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Evaluation of community pharmacists' knowledge gaps and dispensing errors related to isotretinoin use in Erbil city

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Abstract

Background and objective: Isotretinoin, a potent treatment for severe acne, must be administered with caution due to the possibility of serious side effects. Community pharmacists play an important role in ensuring the safe dispensing of medications and providing patient counseling. However, dispensing errors may occur due to pharmacists' current knowledge gaps, particularly in Erbil City. Therefore, this study aims to evaluate the knowledge gaps and dispensing errors among community pharmacists in Erbil City regarding isotretinoin use, to improve safe dispensing practices and patient safety.

Methods: A cross-sectional study consisted of 350 community pharmacists in Erbil City who were selected using a convenience sampling method. Data were collected using a self-administered questionnaire divided into three sections: sociodemographic information, isotretinoin knowledge, and dispensing practices. The data was analyzed using statistical package for the social sciences (SPSS) version 25.

Results: The mean age of the participants was 28.32 ± 5.80 years, and the mean duration of working experience was 5.10 ± 4.60 years. A significant percentage of pharmacists demonstrated a lack of knowledge about isotretinoin treatment. Many people were unaware of its proper use, potential side effects, and the need for counseling. Approximately 67.1% of the participants were classified as having poor knowledge, and only 16.3% of the participants demonstrated good knowledge. This study indicated that the younger, female, and single pharmacists tended to have more knowledge. These findings indicate a significant knowledge gap among pharmacists, emphasizing the importance of more comprehensive educational initiatives to improve isotretinoin-related patient counseling and safe dispensing procedures.

Conclusion: A significant knowledge gap in isotretinoin therapy was identified among Erbil City's community pharmacists. Many pharmacists were not familiar with its proper use, side effects, and safety precautions, emphasizing the need for more comprehensive training and educational initiatives to increase pharmacists' level of knowledge in this area.

Keywords: Acne vulgaris, Community Pharmacists, Isotretinoin, Knowledge.

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Introduction

Acne vulgaris is a common, inflammatory skin condition that affects approximately 9.4% of people worldwide. It is characterized by inflammation, follicular obstruction, bacterial proliferation, and excessive sebum production (1, 2). The condition is most common in teenagers, with about 85% suffering from the disease. Acne can range in intensity from mild to severe, systemic infections, often causing emotional discomfort and facial scarring (3, 4). Isotretinoin, a potent systemic retinoid, is the mainstay of treatment for severe or resistant acne vulgaris, especially nodulocystic acne. The FDA approved isotretinoin in 1982, a systemic retinoid and vitamin A derivative, specifically 13-cis-retinoic acid, as a pharmacotherapeutic agent for the treatment of severe, resistant nodulocystic acne vulgaris (5). Isotretinoin has several potential side effects, including dryness of the skin and mucocutaneous membranes, nose bleeding, and high teratogenicity. It is categorized as pregnancy category X due to its high teratogenic potential, meaning it must be avoided during pregnancy to prevent serious birth defects(6).

Isotretinoin has raised concerns about potential associations with depression and suicidal thoughts, and patients should be closely monitored for mood swings (7). While using isotretinoin, numerous laboratory abnormalities can result, such as decreased HDLs, increased LFTs, and various hematological changes, including decreased hemoglobin, hematocrit, erythrocyte, and leukocyte counts, alongside increased platelet counts (8). Patients are at serious risk when taking tetracycline antibiotics, vitamin A dietary supplements, and isotretinoin together, as taking extra vitamin A could have additive toxicity and worsen the effects of having too much retinoid (9, 10). Musculoskeletal discomfort, joint pain, and arthralgia are also possible side effects of isotretinoin therapy (11). Patients should take isotretinoin with meals, especially those containing fat, to maximize bioavailability and minimize medication level variability (12). Patients on isotretinoin should avoid blood donation for at least one month after the last dose to prevent potential teratogenic exposure from blood transfusions (13).

Community pharmacists play a crucial role in ensuring the safety and efficacy of medications, particularly high-risk drugs like isotretinoin. However, Erbil City lacks studies on its knowledge gaps and their impact on isotretinoin dispensing practices. Inadequate knowledge and insufficient dispensing procedures can pose significant patient safety risks, particularly for women of childbearing age who are most vulnerable to the teratogenic effects of isotretinoin. This study aims to assess the knowledge and dispensing practices

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of community pharmacists in Erbil City regarding isotretinoin, with a focus on identifying gaps that may pose patient safety risks.The results will provide evidence-based recommendations to enhance pharmacy practices, inform regulatory policies, and guide educational initiatives in Erbil City, with the aim of improving pharmaceutical care standards and patient outcomes.

