to higher knowledge scores. These findings suggest the importance of age and education in shaping health-related knowledge and behaviours, highlighting the need for targeted interventions.

Limitation

Several limitations should be acknowledged. The cross-sectional design prevents causal inference between knowledge, attitudes, and practices. Self-reported data may be subject to bias, as pharmacists could have overstated their knowledge or underreported undesirable practices. Additionally, the study was restricted to Sulaimani city and used a convenience sample, limiting generalizability to other regions of Iraq. Finally, the absence of

qualitative data constrained deeper exploration of pharmacists' reasoning and contextual barriers to effective counselling.

Conflict of interest

The author declares that there is no conflict of interests.

CRedit authorship contribution statement

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