Subjects and Methods

Study design:

A cross-sectional study.

Study setting:

The study was conducted in Erbil City, the capital of the Kurdistan Region of Iraq, with a specific focus on community pharmacists working in pharmacies located within the city center.

Duration of the study:

From October 2024 to October 2025.

Sample size and sampling method:

A convenience sampling method was used to recruit participants from a total of 1,770 pharmacists registered with the Syndicate of Kurdistan Pharmacists, working across 500 pharmacies in the city center. The minimum sample size was calculated using Epi Info™ version 7.2.5 and determined to be 316 pharmacists; to enhance reliability, 350 pharmacists were ultimately included.

Data collection process

The required data were collected through face-to-face visits to pharmacies using a self-administered questionnaire. The questionnaire was developed based on prior research, literature, and expert consultations and was structured into three sections: socio-demographic information, knowledge regarding isotretinoin use, and dispensing practices.

Inclusion Criteria:

Community pharmacists currently work in pharmacies in the center of Erbil city. Pharmacists who are involved in the dispensing of isotretinoin or other dermatological medications. Pharmacists who have been practicing for at least one year

Exclusion Criteria:

Pharmacy assistants or technicians without a professional pharmacy degree. Pharmacists working outside Erbil city or in a hospital.

Data collection tool:

The study employed a structured questionnaire divided into three sections. The first section captured socio-demographic characteristics, including age, gender, education levels, years of experience, marital status, weekly work hours, and proximity to a dermatologist. The second section of the questionnaire focuses on assessing community pharmacists' knowledge regarding isotretinoin. This section consisted of 25 multiple-choice questions that covered various aspects of the medication. Where 10-12

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questions were extracted and modified in research conducted by Jarab et al. in 2023 to evaluate the knowledge, awareness, and practices of community pharmacists regarding the safe and appropriate dispensing of isotretinoin, a drug commonly used to treat severe acne (14). The researcher developed other questions using information from published literature on isotretinoin to cover key knowledge areas and reflect the specific context of community pharmacy practice in Erbil City. The response with the correct answer was awarded one point, while each unanswered or incorrect responses were given a score of zero points. Therefore, the overall possible score was in the range of 0 to 25 points. Prior research by Zhong et al. (2020) and Haron et al. (2021), who employed score-based grading systems in KAP assessments in healthcare settings, provided the basis of knowledge level classification(15, 16). The following categories were used to group knowledge scores: good knowledge (18–25 points), moderate knowledge (15–17 points), or poor knowledge (< 15 points).The third section of the questionnaire focused on pharmacists' practice related to dispensing isotretinoin. It includes 18 Yes/No questions designed to evaluate the actual dispensing practice of community pharmacists of isotretinoin. Every "Yes" response was given one point, and every "No" response was given zero. The range of the overall practice score was 0 to 18. Using the classification methods from Zhong et al. (2020) and Haron *et al.* (2021)(15, 16), the practice levels were categorized as follows: good dispensing practice (13–18 points),moderate dispensing practice (11–12 points), poor dispensing practice: (0–10 points).

Pilot study:

A pilot involving 25 community pharmacists in Erbil City assessed the internal consistency of the initial questionnaire. During the pilot, the knowledge section's 25 items had a Cronbach's alpha of 0.620, suggesting questionable or marginally acceptable internal consistency. The 18-item dispensing practice section exhibited an alpha of 0.729, indicating acceptable reliability. Based on these results, some knowledge and dispensing practice items were clarified and adjusted to improve their consistency and reliability before proceeding to the main study.

Statistical Analysis:

Statistical Package for the Social Sciences (SPSS) version 25 was used to analyze the data. For every variable that was collected, the frequency and percentage distribution tables were shown first. The association between categorized levels of knowledge and dispensing practices, and sociodemographic variables was evaluated using the Chi-square test. The linear relationship between pharmacists' knowledge and dispensing

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practice scores was examined as well using Pearson correlation analysis. Statistical significance was defined as a P-value of equal to or less than 0.05.

Ethical Considerations:

The study was conducted completely according to accepted ethical guidelines. Prior to beginning the study, ethical approval was obtained from the scientific and ethics committee of the College of Pharmacy, Hawler Medical University**.** Official permission was obtained before data collection started. Verbal informed consent was obtained from all participants before data collection.

Results:

A total of 350 community pharmacists participated in the present study.

Socio-demographic characteristics of participants:

The general socioeconomic characteristics of the participating pharmacists are presented in Table 1. The mean age of the participants was 28.32 ± 5.80 years, with ages ranging from 21 to 56 years. This indicates that the sample consisted primarily of young pharmacists. The mean duration of working experience was 5.10 ± 4.60 years, ranging from 1 to 26 years. According to the results, most of the participants were just starting their careers. Most had a bachelor's degree (329, 94%), were female (211, 60.3%), and were single (193, 56.3%). Part-time employment was reported by the majority of participants (167, 47.7%), while full-time or casual employment was reported by the remaining participants. Geographically, 187 (53.4%) of the population lived far from a dermatologist.

Pharmacists' knowledge regarding isotretinoin use:

The results presented in Table 2, reveal a wide variation in community pharmacists' understanding of isotretinoin, with significant knowledge gaps, particularly in areas concerning drug safety. While the majority of respondents correctly identified severe acne as the primary indication for isotretinoin (64.9%) and recognized dry skin as the most common side effect (68.3%), awareness of more critical safety issues was considerably lower. Only 41.7% of pharmacists identified teratogenicity as the most serious adverse effect, and just 57.4% were aware that isotretinoin is classified as a Category X drug. Furthermore, although 77.4% acknowledged that pregnancy is a contraindication, only 33.7% recommended the use of two forms of contraception, and just 28.0% knew that contraception should be continued after treatment cessation.

Knowledge of drug interactions was also suboptimal. While 66.3% of pharmacists appropriately avoided tetracyclines, only 43.1% recognized the risk of intracranial hypertension, indicating limited awareness of potentially dangerous drug interactions. Even more

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concerning was the low level of understanding regarding laboratory monitoring:only 27.7% and 28.3% correctly answered questions about the required monitoring parameters and testing frequency, respectively. Knowledge of systemic side effects was also lacking; only 34.6% identified depression, and 28.0% identified joint pain as adverse effects, suggesting a poor grasp of both long-term and mental health risks associated with isotretinoin use.

Table 1. Demographic characteristics of study participants (n = 350)

Variables	Frequency	Percentage
Age group (years)		
< 30	275	78.6
30 – 45	66	18.9
> 45	9	2.5
Working experience		
≤ 10 years	315	90
>10 years	35	10
Gender		
Male	139	39.7
Female	211	60.3
Education level		
Bachelor's degree	329	94
Master's degree or Doctorate	21	6
Marital status		
Single	197	56.3
Married	153	43.7
Work hours		
Full-time	108	30.9
Part-time	167	47.7
Casual	75	21.4
Distance to a dermatologist		
Nearby	163	46.6
Far	187	53.4

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Table 2. Community pharmacists' knowledge regarding isotretinoin use (n = 350)

	Questions	Correct answer	No. (%) Answered correctly
1	For which severity of acne is isotretinoin primarily indicated?	Severe acne	227 (64.9)
2	How does isotretinoin work in treating acne?	Reduces sebum production	148 (42.3)
3	Which of the following is the most common side effect of isotretinoin?	Dry skin	239 (68.3)
4	Which of the following is a contraindication for isotretinoin use?	Pregnancy	271 (77.4)
5	What is the pregnancy risk classification for oral isotretinoin?	Category X	201 (57.4)
6	What is the most serious risk associated with oral isotretinoin use?	Teratogenicity (birth defect)	146 (41.7)
7	What advice should be given to women of childbearing age taking isotretinoin?	They should use two forms of contraception	118 (33.7)
8	What is the typical dosage range per kg for isotretinoin in acne treatment?	0.5-1.0 mg/kg	182 (52)
9	Typical duration of isotretinoin treatment for acne?	16-30 weeks (4-7 months)	184 (52.6)
10	Medication to use cautiously with isotretinoin?	Tetracyclines (including doxycycline	232 (66.3)
11	Why omega-3 supplements with isotretinoin?	They reduce mucocutaneous side effects	162 (46.3)
12	Liver function & triglyceride test schedule in healthy patients?	Once at start/peak	97 (27.7)
13	Liver function and triglyceride test frequency in patients with preexisting conditions?	Every month	116 (33.1)
14	Sunscreen reapplication frequency for isotretinoin users?	Every 2 hours, especially after swimming or sweating	212 (60.6)
15	Lab tests to monitor isotretinoin patients?	All of the above	99 (28.3)

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16	Long-term side effects reported with isotretinoin?	Joint pain	98 (28)
17	When should isotretinoin be discontinued or adjusted?	Severe side effects	176 (50.3)
18	Why use tetracyclines cautiously with isotretinoin?	Increased intracranial pressure	151 (43.1)
19	How to take isotretinoin for best absorption?	With a meal & a full glass of water	227 (64.9)
20	How long should contraception continue after treatment?	1-2 months	98 (28)
21	Adverse effects controversially linked to isotretinoin?	Depression	121 (34.6)
22	Mechanism for nosebleeds in isotretinoin use?	Drying of the mucous membrane	196 (56)
23	How long do isotretinoin users avoid blood donation after therapy?	1 month after stopping therapy	90 (25.7)
24	Recommended contraceptive combination for women of childbearing age on isotretinoin?	Barrier method (e.g., condoms) and oral contraceptives	165 (47.1)
25	Can patients take vitamin A while using isotretinoin?	No, it should be avoided	190 (54.3)

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Overall, among the 350 pharmacists surveyed, only 57 (16.3%) demonstrated good knowledge, 58 (16.6%) had moderate knowledge, and a substantial majority of 235 (67.1%) fell into the poor knowledge category, as presented in Table 3 and illustrated in Figure 1.

Table 3. Distribution of knowledge score among community pharmacists

Knowledge level	Category	No.	%
	Good	57	16.3
	Moderate	58	16.6
	Poor	235	67.1
		350	100

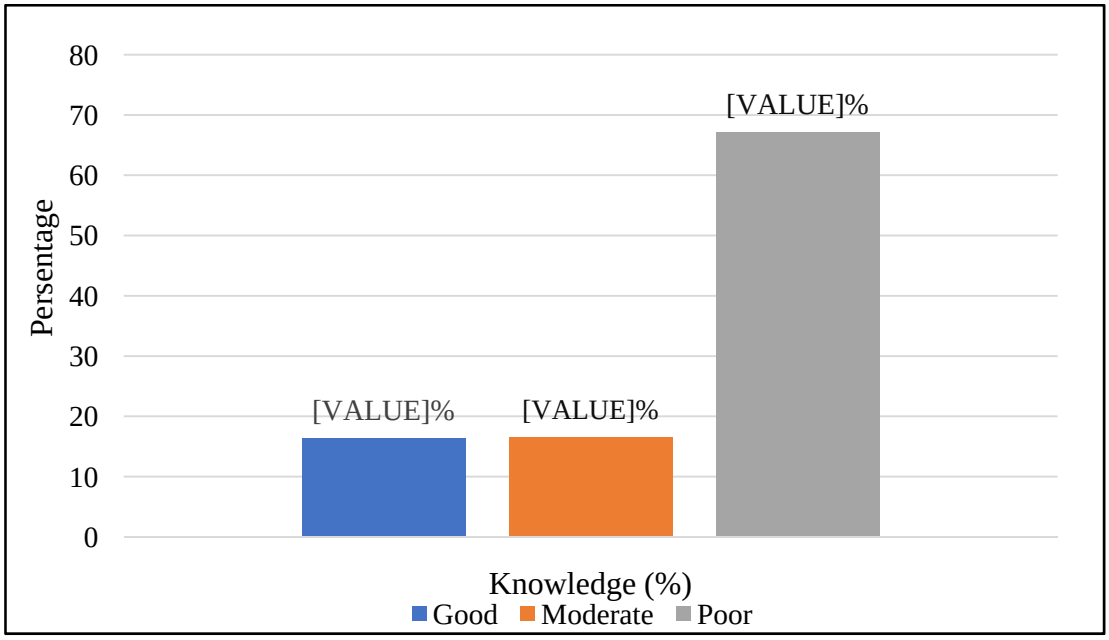

Figure 1. Knowledge scores of study participants. Knowledge score <60% = poor knowledge, 60–70% score = moderate knowledge, >70% score = good knowledge

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An analysis of the association of pharmacists' knowledge levels with demographic characteristics discovered several noteworthy patterns, as indicated in Table 4, which could guide future educational initiatives. Despite the fact that there were no statistically significant associations at the P <0.05 level, the trends that were observed provide important information. The distribution of knowledge among pharmacists under 30 was relatively better, with 17.5% and 18.9% of them falling into the good and moderate knowledge categories, respectively. In contrast, knowledge levels decreased with age, as 78.8% of individuals in the 30 to 45-year-old age range and 88.9% of those over 45 were categorized as having poor knowledge. According to these results, younger pharmacists may be more knowledgeable about safer isotretinoin prescribing procedures and recent clinical advancements. Differences based on gender were also discovered. Compared to male pharmacists, who had poor knowledge at a rate of 74.1%, female pharmacists had a better knowledge profile, with only 62.6% of them categorized as having poor knowledge. Unexpectedly, only 4.8% of pharmacists with advanced degrees (Master's or Doctorate) showed good knowledge, whereas 80.9% were categorized as having poor knowledge. This surprising result might suggest that postgraduate academic training did not place enough emphasis on isotretinoin-specific knowledge and that community pharmacies did not provide enough practical experience. About one-fifth of single pharmacists (19.8%) had good knowledge, while married pharmacists, only 11.8% had good knowledge. While married pharmacists may have conflicting responsibilities that restrict their opportunities for professional growth, single pharmacists may have fewer personal obligations and more time for continuing education, which could explain this trend. That’s why the single pharmacists might have a greater knowledge level. In terms of employment status, those in casual roles (who work fewer than 20 hours per week) had the lowest percentage of good knowledge (9.3%) and the highest proportion of moderate knowledge (22.7%). Because they were less likely to participate in high-risk drug dispensing and continuing education programs. Additionally, compared to pharmacists working farther away (14.7%), those working closer to dermatologists had a slightly higher knowledge profile (17.6% good knowledge), which may be related to easier access to clinical consultations or referrals that support drug safety considerations.

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Table 4. Association between socio-demographic characteristics and pharmacists' knowledge level of isotretinoin (n =350)

Variables		Knowledge level			Total No. (%)	P-value
		Good No. (%)	Moderate No. (%)	Poor No. (%)		
Age group (years)						
	< 30	48 (17.5)	52 (18.9)	175 (63.6)	275 (100)	0.068
	30–45	9 (13.6)	5 (7.6)	52 (78.8)	66 (100)	
	> 45	0 (0.0)	1 (11.1)	8 (88.9)	9 (100)	
Working experience						
	≤ 10 years	52 (16.5)	55 (17.5)	208 (66.0)	315 (100)	0.337
	> 10 years	5 (14.3)	3 (8.6)	27 (77.1)	35 (100)	
Gender						
	Male	20 (14.4)	16 (11.5)	103 (74.1)	139 (100)	0.057
	Female	37 (17.5)	42 (19.9)	132 (62.6)	211 (100)	
Education level						
	Bachelor's degree	56 (17.0)	55 (16.7)	218 (66.3)	329 (100)	0.283
	Master's degree or Doctorate	1 (4.8)	3 (14.3)	17 (80.9)	21 (100)	
Marital status						
	Single	39 (19.8)	35 (17.8)	123 (62.4)	197 (100)	0.071
	Married	18 (11.8)	23 (15.0)	112 (73.2)	153 (100)	
Work hours						
	Full-time	17 (15.7)	21 (19.4)	70 (64.9)	108 (100)	0.093
	Part-time	33 (19.7)	20 (12.0)	114 (68.3)	167 (100)	
	Casual	7 (9.3)	17 (22.7)	51 (68.0)	75 (100)	
Proximity to a dermatologist						0.205
	Near	33 (17.6)	36 (19.3)	118 (63.1)	187 (100)	
	Far	24 (14.7)	22 (13.5)	117 (71.8)	163 (100)	
Total		57 (16.3)	58 (16.6)	235 (67.1)	350 (100)	

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Discussion

This study was intended to evaluate Erbil City community pharmacists' knowledge of isotretinoin use. The majority of participants (67.1%) were categorized as having a poor knowledge score about this high-risk medication; only 16.3% of pharmacists in this study had a good knowledge score, indicating a lack of knowledge about isotretinoin. Fewer people were aware of major risks like teratogenicity (41.7%) and appropriate contraception (33.7%), even though 64.9% correctly identified severe acne as the primary indication and 68.3% identified dry skin as a common side effect. Just 25.7% of respondents knew that blood donation must be delayed for one month after therapy. Despite having a marginally better knowledge of risks and monitoring, these results are in consistent with those of Jarab et al. (2023), who also reported gaps in pharmacist knowledge. The significance of better pharmacist education regarding isotretinoin safety and counseling is generally emphasized by both studies (14). Consistent with previous research, 68.3% of participants accurately recognized skin dryness as a common isotretinoin side effect. This is consistent with research findings from the United Arab Emirates (17). According to the study's results, 77.4% of pharmacists in Erbil correctly recognized pregnancy as a contraindication for using isotretinoin. This is an impressive improvement over the 34.2% found in a similar study conducted in Ethiopia by Tuha et al. (2019) (18). Regarding drug-drug interactions, 66.3% of the pharmacists in the current study correctly identified tetracyclines as medications to be used with caution, while 43.1% knowing the reason of this caution, this discrepancy highlights a concerning weakness: while pharmacists may remember the names of contraindicated medications, their understanding of the clinical reasoning behind these contraindications appears limited. This pattern reflects a more general problem that has been identified in a Palestine-based study conducted by Abukhalil et al. (2024), prescribers, including some pharmacists, only 30% of participants acknowledged the risk of IIH associated with concurrent tetracycline and isotretinoin use (19). While 54.3% of them correctly identified vitamin A as something to avoid during isotretinoin therapy. On the other hand, a previous study revealed that only 2.38% of pharmacists were aware of the interaction between isotretinoin and vitamin A (20). According to previous research, male pharmacists have significantly higher levels of knowledge and understanding about isotretinoin therapy than female pharmacists.

The difference is frequently attributed to social and cultural factors, as female pharmacists balance work and family responsibilities, which can limit their

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time and opportunities to learn new drugs or further their education (14). However, the current study found that although the percentage of good knowledge among female pharmacists was slightly higher (17.5%) than that of male pharmacists (14.4%). Female pharmacists might have similar access to professional development, educational resources, and motivation to stay informed, regardless of extra household duties. This result may be explained by changing social roles, easier access to internet resources, or workplace assistance that helps female pharmacists manage their workload and stay knowledgeable in their field. It also highlights how crucial it is to give all pharmacists, regardless of gender, equal access to resources and opportunities to advance their expertise in safe dispensing procedures. The percentage of pharmacists with good knowledge was slightly higher among females (17.5%) than among males (14.4%) in the current study. This finding is in contrast to earlier studies that demonstrated that women scored much higher on knowledge and awareness tests related to isotretinoin therapy. According to one study, women's mean knowledge scores were higher than men's (8.31 ± 6.46) at 11.0 ± 5.70 (21). According to our study's age-related patterns, pharmacists under 30 had a higher percentage of good knowledge (17.5%) than those between 30 and 45 years old (13.6%) or over 45 (0%). This is somewhat consistent with previous research, which found that younger participants, particularly those aged 16 to 25, had more knowledge of isotretinoin (21). Since our study focused on licensed pharmacists with relatively uniform access to drug information and professional training, rather than general or student populations as in previous studies, the discrepancy may be explained by differences in sample characteristics.

Limitations of the study: This study has a number of limitations, despite the fact that it provides insightful information about knowledge gaps and potential dispensing errors in the use of isotretinoin among community pharmacists in Erbil City. First and foremost, because of its cross-sectional design, it is more difficult to determine causal relationships or assess how knowledge or practice changed over time. Second, the use of a self-administered questionnaire may have introduced response bias, possibly as a result of participants misinterpreting certain questions or giving answers they thought were right or expected, especially regarding isotretinoin-related professional practices. Third, the findings may not apply to other areas because they are specific to community pharmacists in Erbil City.

Conclusion

Pharmacists have a significant knowledge gap about isotretinoin therapy; many are unaware of its risks, appropriate use, and counseling needs.

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While younger and female pharmacists had slightly better knowledge than their counterparts, the overall level of knowledge remained inadequate. It's interesting to note that formal qualifications alone are insufficient in the absence of continuous professional development, as longer work experience and higher education levels do not always turn into increased knowledge. These results demonstrate the critical need for focused educational initiatives that close knowledge gaps and enable pharmacists to accurately counsel patients and safely dispense isotretinoin. Given the serious consequences of using isotretinoin, the Ministry of Health and the Erbil Directorate of Health should require pharmacists to complete training courses on risk management, patient counseling, and safe dispensing. These courses should be linked to pharmacist license renewals and included in structured continuing professional development (CPD). This strategy ensures that pharmacists stay up to date on their knowledge and are ready to protect the public's health. Making this policy a top priority will significantly reduce unnecessary damage and enhance community patient safety.

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Consent for publication

Informed consent was obtained from the participants.

Competing interest

The authors declare that they have no competing interests.

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